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Editorials

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

MESSAGE OF THE PRESIDENT

A HAPPY NEW YEAR to all members of the International Association of Milk and Food Sanitarians! Like other years, the new one will pass all too quickly, leaving unaccomplished some of our plans and aspirations. So let us grasp the present moment to think of the Association's recent accomplishments and of its future needs.

At the Philadelphia meeting a constitutional amendment to establish the office of President-Elect was presented and will be submitted in the near future to the entire membership for consideration. The Association approved the 3–A sanitary standards for dairy equipment thus far accepted by your Committee on Sanitary Procedure working jointly with the Dairy Industry Committee and the USPHS. Considerable progress toward the formulation of uniform milk sanitation standards that would be acceptable to most of the members was reported by your Committee on Ordinances and Regulations. Negotiations are under way for the collaboration by your Committee on Food Handling Equipment with other associations of sanitarians, with USPHS, and with industry through the National Sanitation Foundation, in establishing a joint program in the food equipment field similar to the 3–A program for dairy equipment. Other interesting Committee reports which cannot be discussed here will appear in the Journal.

Some criticism was heard at the Philadelphia meeting concerning the subject coverage of the program. This is a healthy sign of real interest, if followed up by constructive suggestions. Every member is invited to submit his ideas as to the type of papers and as to suitable authors for the 1949 meeting, which will probably be held in Columbus, Ohio. And let us all make every effort to attend. We need the contacts and the inspiration.

We find ourselves in an era of expanding sanitary activities and of growing public recognition of the value of sanitation. More and more sanitarians are being employed by industry to accomplish the same ends that official sanitarians seek. Should the Association recognize this professional kinship of interests and remove the present limitations which restrict industry sanitarians to associate membership? This subject was discussed at the Philadelphia meeting, is being considered by your Executive Board, and is being covered by Dr. Shrader in a series of articles in the Journal. Your comments are needed for the guidance of your Executive Board during the year ahead.

A. W. FUCHS, *President.*

BIOGRAPHY OF ABRAHAM WALLERSTEIN FUCHS

Born in New York City, February 2, 1892. Education: Boys' High School, Brooklyn, N. Y., 1906–09; Cornell University, C. E. 1913, with major in sanitary engineering. Draftsman, Baltimore Sewerage Commission, 1913–16; draftsman, Lehigh Valley R. R., 1916; assistant engineer, State Barge Canal, Little Falls, N. Y., 1916. U. S. Public Health Service, 1916 to date: as assistant sanitary engineer, 1916–20; as associate sanitary engineer, 1920–28; as sanitary engineer, 1928–36; commissioned in PHS Regular Corps, 1930, with rank of Major; as senior sanitary engineer with rank of Lt. Colonel, 1936–42; as sanitary engineer director with rank of Colonel, 1942 to date.

Assignments in Public Health Service: 1916–17, Stream Pollution Investigations Station, Cincinnati, O., field studies of trade wastes. 1918–19, in charge of malaria control in extracantonment zones at Park Field, Tenn., Payne Field, Miss., and Government Shipyard, Wilmington, N. C. 1919–21, in charge of cooperative malaria control demonstrations in the States of North Carolina and Tennessee. 1921–23, malaria surveys along the Missouri Pacific R. R., the Seaboard Air Line Ry., and the Chicago, Rock Island and Pacific Ry. 1923–24, studies of major drainage in relation to malaria in Mississippi, Arkansas, and Missouri. 1924–27, municipal health department surveys, hdqtrs. at Baltimore. 1927–30, in charge of milk investigations in Mississippi. 1930–31, milk sanitation surveys in Connecticut and New York for White House Conference on Child Health. 1931–33, isolation and laboratory studies of a test organism for use as an index of bactericidal treatment of milk containers and equipment, New York, N. Y. 1933–40, asst. chief of Office of Milk Investigations, under Leslie C. Frank, Washington, D. C. 1940 to date, chief of Milk and Food Section, Sanitary Engineering Division, Washington, D. C.

Author of numerous papers and bulletins on malaria control and milk and food sanitation. Editor of all editions of the P.H.S. Milk Ordinance and Code since 1933, of all editions of the P.H.S. Frozen Deserts Ordinance and Code, and of all editions of the P.H.S. Ordinance and Code Regulating Eating and Drinking Establishments.

Married July 9, 1922. Two children. Home address: 5420 Connecticut Ave., Washington 15, D. C. Fellow A.P.H.A. Member I.A.M.F.S., Federal Sewage Research Assn., Conf. of State Sanitary Engrs., Assn. of Food & Drug Officials of U. S., Technical Research Committee of National Sanitation Foundation, National Research Council Committee on Quality of Market Milk, Sigma Alpha Mu Fraternity. President I.A.M.F.S., 1949.

FACTS VERSUS OPINIONS

WHEN we look back at conditions in the field of learning at the time of the Renaissance—say, about the time of the fourteenth century—all the mental disciplines had developed to about the same extent. Most of them had ceased to advance knowledge but consumed their energies in endless speculation and disputations. Then someone essayed the unorthodox procedure of examining certain of the current conceptions in the light of everyday living. In other words, he experimented with ideas and materials. He measured his data. He expressed his findings in terms that other workers could check. Measurement, experimentation, facts—these three words determine the difference between the present level of science and technology to the whole remaining group of subjects such as sociology, economics, law, psychology, philosophy, theology, and others. The one group measured; the other merely described. The former progressed from one confirmable discovery to another; the other revolved in circles around authority and fixed beliefs. The one had the courage to step out on the ground of confidence in its findings; the other timorously essayed to advance, drew back, expostulated, argued, guessed, feared, and cycled around and around, traveling a lot and not getting anywhere.

Twenty-five years ago, the several organizations that were (and still are) active in milk and food public health work drew up standard ordinances and regulations. Local groups followed thru—and are still drawing up new ones. Papers and discussions at the annual meetings continue to "rehash a lot of the same old stuff," as inelegantly expressed.

Moreover, we have new codes and laws on milk and food control. They still carry conflicting items. At the last meeting of the International Association, the question was asked, "If all conflicting measures are left out of a milk ordinance, does there remain any substantial number of provisions on which practically everyone agrees?" The reply of the speaker was, "There would be practically nothing left."

What does this mean? Well, in the first place, truth is not antagonistic to truth. Facts are sometimes not recognized as such and so we substitute ideas (and notions!) for facts. In the case of milk ordinances, it appears that the situation is a sorry one. There have been several pretentious efforts to assemble "expert" advice—but after all, mostly opinions.

Are we to continue with this sort of thing? Heaven forbid! The answer is research. We need some carefully planned, long time, broad gauge, fundamental study that does not fear the discovery of the significance (or lack of significance) of any cherished "requirements", a research that comes down to earth and digs out facts—hard, stubborn facts.

Such a program needs to be organized around a team of competent investigators. For example, if the effect of non-farm-straining of milk is studied for its effect on flavor, we suggest that the team consist of a high grade dairy husbandryman, a real chemist, a tops bacteriologist, possibly a good sanitary engineer, maybe also an experienced public relations man. Such a group should be able to present *dependable* evidence as to what effects, if any, are imparted to milk by the delay in straining between the time of milking and delivery to the plant.

A very large amount of work in this field has been done. However, it is scattered, piecemeal, inadequate in depth and breadth, generally not convincing—in a word, not high class research. Our field of milk and food sanitation is full of such work. The problems are numerous. A great constructive step

would be the formulation of the problems and then the publicity necessary to acquaint adequately equipped groups with the needs. Let's team up on sanitation research and substitute facts for opinions. J. H. S.

SYMPATHETIC CONSIDERATION TO "MILK AND FOOD SANITATION: ONE FIELD, ONE ORGANIZATION"

In our last issue (November-December 1948, p. 319) we discussed the desirability of broadening the membership qualifications of the International Association of Milk and Food Sanitarians, Inc., to embrace properly qualified milk and food sanitarians regardless of whether they were employed by a governmental unit or were industrial employees. We maintained that our experience in the Association over the past twenty-five years shows that the interests of the public in having clean and safe food is best served by a uniting of the work of the regulatory and commercial men. The common aim of all of such professional men is the high quality and sanitation of all food-handling operations.

At the last annual meeting, the Association adopted a motion to authorize the Executive Board to study this whole question, and in their judgment propose proper amendments to our Constitution to implement this broadened objective (see p. 377 of above issue).

The Executive Board has reacted favorably to this matter. They are going a step farther and are considering additional measures to increase the services which the Association can render its membership and also provide better means for enabling the membership to participate in and guide the policies and the work of the Association. J. H. S.

MISSOURI ASSOCIATION OF MILK SANITARIANS

As we go to press, we have just been informed that the Executive Board of this Association has approved the application of the Missouri Association of Milk Sanitarians to become an Affiliate of the International Association of Milk and Food Sanitarians, Inc. In 1939 the Missouri Association designated this Journal as its official organ, thereby acquiring "Designate" status (at that time, there was no provision in the Constitution of the International Association for the "Affiliate" relationship). Now it advances to become officially an "Affiliate." Such a move to the more highly integrated relationship is eloquent of the real advantages and satisfaction which the membership feel with regard to the aims and work of the International Association.

An organization is made by the character of its leadership. When this fine group was welcomed into the Association as a Designate in 1939, we pointed out some of the outstanding contributions which these men had made to milk sanitation, and wrote: "Missourians jolted us into an increased supervisory alertness. We hope that they will do it again." Their leadership in the field is attested by one of their members being the First Vice-President of this Association, Dr. M. R. Fisher, and another one is an Associate Editor of the Journal, Mr. R. W. Hart, and still another is one of the Association Auditors, Mr. C. E. Carl. Therefore, influences out of this organization are far-reaching—and increasing as the International Association continues to grow and belt the world. Again we say: in union there is strength. In this case the accession is a powerful one. Missouri, we cordially welcome you into our enlarging membership. We salute quality. J. H. S.

MERIT AND SHORTCOMINGS OF VARIOUS PROCEDURES FOR MAKING SEDIMENT TESTS OF MILK *

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Milk, as it is elaborated by the udder, is free of extraneous material. The measure of this is therefore generally assumed to be an index of the protection and care given the milk. The measure and the significance of the measure of extraneous material in milk however, are affected by a number of factors.

These may be grouped for convenience approximately as follows:

1. Geographic, climatic, and physical conditions prevailing at the time of milking.
2. Characteristics of the milk at the time of performing the sediment test.
3. Procedure or performance of the test for extraneous material.
4. Interpretation of the completed test.

Idealistically, milk can and should be protected from all extraneous material. There are conditions, however, when the significance of any extraneous material may change. We must recognize that with climatic changes, and in different geographic areas, the character of extraneous material can change with the season. Adjoining counties have differences in soil type ranging from gumbo clay to sandy loam or glacial gravel. Heavily cultivated land of good humus content may dry and blow in windy seasons. Seasonally, some areas experience continued wet spells. Now, idealistically, what is the criteria that is to be employed: is reasonable care in the exclusion of extraneous material going to give the same results in all places? Is the absence of extraneous material an index of the same degree of care being given in all places or at all times? Moreover, are the techniques used in measuring the material responding equally under these different conditions?

Physical Chemical Factors

The sediment test is a measure of visible material. The characteristics of the material will determine its visibility. Extraneous material consists of inorganic and organic substances. These substances may be soluble or insoluble. The particles may range in size from sub-microscopic to well-formed organic shapes.

Mineral particles of soil are classified according to size into three principal groups called sand, silt, and clay.[1] The particle sizes arbitrarily assigned and proportions in typical soils are:

Range in Particle Size of Separates and Distribution in Typical Soils

Separate	Diameter		*Becket fine sandy loam, Mass.*	*Iredel loam, N. C.*	*Taylor clay, Minn.*
	mm.	*micron*		*(percent)*	
Fine gravel	2.0 –1.0	2000–1000			
Coarse sand	1.0 –0.50	1000– 500	3.1	4.3	0.0
Medium sand	0.5 –0.25	500– 250	10.5	6.0	0.3
Fine sand	0.25–0.10	250– 100	8.2	4.5	0.4
Very fine sand	0.10–0.05	100– 50	25.3	11.7	3.0
Silt	0.05–0.005	50– 5	22.0	13.2	9.8
Clay	....–0.005	– 5	27.1	42.2	39.1
			3.8	18.0	47.6

* Presented before the Annual Michigan Dairy Sanitarians Conference, April 7–8, 1948.

Sand grains feel gritty to the fingers and can be distinguished without difficulty by the unaided eye. Silt, barely visible to the naked eye, has the appearance and feel of flour. The individual particles of the clay fraction are not distinguishable by the eye, and a large portion are too small to be seen under the microscope. Varying proportions of these different soil particles determine soil texture.

The color of soil particles varies, and is one of the obvious characteristics. Some are dark brown to black, others red or reddish brown; some are yellow, gray or alkali, or white.

The organic matter of soil consists of carbohydrates, protein and fat-wax s types of substances. Physically, soil organic matter is homogeneous, amorphous, dark colored, and practically odorless. Coarse sandy and gravelly soils contain only a fraction of one percent organic matter, whereas peaty soils may have as high as 90 to 95 percent.[2] Most productive mineral soils have from 2 to 6 percent organic matter. Resistant organic matter in the soil that is dark brown to black is called humus. It is colloidal in nature, with particle size of one micron or less. It has been estimated that the average diameter of soil colloid particles is about 0.05 micron. It would require 500,000 such particles to make a continuous row of one inch high.

Extraneous material originating from unclean or ungroomed animals consists in all probability of combinations of soil, fecal, and epidermal products. The particle size of this material in all probability conform to those of soils, plus larger particles.

The solubility of extraneous material in milk does not appear to be too well known. Fresh cow manure has been reported containing a range of 2.5 to 7.0 percent soluble organic matter, and a wide range of soluble inorganic matter 30 to 90.[3-4] The following table is of interest:

PROPORTION OF FERTILIZING ELEMENTS AND ORGANIC MATTER OF FARM MANURE (INCLUDING LITTER) THAT IS SOLUBLE IN WATER [4]

	Organic matter	*N (Percent)*	*Phosphoric acid (P_2O_5)*	*Potash (K_2O)*
Horses	5	53	53	76
Dairy cows	7	50	50	97
Steers	7	56	36	92
Sheep	7	42	58	97

The soluble mineral matter of dry soil material is considered of relatively low value but may be fairly high in the case of well fertilized soils.[5]

It can be seen that the visibility and retention of sedimentary material on a sediment test disk are affected, among other things, by particle size, the preponderance of particles of a given size, their color, and their relative solubility in a media such as milk. Particles that are extremely small and of colloidal nature are probably only partially retained on sediment test disks.

The presence of small particles in the interstices of lower layers of milk sediment test disks may be readily ascertained by the use of a microscope. This has also been observed in studies of sediment test disks of extraneous material in cheese.[6]

It is significant to note that the fat globules of milk individually range in diameters from 3 to 6 microns, but in clumped formation may aggregate in diameters of 10 to 50 microns. It might seem that particles of soil smaller than the fat aggregates may pass through sediment test disks. Frequently layers of moist milk films or of foam, or of butterfat are observed on the surfaces of recently completed milk sediment tests. This material may be presumed to obscure the visibility of extraneous material, particularly of extremely small particle size.

As the period of holding or storage of milk is prolonged, extraneous material that is present tends to go into solution. The intensity of deposit of sediment on the glass bottoms of 10 gallon cans of milk was observed to decrease after storage periods of 16 hours or more had elapsed.[7] The rate of sedimentation of material in milk is affected also by particle size. Most of the material that ultimately appears on the glass bottoms of cans of milk becomes evident within a period of a few hours. Large particles sediment out first. Small particles sediment out slowly. Evening milk frequently seems to have less sediment than morning milk. If the sedimentary material is relatively soluble, it may decrease in apparent quantity upon overnight storage of the milk. In morning milk, the sedimentation may have reached a point near maximum at the time of examination.

Circular stirring of milk appears to cause a concentration of sediment in a center core on the can floor. Larger soiling particles tend then to collect more readily in the center. Transverse stirring of milk tends to distribute extraneous material more uniformly over the can floor. Finely divided material tends to distribute quite evenly on the can floor irrespective of the currents in the milk induced by stirring, presumably because of a slower rate of sedimentation. It is of course generally recognized that agitation of the milk, either induced or by natural conditions just prior to application of the test, affects its results.

The effectiveness of withdrawal of sediment from can floors by a sediment tester may be affected by mechanical conditions or manipulation. Sedimentary material is lifted from the can bottom by vacuum. The area affected by the vacuum will be influenced by the spacing between the can and the sediment tester. In the use of some testers, the spacing is guided by a measuring spacer. With others, it rests upon the judgment of the operator. The degree of vacuum and upward lift of the suction created is subject to mechanical control in automatic air lift testers. In others it will vary with the rate of manual withdrawal of the plunger rod. Particle size, tenacity, density, and intensity of vacuum will determine the effectiveness of sediment withdrawal from the can bottom by a given sediment tester.

The length of a "horizontal follow through" stroke, and its centering, will affect the withdrawal of sediment. The uniform movement of the tester should be concurrent with the application of vacuum. There is a tendency to overlook this point on "fast" intake lines. Unless care is exercised, the withdrawal of a quantity of milk by a trigger actuated vacuum tester may be more rapid than is required for its full horizontal movement. A full motion stroke across the bottom center of a can is recommended in order to enable better uniformity in test results. The length of travel of a circular motion is dependent upon the distance from center. The intensity of sediment area thus covered is affected by its distribution on the can floor. The sediment test procedure is an arbitrary one. Unless some consistency prevails in the procedure, the results obtained by a given sanitarian, or as among different sanitarians, will not be comparable. The sediment test disks ultimately are compared with a standard. The value of the standard rests in great part upon uniformity in the use of a given procedure by different sanitarians.

The sediment test disk is an aggregate of cotton fibres. The disk is expected to retain extraneous material, but to allow passage of the milk. The completeness of retention of extraneous material may be affected by several factors. The disks have been observed to vary in quality expressed in terms of thickness, weight, and uniformity of diameter. The cotton disks in common use currently are somewhat thinner than used previously. While it has not been demonstrated that the observed variations in the quality of disks are of significance as measured in terms of sediment microscopically examined, it is conceivable that under certain conditions they may be. If the disks are poorly seated or affixed in a tester, by-passing of fluid and material

may occur. The pressure applied in forcing milk by hand through a test disk is probably not very uniform. The pressure utilized in mechanically operated units can be gaged more dependably. Larger particles of sediment are more readily withheld by a sediment test disk. In the light of the fine dispersal character of the separates of some soils, it is conceivable portions are not withheld by a given test disk. Aggregates of extraneous material or of milk solids (particularly fat) that accumulate on disks probably improve retention. On the other hand, greater displacement pressures are necessary to propel the milk through the disk. The difficulty of passing pasteurized milk through a test disk is well known.

Sediment disk test standards are of three general types—mental, photographic or printed reproductions of real or synthesized tests, or actual selected milk test disks.

The best comparator standards consist of actual, selected, milk test disks. Their preparation and care involve more work. They lack a reference value that can be expressed in terms of a specific quantity of sediment. Synthesized test disks made up of known quantities of sedimentary material may be employed. These can have assigned values in terms of contained sediment.

Photographic and printed comparator standards are the most widely used. These may be prepared from selected, actual, milk test disks, or from disks prepared from known quantities of synthesized material.[8, 9] The use of the latter procedure is provided for in the 9th edition of *Standard Methods for Examination of Dairy Products.*

Comparator standards frequently are averages; they do not always represent the frequent cases of extremely large or finely divided particle size material. Some comparator standards do not enable the grading of test disks in their true color. Foam and butterfat films mask the extraneous material. It is a general observation that many sanitarians grade test disks as spot platform tests under very adverse light conditions. The color of the extraneous material may have a decided effect upon its visibility under some lighting conditions.

It is evident there are many conditions which may affect the determination of visible sediment in milk. There has been, in the past, a great disparity among sanitarians on the procedures and the interpretation of results.[10] The emphasis that is being placed upon the test as a means of appraising the quality of milk is gradually focusing attention upon the necessity of recognizing the factors that influence its results.

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THE USE OF PATENT INFORMATION BY SANITARIANS

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THE mental tools of the progressive, active milk and food sanitarian are kept sharpened and up-to-date through the agency of meetings, books, periodicals, and other sources of information. There is, however, a very important source which has been too universally bypassed: the U. S. Patent Office.

Sanitary control of food-handling equipment presupposes a knowledge by the sanitarian of the detailed structure and inner workings of some of this equipment. In many cases it is impossible or impractical to gain this knowledge readily after equipment has been installed. This is where the Patent Office enters the picture. There one can find detailed drawings and descriptions of practically every mechanical device which the sanitarian might encounter.

Consider an example from the Yonkers Department of Health. In handling the problem of deciding on the approval or disapproval of an automatic dispenser for the sale of bulk milk in restaurants, it was found expedient to study the detailed plans of one of these dispensers. This was done with the aid of the drawings and text in the patent covering this device. With the knowledge gained in this way, the sanitarian is now able to go into a milk plant, watch the assembly, disassembly, and handling of the device, and know what he is looking at. Specifically, this device is the Motorflow Milk Dispenser which is covered by U. S. Patent No. 2,170,720 entitled "Milk Can Construction."

It is a simple matter to obtain copies of patents. A letter addressed to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., and containing the patent number, the kind of article covered, and 25 cents in cash will bring a copy of the patent usually within two weeks. The money should be sent by check, money order or, preferably, by coupons. Purchased in advance from the Superintendent of Documents, coupons totaling 25 cents for each patent are mailed to Washington with the necessary information. These coupons, each worth five cents, may also be used in purchasing other publications from the Superintendent of Documents, such as Farmers' Bulletins, Circulars, Reports, etc.

The number of the patent or patents covering a particular machine can be obtained from one of the following sources: (1) from the machine itself, (2) from the manufacturer (3) from the *Official Gazette* of the U. S. Patent Office, and (4) from the technical literature. This *Official Gazette* is published weekly, and it contains a listing and description of all patents issued during the past week. It is available in many libraries and by subscription, and is a valuable and interesting source of information.

As examples of patents which might be of interest to milk and food sanitarians, the following list was selected from among the patents issued during the week reported in the *Official Gazette* of June 1, 1948:

2,442,353—Potato Masher of Welded Construction.
2,442,454—Handle Structure for Cooking Utensils.
2,442,475—Egg Washing Machine.
2,442,502—Preparation of Lactic Acid Bacteria.

2,442,515—Open Top Display Refrigerator.
2,442,532—Treatment of Glycerides for Use in Edible Fats.
2,442,536—Confectioners' Hard Butter Prepared by Low Temperature Interesterification.
2,442,537—Full Pastry Shortening.
2,442,538—Margarine Oil Production.
2,442,551—Kitchen Fork with Ejector.
2,442,557—Device for Holding Food During Storage, Cooking, and Slicing.
2,442,600—Vegetable Peeler Wherein the Abrading Surfaces are Sprayed Stainless Steel.
2,442,633—Meat Ball Forming Machine.
2,442,636—Bottle Holder and Carrier.
2,442,663—Meat Curing.
2,442,689—Machine for Assorting Eggs According to Weight.
2,442,705—Sanitary Garbage Can Cover.
2,442,730—Drinking Straw Dispenser.

International Dairy Congress

The XIIth International Dairy Congress will be held under the direction of the International Dairy Federation at Stockholm, Sweden, August 15–19, 1949, under the distinguished patronage of H. R. H. the Crown Prince Gustaf Adolf.

Mr. Waldemar Ljung, Organizing Secretary of the Congress, visited the United States a few weeks ago to invite the participation of dairy people in the Congress and to encourage them to submit papers.

The subjects listed in the preliminary program are as follows:

Section I — Milk production, hygiene and control
II — Physics, chemistry and microbiology
III — Dairy industrial technique
IV — Economics and trade
V — Organization of the dairy industry
VI — Tropical dairying

Attendance at the International Dairy Congress will enable scientists, research workers, and representatives of the dairy industry to discuss dairy problems and interchange ideas which should contribute to the promotion of the dairy industry of all countries represented at the Congress. The following countries expect to have representatives at the Congress: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Czechoslovakia, Denmark, England, Finland, France, Hungary, Ireland Free State, Italy, Luxemburg, New Zealand, Norway, Portugal, Rumania, Switzerland, The Netherlands, United States of America, and Uruguay.

Information pertaining to the Congress is obtainable from Dr. O. E. Reed, Chief, Bureau of Dairy Industry, Washington 25, D. C. Dr. Reed has been named official correspondent of the United States.

This is the first Congress to be held since the one at Berlin in 1937.

SANITARY STANDARDS COVERING HOMOGENIZERS AND HIGH PRESSURE PUMPS OF THE PLUNGER TYPE

Formulated by

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, UNITED STATES PUBLIC HEALTH SERVICE, THE DAIRY INDUSTRY COMMITTEE

As of June 23, 1947

IT IS the purpose of the IAMFS, USPHS, and DIC in connection with the development of the 3A Sanitary Standards program, to allow and encourage full freedom for inventive genius or new developments. Specifications for homogenizers and high pressure pumps of the plunger type which are developed and which so differ in design, material, and construction, or otherwise, as not to conform to the following standards, but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAMFS, USPHS, and DIC at any time.

3A STANDARDS

HOMOGENIZERS AND HIGH PRESSURE PUMPS OF THE PLUNGER TYPE to be used for the processing of dairy products to conform to 3A Standards, shall comply with the following standards.

A. Material

1. *Power Frame:* Exteriors shall be rust-proofed or shall be rendered corrosion-resistant or painted.
2. *Cylinder Block and Fittings:* All metal pump parts having any surface in contact with the product shall be constructed of dairy metal, consisting of stainless steel, nickel alloy, or equally corrosion-resistant material that is non-toxic and non-absorbent.
3. *Homogenizing and/or Relief Valve, including the pressure regulating spring,* shall be corrosion resistant and be easily removable for cleaning and inspection.

B. Construction

1. *Power Frame and Frame Covers:*
   (a) Exteriors of structural parts not in contact with the product shall have a smooth finish, and shall be so constructed as to be easily cleanable.
   (b) The bottom of the frame or base shall be entirely closed. Any skirt extending below the bottom wall of the base shall be limited to a distance of 1½" below the bottom wall.
   (c) All exterior surfaces shall be self draining. The minimum clearance between the lowest point on the base and the floor shall be not less than 4 inches.
2. *Legs or Feet:*
   (a) Legs or Feet shall be smooth with rounded ends and have no exposed threads.
   (b) Legs made of hollow stock shall be sealed.
3. *Cylinder Block and Fittings:*
   (a) All product contact surfaces shall be readily removable or accessible for cleaning and inspection.
   (b) All surfaces shall be machined or polished to not less than 120 grit finish properly applied. Sharp corners and edges shall be avoided.

(c) There shall be no threads in contact with the product.

(d) The cylinder block shall be constructed so that it will be possible to brush through all openings and passages in at least one direction. There shall be no dead-ended passages.

(e) The space between the cylinder block and drive housing shall be readily accessible for cleaning, self-draining, and protected so that liquids will not enter the drive housing. This space shall be provided with a cover.

1. The cover over the plungers may, however, be designed to permit observation of packing leakage and of water applied to plungers without removing cover from the machines.

(f) All cylinder block fittings shall be of the flanged type.

(g) Inlet and outlet openings shall conform with the 3A Sanitary Standard for Fittings. In the case of high pressure pumps they shall be of the flange type construction.

(h) Suction and discharge valve springs, when used, shall be smooth, have open ends, and be readily cleanable. Pitch of springs shall be such that open space between coils is not less than 3/32". Openings at ends of springs shall be not less than 3/32".

(i) Homogenizing pressure regulating springs and/or relief valve springs shall not be in contact with the product.

C. Recording or Indicating Gauges

1. The gauge shall be of the sanitary diaphragm or pressure bulb type.
2. The gauge connection to the gauge well shall be of the flange type.
3. The gauge parts having contact with the product shall be smooth, readily cleanable, and constructed of dairy metal, consisting of stainless steel, nickel alloy, or equally errosion-resistant material that is non-toxic and non-absorbent.

D. Gaskets

1. *Gaskets* shall be easily removable and cleanable or of the single service type. They shall be of rubber or rubber-like material, or of a plastic material, or of other suitable sanitary material.

E. Plunger and Valve Rod Packing

1. *Packing* shall be easily removable for inspection and cleaning.
2. *Packing* shall be of a reasonably impervious material.

F. Nameplate

1. *A nameplate* shall be permanently attached to the machine indicating:
   (a) Name of the Manufacturer
   (b) Model and Serial Number
   (c) Capacity

G. Sealing

1. *Homogenizers* used with high-temperature short-time pasteurizing equipment shall be provided with an easily accessible or externally visible seal or seals that will prevent altering the capacity of the homogenizer.

The above standards are approved for publication as 3A Standards

(Signed) C. A. ABELE
Chairman CSP, IAMFS

(Signed) A. W. FUCHS
In Charge Milk and Food Unit USPHS

(Signed) E. H. PARFITT
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QUATERNARIES VS. CHLORINE IN BACTERIA CONTROL *

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FOR many years chlorine has been the principal chemical germicide used in the dairy industry. Among its advantages may be included its rapid action, low cost and wide effectiveness against most kinds of microorganisms. Unfortunately, chlorine is irritating to the skin, corrosive to many metals, relatively unstable on standing, and its activity is effectively reduced in the presence of organic matter.

A few years ago there came into prominence a relatively new group of chemicals, the quaternary ammonium compounds, which exhibited germicidal action. Because of this and certain other properties of these compounds, it was felt by some individuals that they might replace chlorine as the general dairy disinfectant.

Quaternary ammonium compounds are a rather heterogeneous group of chemicals classified among the cationic surface active agents, which means that they carry a positive charge when in solution. All of these compounds possess the ability to some degree of lowering surface tension and increasing the wetting power of a solution. As a group the quaternaries are practically odorless and tasteless in the dilutions used. They are noncorrosive and nonirritating. They are very stable and apparently have low toxicity for animals. In fact, young rats fed a diet containing three per cent of a common quaternary ammonium compound (alkyldimethylbenzyl ammonium chloride) showed no ill effects.[5] Other laboratory animals have been supplied with a 0.1 per cent solution of this compound as their sole source of fluid for months without harm. Whether a nontoxic character can be ascribed to all quaternaries is yet to be determined.

Obviously it would be desirable to have a material with the above characteristics for use as a general purpose germicide.

GERMICIDAL PROPERTIES OF QUATERNARIES

The standard Food and Drug Administration method for testing chemical disinfectants and antiseptics was used in early trials with quaternary ammonium compounds. In running this test the ability of the chemical to kill a test organism is compared with that of phenol under rigidly standardized conditions. It is not the purpose of this paper to enumerate the shortcomings of the test, but suffice it to say that most of the investigators who worked with the quaternaries were not satisfied with the results. True, excellent phenol coefficients were reported for the quaternaries, but the results were highly erratic and in many cases were not reproducible.

As a result of the difficulties found in testing quaternaries, modifications of the Food and Drug Administration test have been made.[16] Also, entirely new techniques have been developed by which the quaternaries are tested under conditions more nearly approximating their actual use.[8] The general result is proof that the quaternary ammonium compounds as a group exert considerable germicidal activity. However, individual quaternaries show widely different killing powers. Also, they differ in their effectiveness against different organisms.

* Presented at the Fourth Annual Meeting of the Wisconsin Milk Sanitarians Association, Madison, September 7, 1948.

In comparing the germicidal action of quaternaries with that of chlorine compounds, investigators have reported that the former are more effective against Gram positive than against Gram negative bacteria,[1, 7] whereas chlorine is more effective against Gram negative forms.[7] One exception to this generalization is the ordinary Gram positive cheese starter bacteria, which are more resistant to quaternaries than to chlorine.[7] In trials against spores certain investigators have found little or no killing effect of quaternaries even in concentrations far above those normally used.[12] Another investigator has reported quaternaries to be much more effective than chlorine against certain spores.[7] It might be well to point out that seldom do the researchers use the same quaternaries under the same conditions and they often use different spore forming organisms for testing. Therefore, it is hazardous to draw a conclusion from the few available reports of trials. Probably it is safe to say that the use of quaternaries for sanitizing milk plant equipment cannot be expected to solve all problems arising from thermoduric bacteria in the milk.

One other property of the quaternaries that deserves particular mention is their bacteriostatic action; that is, their ability to prevent the growth of bacteria in concentrations too low to kill. Whereas chlorine readily evaporates from the rinsed surface of a piece of equipment, the quaternaries tend to remain in the film of moisture on the surface. Thus, these compounds can continue to inhibit bacterial growth during the time equipment is not in use.

Effect of Various Factors on the Germicidal Activity of Quaternaries and Chlorine

Temperature

Chemical reactions in general increase in rate as the temperature is increased. It is well known that chlorine is a much more effective germicide in hot water than in cold water. Comparisons of the effect of temperature on the action of chlorine and the quaternaries have shown that the quaternaries show nothing like the decided stimulation of activity due to increased temperature that is shown by chlorine.[7] Use of quaternaries in hot water speeds up their action to some extent, but nothing like as much as is true with chlorine.

Conversely, chlorine activity is slowed down in cold water to a much lesser extent than is that of the quaternaries. For example, in one experiment in which the effect of temperature was studied, the concentration of chlorine necessary to kill a test organism in a unit time was the same at 68°, 50°, and 40° F. However, with six different quaternaries tested at the same time, the amount required to kill the test organism was increased from 5 to 400 times as the temperature was reduced from 68° to 40° F.[14]

Thus, it seems apparent that the quaternaries do not show the marked stimulation of activity with increases of temperature that are shown with chlorine, and they may be inhibited even more than chlorine at lower ranges of temperature.

Hydrogen ion concentration

Chlorine is most effective in acid solution, and rapidly loses its effectiveness in the presence of alkali. This is one reason why care must be taken to remove all traces of alkaline washing powders from dairy equipment before using chlorine as a germicide.

As a general rule the quaternaries are most effective in alkaline solution, although the degree of alkalinity compatible with optimum activity seems to vary with different quaternaries. With many of the quaternaries a precipitate is formed in the presence of considerable alkali and the germicidal efficiency is lost. For this reason the user must take care in using quaternaries with alkaline washing powders. This point will be considered further below.

In general, the stimulation in activity resulting from adjustment to optimum pH is not as great with quaternaries as with chlorine.[7]

Water hardness

Chlorine is not greatly affected by the hardness of water used to make the solution except insofar as the hardness may increase the pH of the water. Tests with chlorine have shown the same germicidal activity in distilled water as in water with 400 ppm hardness.[14] However, studies have shown the quaternaries to be less effective in hard water than in soft water.[10, 14] This has been explained in one instance on the basis of combination of magnesium and calcium ions with the quaternary ammonium compounds, thus reducing their effectiveness.[13]

Organic matter

One of the major limitations of chlorine is its inability to act effectively in the presence of considerable organic matter. Apparently chlorine combines with the organic matter and is thus removed from availability to act on bacteria. However, tests by Johns[9], indicate that the amount of milk necessary to inactivate or markedly reduce the action of chlorine is considerably greater than was formerly believed.

Trials with the quaternaries [4, 9, 12, 15] indicate that these compounds also are interfered with by organic matter, but not to such an extent as is chlorine. In general it may be said that organic matter interferes with the action of both chlorine and the quaternaries, but to a lesser extent with the latter compounds.

Comparison of Quaternaries and Chlorine for Various Applications

Udder rinse before milking

One of the important uses of chlorine in the dairy is for the washing of teats and udders before milking. Unfortunately this chemical is irritating to the skin of the udder and the hands of the milker. Also, as it is used organic matter is added to the solution and its effectiveness is lost rapidly. It has been estimated that under ordinary conditions, no more than ten cows' udders should be washed with the same pail of chlorine solution. This may necessitate rather frequent changes of the rinsing solution.

Quarternaries have been found satisfactory for the purpose of washing udders and teats before milking. Most persons who have reported on this use claim a reduction in the incidence of chapping and irritation of the skin as compared with chlorine. This would suggest that the quaternaries might be more effective in preventing the initiation of infections. Also, one group of investigators [12] found that from 30 to 40 udders could be washed with a single solution before there was a significant decrease in the germicidal effectiveness of the washing solution due to the accumulation of organic matter.

As to the effect of quaternaries and chlorine rinses on the bacteria count of the milk, little difference has been reported. Kesler and others [11] at Ohio State University compared the bacteria counts in milk from cows whose udders had been rinsed before milking with a quaternary, with chlorine, and with plain water. The chemicals were used in concentrations of 200 and 400 parts per million. These investigators could detect no significant differences in the bacterial content of the milk regardless of the rinsing solution used.

Milking machine sanitizing

Comparisons of quaternaries and chlorine solutions for sanitizing milking machine parts, including teat cups, show little differences in effectiveness. Both reduced contamination considerably, but neither was markedly better than the other.[15] Under practical con-

ditions of exposure neither quaternaries [12, 15] nor chlorine [15] completely sterilized milking machine teat cups upon treatment between cows, where the exposure time was only for a few seconds. However, both types of chemicals showed better results when the chemical rinse was preceded by a water rinse to remove much of the milk.[15]

Quaternaries have been tried as replacement for the lye soak solution used for milking machine rubber parts between uses. As a growth preventive 200 ppm of a quaternary was as effective as 0.5 percent lye, but the quaternary left an undesirable deposit on the rubber in some cases. The quaternary tried appeared to be superior to lye at reducing milk contamination with thermoduric bacteria originating from the milking machine.[6]

Dairy equipment sanitizing

Various quaternaries have been compared with chlorine as sanitizing agents for vats and other large equipment.[15] Under the conditions of the test the quaternaries were no better than chlorine against a variety of organisms. In fact, they required a longer time to act or higher concentrations than did chlorine to effect the same result. As might be expected, the amount of milk residue left in the equipment affected the results. When considerable milk was present the quaternaries showed to better advantage than did chlorine at equivalent concentration.

Milk can sanitizing

Quaternaries have been used to excellent advantage in sanitizing milk shipping cans. They may be applied as an atomized spray into the cans after washing and steaming. The main advantage of the quaternaries in this application over chlorine is that the effect of the former persists for a considerable while after the treatment. Mueller and others [12] have shown that milk cans treated with a quaternary rinse after cleaning had much lower counts after 24 hours standing than did similar cans that were not so rinsed. In another study Davis [2] tried solutions of four quaternary compounds as can rinses. He observed a 52 percent reduction in bacteria counts in cans taken immediately from the can washer as compared with untreated cans. After 24 hours the treated cans showed 96 percent reduction, thus illustrating the marked bacteriostatic action of these compounds.

Mastitis control

Efforts have been made toward helping control mastitis by washing the teats and milking machine teat cups with chlorine and with quaternaries.[4, 15] Results of these studies indicate that the quaternaries tried were little if any more effective at destroying the mastitis streptococci on the teats or teat cups than was chlorine. It should be borne in mind, however, that quaternaries are less irritating to the skin of the teats and of the workers' hands than is chlorine.

USE OF QUATERNARIES IN DETERGENT MIXTURES

It has been suggested that it would be highly desirable to the dairy industry to have available a mixture of a germicidal quaternary with a suitable detergent for use in cleaning and sanitizing dairy equipment. However, care must be exercised in choosing the components of such a mixture. For example, soaps and other anionic wetting agents are incompatible with the quaternaries, react with them, and dissipate their germicidal effectiveness. Although as a general rule the quaternaries act best in alkaline solution, care must be taken in choosing the alkaline cleaning agent for use with or before the quaternary. For example, certain manufacturers caution against the use of sodium metasilicate, sodium tetraphosphate, and sodium hexametaphosphate with their quaternary ammonium compounds.[3, 17] Unless used to considerable excess, trisodium phosphate is compatible with most quaternaries and can be used in conjunction with it.[17] Here again the question of residual organic matter enters the picture, and for this reason it is usually recommended that the quaternaries not be used except on equipment that is already physically clean. Therefore, it might be most desirable to use a compatible cleaning compound such as trisodium phosphate first, followed by a germicidal rinse with a quaternary compound.

COMPARISON OF COSTS

The quaternary ammonium compounds now on the market are more expensive per unit quantity than are chlorine compounds. For purposes of comparison I have chosen a representative of each as purchased for use in the university. Admittedly these materials were purchased in fairly small quantity, thus adding to the cost, but their general relationship should be about the same regardless of the quantity purchased. The chlorine compound was a common dairy sanitizer consisting chiefly of calcium hypochlorite. When made up to a concentration of 200 ppm available chlorine, as recommended, the material costs 0.2 cent per gallon. The quaternary ammonium compound used for comparison was a 10 percent solution of mixed alkyl dimethyl benzyl ammonium chlorides. When made up to a concentration of 200 ppm this material costs 0.8 cent per gallon. Thus, in this comparison, the quaternary is about four times as expensive as the chlorine compound.

Proponents of the quaternaries point out that these materials are much more desirable than chlorine for many purposes because of their bland, odorless, nontoxic and practically tasteless character. Perhaps in many instances in the food industry these desirable characteristics are sufficient to overweigh their greater cost.

ADVANTAGES OF THE QUATERNARIES OVER CHLORINE

From the above statements it is apparent that neither chlorine nor quaternary ammonium compounds can be expected to do a good sanitizing job unless the surfaces on which they are to act are already clean. Organic matter reacts with each chemical and dissipates its germicidal strength. Therefore, according to present information there are few places in the dairy where the quaternaries can be expected to do a more effective sterilizing job than chlorine. There seems to be little doubt that for sanitizing clean equipment chlorine acts more quickly and is even slightly more effective than quaternaries at equivalent concentration. However, the residual action of chlorine is slight, and in instances where the equipment is to be left idle for several hours the quaternaries may find a real application. Such an instance is milk shipping cans, where the residual bacteriostatic action of quaternaries offers promise in reducing the bacteria count of milk.

Another possible advantage of the quaternaries is in washing udders before milking. For this purpose the quaternary solutions are less irritating than is chlorine of equivalent strength, and they maintain their effective strength longer because of a lesser susceptibility to the presence of organic matter.

SUMMARY

Because of their nonirritating quality, prolonged bacteriostatic action and relatively lesser susceptibility to organic matter, the quaternary ammonium compounds may be preferable to chlorine as a rinse solution for udders before milking and as a rinse for certain articles of dairy equipment. However, these compounds are more expensive than chlorine; they act more slowly, and, in the absence of organic matter, are less effective germicides. Also the quaternaries are more likely to be inhibited by unfavorable

water hardness, pH, temperature, and incompatible detergents used for cleaning.

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Regular Corps Appointments for Sanitarian Officers (Milk and Food) in the United States Public Health Service

Competitive examinations for appointments in the Regular Corps of the U. S. Public Health Service in the grades of Assistant Sanitarian (1st Lieutenant) and Senior Assistant Sanitarian (Captain) will be held in the near future. This announcement is to acquaint milk and food specialists with opportunities in the Public Health Service.

Regular Corps appointments are permanent in nature and provide opportunities to qualified sanitarians for a life career in public health. Assignments to duty are made with consideration of the officer's preferences, abilities, and experience. There is ample opportunity for professional growth and development.

For officers with dependents, entrance pay (without benefits) is $3811 a year in the Assistant grade and $4489 in the Senior Assistant grade. Promotions are at regular intervals up to and including the full grade of Sanitarian, which corresponds to the rank of Major, at $5822 to $7981 a year. Promotion to the Senior grade (Lieutenant Colonel) and to the Director grade (Colonel) is by selection. Retirement

(Continued on page 51)

PROGRESS REPORT OF THE COMMITTEE ON PROFESSIONAL STATUS OF SANITARIANS OF THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS

THE work of the Committee on Professional Status of Sanitarians since its appointment in April, 1948, has been directed toward the assembling of those facts and figures which would tend to describe the sanitarian in relation to the other professional categories engaged in the field of Public Health. In outlining the problem it was decided that the three broad objectives of the study would be (1) the salary scales now in effect for milk and food sanitarians (2) the opportunities for advancement offered in the existing health agency personnel classification systems and (3) the recognition given to milk and food sanitarians as professional specialists in the field of Public Health.

Because of the number and variety of agencies which employ sanitarians and because of the short time which has elapsed since the start of this study, the report at this time is restricted almost entirely to the place of the sanitarian in the state health departments of the United States. The facts and figures presented here,* unless indicated to be from other sources, have been derived from a study of some 225 state merit system class specification sheets for jobs including the discharge of duties in the field of milk and/or food sanitation.

WHAT IS A SANITARIAN?

Unlike the physician, engineer, and nurse, whose functions are well recognized both within and without the field of public health and whose training has evolved into a highly standardized, rigid, academic discipline, the sanitarian has originated in the field of public health, has until recently had no counterpart in other fields of activity, and is the product of a variety of academic backgrounds. In the July, 1948 issue of the *American Journal of Public Health* there appears "Proposed Report on the Educational Qualifications of Sanitarians" by the Committee on Professional Education of the American Public Health Association. This report includes the following statement of function for the sanitarian :

"Under the supervision of the health officer or public health engineer or other person designated by the health officer, the public health sanitarian carries out inspectional, educational, and investigational duties, and assists in the enforcement of the law in the field of environmental sanitation. His activities include assistance in the control of domestic water supply and sewage disposal; wastes disposal; swimming pools and recreational areas; dairies and milk handling plants; manufacturing, processing, storage, handling and distribution of foods; housing; industrial sanitation; school sanitation; rodents and insects and nuisances."

On the basis that those who perform functions within the above quoted statement are sanitarians, the job description sheets were studied to determine the frequency with which the various titles occurred. It was found that the term "Sanitarian" was used 107 times, "Sanitation Consultant" three times, "Supervisor" thirteen times, "Officer" eight times and "Inspector" sixty-one times. There was a total of twenty-five separate titles in use describing the various phases of food and milk inspectional activity, such as Milk Sanitarian, Food Sanitarian, Field Sanitarian, General Sanitarian, Milk Sanita-

* The salary scales are those which were in effect during June, 1948.

tion Supervisor, Sanitation Supervisor, Food Sanitation Supervisor, Sanitary Officer, Milk Sanitation Officer, Sanitation Officer, Food and Drug Inspector, Bakery Inspector, Food Inspector, Dairy Inspector, and Milk Inspector. From this diversity of titles it is apparent that there exists neither a generally accepted standardization of job titles nor a general recognition that milk and food sanitation activities are the function of a single professional group.

The second basis for definition of the sanitarian will be in terms of his training. The previously mentioned Committee Report of the American Public Health Association includes recommended minimum training requirements for sanitarians. In this report sanitarians have been cast into three classes depending upon the responsibility the particular job entails. Their recommendations are that the minimum training requirement for the Assistant Sanitarian or lowest bracket shall be two years college and that the Sanitarian for intermediate grade shall have two years of college training plus one year of experience plus a special public health curriculum of one semester. The Supervising Sanitarian is required to have four years of university education with three years of experience and one year of graduate study in sanitary science or public health.

The class specification sheets from state health departments were cast into three categories which are believed to be in general agreement with those recommended by the American Public Health Association as follows:

1. *Administrative Jobs*

   There were described twenty-one positions which entailed the administrative responsibility for the discharge of a state-wide milk and/or food sanitation program.

2. *Advisory and Supervisory Positions*

   There were ninety-one positions described as requiring the performance of either an advisory service such as may be rendered by a state milk sanitation consultant to milk sanitarians or a supervisory function such as may be rendered by a District Sanitarian with subordinate personnel.

3. *Inspectorial Positions*

   There were described 113 positions which entailed no responsibility other than the rendition of inspectional and educational service in the milk and food sanitation fields.

TABLE 1

EDUCATIONAL REQUIREMENTS FOR MILK AND FOOD SANITATION POSITIONS

	Administrative			*Advisory*			*Inspectorial*			*All Categories*		
Training required	*No.*	*%*	*Cum. %*	*No.*	*%*	*Cum. %*	*No.*	*%*	*Cum. %*	*No.*	*%*	*Cum. %*
1 year grad. study	..	....	....	8	8.8	8.8	..	....	....	8	3.5	3.5
1 year or equiv.[1]	..	....	....	8	8.8	17.6	1	.9	.9	9	4.0	7.5
1 semester grad study	..	....	....	1	1.1	18.7	..	....	....	1	.4	7.9
Specific curricula	..	....	....	4	4.4	23.1	5	4.5	5.4	9	4.0	11.9
4 yrs. college	17	81.0	81.0	37	40.6	63.7	22	19.4	24.8	76	33.8	45.7
4 yrs. college or partial substitution [2]	..	....	....	8	8.8	72.5	9	8.0	32.8	17	7.7	53.4
4 yrs. college or equivalent [3]	..	....	....	5	5.5	78.0	4	3.6	36.4	9	4.0	57.4
4 yrs. college or complete substitution [4]	..	....	....	6	6.6	84.6	12	10.5	46.9	18	8.0	65.4
1–3 yrs. college	..	....	....	3	3.3	87.9	7	6.2	53.1	10	4.4	69.8
1–3 yrs. college or equivalent [3]	..	....	....	..	....	....	8	7.1	60.2	8	3.6	73.4
3–4 mos. training	..	....	....	1	1.1	89.0	9	8.0	68.2	10	4.4	77.8
High school or less	4	19.0	100.0	10	11.0	100.0	36	31.8	100.0	50	22.2	100.0
Total	21			91			113					

[1] 3 jobs permit substitution of experience for all training.
6 jobs permit substitution of experience for post graduate training.
[2] Substitution permitted for part of training.
[3] No substitution formula provided.
[4] Substitution permitted for all training.

The educational levels required in these three categories were tabulated and appear in Table 1. It may be noted from cumulative totals that a basic requirement of at least four years of college or its equivalent in training and experience is called for in 81 percent of the administrative jobs, 84.6 percent of the supervisory-advisory, 46.9 percent of the inspectorial, and 65.4 percent for all categories.

WHAT IS THE SANITARIAN PAID?

A significant index of status is the salary level prescribed for the positions in milk and food sanitation. From the job description sheets which had been classified into the previously mentioned categories, Tables 2, 3, and 4 were prepared. It must be pointed out that these are salary levels for class specifications and that the median does not represent the median salary of individuals. In a recent study of salaries * of state public health workers prepared by the Federal Security Agency, U. S. Public Health Service, State Personnel Administration Unit, in cooperation with the Association of State and Territorial Health Officers and the American Public Health Association, median salaries were stated for the various categories of public health personnel.

Table 5 has been prepared from this source. It will be noted that sanitation personnel occupy the position of being third from the bottom. This level should be interpreted somewhat with

TABLE 2

DISTRIBUTION OF MILK AND FOOD SANITATION ADMINISTRATIVE POSITIONS BY SALARY

	Number of positions prescribing	
Salary intervals	*Minimum salary*	*Maximum salary*
$3000–$3500	1	..
$3500–$4000	5	..
$4000–$4500	3	5
$4500–$5000	9	2
$5000–$5500	1	4
$5500–$6000	0	5
$6000+	2	5
Total	21	21
Median	$4500	$5496

TABLE 3

DISTRIBUTION OF MILK AND FOOD SANITATION AND ADVISORY AND SUPERVISORY POSITIONS BY SALARY

	Number of positions prescribing	
Salary intervals	*Minimum salary*	*Maximum salary*
$2000–$2500	8	1
$2500–$3000	19	6
$3000–$3500	30	21
$3500–$4000	25	23
$4000–$4500	6	17
$4500–$5000	2	14
$5000+	1	9
Total	91	91
Median	$3200	$3900

TABLE 4

DISTRIBUTION OF MILK AND FOOD SANITATION INSPECTORIAL POSITIONS BY SALARY

	Number of positions prescribing	
Salary intervals	*Minimum salary*	*Maximum salary*
$1500–$2000	19	3
$2000–$2500	45	17
$2500–$3000	29	42
$3000–$3500	14	29
$3500–$4000	5	15
$4000+	1	7
Total	113	113
Median	$2400	$3000

* The salary scales used were those which were in effect during November, 1947.

TABLE 5

MEDIAN SALARIES OF STATE PUBLIC HEALTH WORKERS

Category	*Median salaries interval*
Medical	$5800–$6000
Sanitary engineer	$4000–$4200
Consultant nurse	$3100–$3200
Nutritionist	$3000–$3100
Laboratory personnel	$2800–$3000
Sanitation personnel	$2400–$2600
Public health nurses	$2300–$2400
Graduate nurses	$2000–$2100

regard given to the following statement appearing in the introduction to this study.

"In order to make salary comparisons of any real significance among nurses, it was necessary to divide them into three groups—Graduate Registered Nurses, Staff Level Public Health Nurses, and Supervisory and Consultant Public Health Nurses. It was not possible to make a similar grouping of sanitation personnel because the titles and functions assigned to sanitarians are not as well standardized as those assigned to nurses."

FUTURE WORK OF THE COMMITTEE ON PROFESSIONAL STATUS

It is the feeling of the Committee that the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS should continue this activity in the professional development of sanitarians and that their future efforts should include:

1. The continuance of the present phase of securing information which will tend to portray the status of the sanitarian in relation to other personnel in public health and milk and food sanitation.
2. The initiation of a study directed toward a standardization of job titles and descriptions in the field of milk and food sanitation.
3. The initiation of a study in the administrative phases of milk and food control to determine the optimum deployment of milk and food sanitarians from the three categories of responsibility in milk and/or food control organizations.
4. The study of the certification, registration, and licensing plans for sanitarians now in effect in Canada, New Jersey, and California and sponsored by other organizations of sanitarians or public health personnel.
5. The determination of the promotional opportunities open for milk and food sanitarians in his local, state, and federal milk and food sanitation services.
6. The study of the means of improving the professional competency of milk and food sanitarians through in-service training methods.

Committee Members

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NEW APPROACH TO FOOD-HANDLER TRAINING *

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WE have come a long way in the field of education; however, we have a great deal more territory to cover. In this paper we are limiting our comments and suggestions to the new approach in food-handling training. Before we go into that, permit me to cite you just one example of why we need more education in many of our food-handling establishments. I choose this one example because it is one that we all come face to face with every day, and that is the little butter patty. The next time you are eating out, pick up that little butter patty, whether it is margarine or butter, hold it up to a light so that you get the sheen on the butter, and then start counting the fingerprints that you see. The presence of fingerprints on the butter are just the same as if the waitress or the food handler who handled that butter deliberately walked up to you and stuck his or her finger into your mouth.

BASIS FOR EDUCATIONAL PROGRAM

The late Dr. Rosenau collected 25 samples of butter in the city of Boston. He took them back to his laboratory and this is what he reports: In 6 out of the 25, he isolated the organism *E. coli.* In 14 of the 25 samples, he found streptococci. The literature does not report just exactly what type it was; it merely reports that there were 14 colonies of streptococci. From 2 of the patties he isolated the tuberculosis organism. Three out of the 25 were free from organisms.

That in itself is enough background to set up some type or form of education. Education in the past has not been too successful, that is, in the food-handling game. Oh! we put on schools and we put on shows and lectures and barnstorm all around the country, but in making a follow-up or check-up on what we have been teaching and what we thought, we found that we did not put too many of our subjects over.

This may be a surprise to some of you who are already in the game. To others you know very well what we are talking about. In education as well as other fields, there are a number of ways of approaching a problem and its solutions. I like to think of this whole thing as a wagon wheel; the hub of the wheel is the solution to the problem and the spokes of the wheel are the various ways or avenues of reaching it. Where an approach may not succeed in one instance, another type of approach may succeed. It also depends on the way you say a thing too; it is possible to call a man a "silly fool" and he will sort of laugh and joke with you about it. You can call him the same thing, "silly fool," in a different tone of voice using exactly the same words, and he is likely to "knock your block off." If you don't believe this, just go out and try it for yourself.

In education we must deal with repetition. We know that people learn by repetition. That doesn't mean that we repeat the same thing in the same words over and over. By repetition

* This program has been worked out co-operatively with the Kansas City Health Department and the Missouri Division of Health. Acknowledgment is given to the Kansas City Health Department for their interest and initial art work.
Presented at meeting of Missouri Association of Milk and Food Sanitarians.

we mean that you say the same thing but you say it in a different way. That is, you tell them what you are going to tell them, then you tell them, and then you tell them what you have told them. You say the same things but you approach them from a different angle.

How a food-handling school is worked up reflects a whole lot in the success of the school. There are various ways of doing this. You can make the course anywhere from 2 hours to 8 hours long. The average runs from 4 to 6. In the past, we tried everything from giving door prizes to closing all the establishments in the town and bringing every one in at once. These approaches seemed successful at the time and the thing to do. But in the follow-up we found they were not as successful as we had previously hoped that they would be. Something was wrong, definitely wrong. And what was it! We feel that our new approach to food-handling training may solve many of these problems, but we do not contend for a moment that they will solve them all. We do feel we have something to offer, something new, perhaps a bit novel. But in summing it up, we hope and feel that it is a step in the right direction.

Organization of Subject

Regardless of what method or technique you are using in food-handling education, it is impossible to get away from the basic subjects. In reviewing this material please remember that it is essential that we stick to our basic subjects and basic facts in presenting it. But we can present them in a little different light or in a little different way.

Now, let us say something about the use of moving pictures or films in our food-handling schools. Moving pictures are of little or no value in teaching food handlers when they are used as a main teaching aid.

Think back now on the films you have seen on this subject. There aren't very many that we might classify as really good. In thinking back, try to sum up just how many ideas you can think of that were in the one given film. I dare say that you will find that ordinary film of this subject contains anywhere from 25 to 125 various and sundry ideas, and how long do these films run—very seldom more than 20 minutes. Most of them run for approximately 15 minutes. That's almost better than an idea a minute. Three ideas a minute. And on top of all this, the audience is seldom properly prepared for viewing the film.

The National Sanitation Foundation recently completed some research on the I.Q. of food handlers, and their report indicates that the I.Q. of the average food handler is between the 5th and 8th grade. Not only do we have a bombardment of too many ideas in too short a time in moving pictures and films, but they are aimed at a higher level than possessed by most of the food handlers over the country. That is just one reason why we are against the use of moving pictures or films as a main teaching aid in our food-handler training program.

We recommend the use of demonstrations using fluorescent material and "Blacklight" and we recommend slides. We believe in the versatility that the slides offer any teacher. With a set of good slides, preferably in color, you can rearrange the order in any way you desire; you can present them and change your dialogue that goes with each slide to suit the particular group that you are talking to. You can dwell just as long or short a period of time on each slide as you wish. Can you do these things with a film or a moving picture? You cannot, nor can you accomplish it with even a film strip.

With slides and what we call "live patter" you can achieve a personal relationship between you as a teacher or speaker and the audience. If you present them in the right manner you can achieve the effect of talking to each person in the audience as though he or she were the only other person in the room. Therefore we achieve not only the versatility that the slides offer but also present an opportunity for a close relationship between you and your audience. We further recommend that the groups be broken down. Heretofore, we have herded everyone together —cooks, bartenders, managers, soda fountain personnel, and what have you. And we teach them all the same thing. It's true that each should know a little about the other fellow's job, we grant you that one point. But the waitress is not interested in the cook other than the fact that he gives her good food to serve her customers. Nor is she interested in the dishwasher's problems or what he is doing, other than the fact that he delivers to her a clean, sanitized dish. And perhaps she is only interested in this because her customer complains and her tips fall off. Therefore, we recommend that the food-handling schools be broken down into groups or to sections. That is, first we shall have a specific school for managers, and incidentally, we are dropping the term "school" and dropping the term "education." It seems that in the past these two terms in particular have actually scared or frightened off some of the very people that we are trying to reach. We propose that it be called Professional Food Handler Training Program. It is by far one of the largest professions practised in this country today. So let us give it that name or terminology, "Professional Food Handler Training Program."

We plan to train the managers, to teach them the managerial things. In addition to this we propose that the manager be given a sample of what his employees will be taught. Until we have sold the manager on accepting these ideas, we are wasting our time. Or if we train the food handler and the manager does not permit his employees to carry out the things we have taught, we have certainly wasted our time. It is impossible for our local sanitarians to be in each establishment 24 hours a day or during all of their operation period. Therefore, if we train and sell the manager on these things, we have on the premises during all the working time an inspector or sanitarian. If the manager is sold on doing the things correctly, he will see to it that his employees carry them out.

After we have had a meeting with the managers, which incidentally will only be two hours for one meeting, we next shall meet with his waitress for one meeting for two hours. Then we shall take the dishwasher and the cook, then take the bartenders and soda fountain personnel, teaching each group just the things that he or she is interested in, dealing with just their main problems.

Objectives

You people who are old in this game of foodhandler education will see that we have obviously left out some items in our slides. I assure you that these items are left out on purpose; we have picked just those items which we have found were most often violated on the inspection sheet. When we get those items corrected we can come back with another program or in our follow-up work and add to our teaching list those items which we had previously left out.

What is it we are exactly after? What is it that we want to achieve in this educational field? We want more learning in a given time. We want a greater retention of that learning, and we want an eager interest in the subjects presented.

This new approach to Professional Food Handler Training may be divided into five main sections or groupings. They are as follows: (1) giving them material which can be controlled for speed of presentation according to the need of the particular group; (2) going into bacteriology only far enough to give them a working knowledge but not so far as to confuse them; (3) breaking the groups up according to specific duties within the establishments; that is, operators, waitresses, bartenders,

soda fountain employees, cooks, etc.; (4) stressing only those items that are found in violation most commonly and thereby getting a greater retention; (5) creating a course which is easily adopted to the group by a selection of material from a master file.

Slide Material

Permit me to say just a few words about the master file. The master file will consist of slides in full color and this file will be divided into these various groupings; that is, a section designed just for operators and managers, another for waitresses, etc. You can choose any one group that you wish to talk to and pull that particular section out of the master file, or perhaps if you are talking to a P.T.A. group or any civic organization, you can select not only any one group but any combination of groups contained in the master file to make up your talk. You can present the material to them from the angle of what they as patrons should expect to receive, or perhaps you can give them a short course or a brief review of just the things that you are trying to teach the food industry. Or you can give an overall picture to the industry by selecting various slides from all of the groups or any combination that you wish to use. The master file will contain slides of actual photographs of bacteria. The reason we are including these in the master file is in order that you may select or rather elect to use them with certain types of audiences or groups that you may be speaking to. Therefore, the master file will give you an opportunity to have that close personal contact with the audience as well as being very versatile and giving you a great amount of latitude.

Now let us take a look at our slides. (See No. 1) You will note that we call it "The Professional Food Handlers Training Program." On the slide we have a slogan, "Do it Right," and that slogan is interwoven with our patter throughout the entire program. It is not my intention to give the patter which goes with each slide; I'm merely trying to outline what we have in mind and to give you some idea of what our slides consist of.

Our next one, as you can see, is perfectly white. (See No. 2) You can not see anything; there is nothing there. This one was prepared to demonstrate bacteria. Bacteria are about us in our everyday life, and yet we cannot see them; therefore we assume, or many of us assume that they are not there. It looks perfectly blank but when we turn on this other light you do see something. If your eyes were microscopes perhaps this is what you would see. An entirely different thing now, at first you did not see anything and yet when we made our eyes microscopes we did see something. Bacteria are invisible, you do not ordinarily see them, and yet they are there. You did not see anything on this slide and yet with merely a flick of a switch you do see something. (See No. 3)

Take a good look at him for this is our character. He represents soil and filth (contamination to you). We have fixed it so that you can see him throughout the entire course. He will be visible, but remember that bacteria as a rule cannot be seen.

On this next one (see No. 4) you see a list of the more common diseases which may be spread through careless food handling. We are going to do away with these highly technical names of specific organisms causing these diseases and we are going to let this little character sitting on top of the arrow here represent all types of filth and soil. He will reperesent all of our diseases.

On this next one (see No. 5) you may get some idea of how bacteria grow. If you start out with one he simply divides himself into two. This process takes approximately 20 to 30 minutes. At the end of another 20 to 30 minutes each of those two can divide themselves and become 4, and they go on up the scale so that at the end of one hour you would have from one germ, 8 germs; at the end of 2 hours, you would have 64; and at the end of 5 hours you would have approximately 33,000 germs. Now let us see what this really means. (See No. 6) On this one you see a piece of pie, and on the pie you see one germ. This piece of pie happens to be left over from the noon meal, so we shall simply set it back on the shelf and wait and serve it at the evening meal. Now here is the same piece of pie which has been sitting on the back shelf from the noon meal to the evening meal. And for every one germ that was on that piece of pie at noon, we now have 33,000 germs. Now you health educators, you can see what we are up to. We are trying to pull it down to where any one can understand what time is and how they grow. Food handlers know what the lapse of time from one meal is to the next. And now we think they can understand how many organisms would be on a piece of pie or anything else that is left out of the refrigerator from one meal to the next. It is the lapse of time that they themselves can understand.

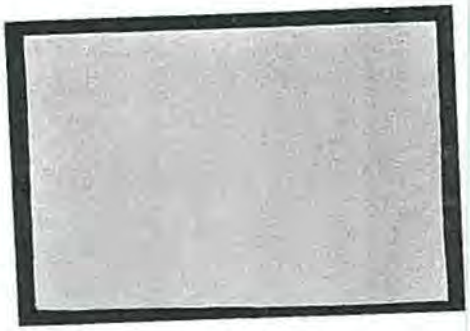
This slide was made to illustrate temperature. (see No. 7) We start out with our little character at a temperature of 50 degrees or below, and at the end of two hours he is just the same; he hasn't moved or changed one single bit. But you take that same little character and let him sit for 2 hours at room temperature and at the end of that time we have 64 germs. Our same little character at 170° F. would be killed off at the end of 2 minutes. This is simply to illustrate what temperature will do to our little character—the germ.

This shows a clean tidy waitress who is still, shall we say, a little careless. (See No. 8) Her hands are all soiled by filth-laden eating and drinking utensils. This next one will give you a closeup of how she picks up the contaminated glasses. (see No. 9) You can see our little character all over these glasses, getting all over her fingers. Our next picture (see No. 10) shows you with her hand up to her face. She has transferred these germs, who have freshly arrived from a customer, to her face. To illustrate, just very hastily looking over the room, I can count 5, no 7, people that have their hands up to their faces. and remember four out of five of all known communicable diseases enter the body through the mouth or the nose. Well, out of the seven we have only 2 left that still have their hands up to their face, and they now have taken them down. I merely bring this out to you to illustrate that it is an unconscious habit that we have, it is a little habit of the hands which may spread disease to ourselves.

I do not intend to go through the entire series of slides that we have but just enough to give you some idea of what we want to illustrate. I do want to show you the last two slides in this particular series which shows a waitress looking into a mirror. (See No. 11) Perhaps you will think that they are already vain enough, but we disagree with you. Every time they pass a mirror, we want them to look into it. For when they look into a mirror they see exactly what the customer sees. We want them to remember the five points of the "Good Will Mirror." (See No. 12) And those five points are these: (1) eye appeal; (2) pleasant facial expression; (3) pleasant voice; (4) genuine interest in the customer; and (5) enthusiasm.

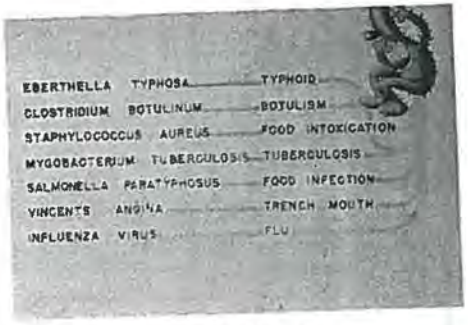
In addition to these slides we have a series of slides which consist of approximately 25 slides. These slides are called the "Hands Habit" series—they are actual photographs of hands. Little habits of the hands, the things they do, right and wrong. These slides bring out the little habits of the hands and stress the importance of changing our habits. We have a complete set of actual photographs of bacteria which will be in our master file; this will consist of approximately 20 or 25

Slide No. 1

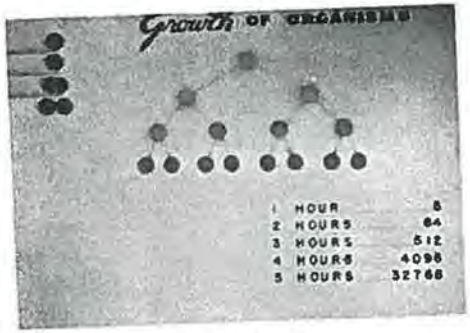


Slide No. 2

Slide No. 3



Slide No. 4



Slide No. 5

Slide No. 6

Slide No. 7

Slide No. 8

Slide No. 9

Slide No. 10

Slide No. 11

Slide No. 12

slides in order that you may choose anyone or group of them when you want to show actual pictures of bacteria. In addition to these we have mentioned, we are going to have separate sections in our master file of slides designed just for managers, just for cooks, dishwashers, bartenders, soda fountain personnel and so on. The master file is not complete. At the present time we have slides for waitresses, we have the "Hands Habit" series, and we have the series on bacteriology. At present we also have two artists working on the bartenders and the soda fountain personnel series. We have material ready to go to work on the manager or operator series, so in due time we shall have the master file complete. It is our intention to duplicate these and they will be for sale. There will be no royalty attached to them, therefore, the price should be kept at a minimum. We hope to have them available for federal, state, city, county, industry, or anyone's use.

This master file will soon lose its punch if it is not kept alive. We plan to replace continually our slides with newer ones, thus giving us a constant turnover of material. In this way our master file will be kept alive.

State Program

In Missouri we shall supply each of our districts and larger cities with copies of the master file. Suggested "patter" for each section in the file will also be supplied. The district and the city personnel will be called together to "brief" them on this new material and suggested uses of it. Following this a state representative will visit each area having a master file to assist in working out any area problem. The real Professional Food Handler Training Program will be carried out on the local, county, and district levels. The state

will offer training and assistance in presenting these training programs and will keep the master file alive and up-to-date. It will be the responsibility of the city, county, or district to carry out the "follow up" of these training programs. The follow-up is just as important as the training program.

In addition to the training program and follow-up, the state advocates that the general public and public schools be shown a portion of this program. Teach them the things they should expect to receive and encourage them to demand these "sanitary courtesies."

Kansas City is employing this new approach to food handler training plus a unique follow-up program. They are intending to take the program into the downtown area. They will first present a class for managers and operators and then follow up with a waitress session, a bartenders session, and a session dealing with soda fountain employees. This will all be carried out in a given area and then instead of moving on to another locality they will make intensive follow ups in those establishments whose employees have been to the course, determining what percentage of compliance they are securing. Any adaptations which may be necessary in the material to get upwards of 80 percent compliance with food handling will be made. And when such compliance has actually been secured the course will then be taken to the next adjacent area.

By presenting the course in such a manner they will gradually spread out from the downtown area until they cover the entire city. The speed then with which the course will be presented will depend upon how long it takes to correct bad habits and replace them with good so that the results will be concrete and not based on the number of people attending classes.

Ice Cream Short Course Conference at the Pennsylvania State College, January 28, 1949

The Annual Ice Cream Short Course Conference held at the conclusion of the Ice Cream Short Course will be held on January 28, 1949, at The Pennsylvania State College, at The Nittany Lion Inn. The program includes the following speakers:

Dr. D. V. Josephson, Head, Dept. of Dairy Husbandry, The Pennsylvania State College

Vincent M. Rabuffo, Editor, The Ice Cream Trade Journal

Robert H. North, Executive Assistant, International Assn. of Ice Cream Mfrs.

Dr. Kenneth Hood, Agri. Economics Extension, The Pennsylvania State College

J. Hoffman Erb, Borden's Dairy & Ice Cream Company, Columbus, Ohio

V. C. Patterson, V. C. Patterson & Associates, Inc., York, Pennsylvania

George P. Gundlach, G. P. Gundlach & Co., Cincinnati, Ohio

The Annual Serum Solids Banquet will be held at The Nittany Lion Inn at seven p.m. the same evening. Banquet speakers will be announced later. The presentation of the scholarship awards will be made at the Banquet as usual.

HOMOGENIZED MILK-CHART SHOWING PERCENTAGE DIFFERENCE IN FAT BETWEEN TOP PORTION OF MILK AND REMAINDER AFTER 48 HOURS STORAGE

EMANUEL KAPLAN, SC.D.

Chief, Division of Chemistry, Bureau of Laboratories, Baltimore City Health Department

REGULATORY agencies frequently define homogenized milk in terms of a comparison of the fat content of the top portion of milk in a container and the remaining milk after the top portion has been removed. For example, a definition originated by the U. S. Public Health Service states that, "homogenized milk is milk which has been treated in such manner as to insure break up of the fat globules to such an extent that after 48 hours storage no visible cream separation occurs on the milk, and the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 10 percent of itself from the fat percentage of the remaining milk as determined after thorough mixing" (1), (2). In accordance with the requirements of the Baltimore City Health Department, the maximum allowable percentage difference is 5 percent instead of 10 percent.

In the laboratory control of homogenized milk, considerable time in calculation can be saved by the use of a chart showing directly the percentage difference in fat content between the top 100 cc. of milk and the remainder after 48 hours storage. Such a chart is shown in Figure 1.

Although the minimum butterfat content permitted in homogenized milk offered for sale in Baltimore City is 3.50 percent, the calculations in the chart were extended to permit its use in the many localities whose butterfat standards are as low as 3.00 percent (3).

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HOMOGENIZED MILK

PERCENTAGE DIFFERENCE IN FAT CONTENT BETWEEN TOP 100 CC. OF MILK IN A QUART CONTAINER AND REMAINDER AFTER 48 HOURS STORAGE

Per Cent Fat in Remainder (R)	Per Cent Fat in Top 100 cc. (T)																																		Per Cent Fat in Remainder (R)
	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.55	3.60	3.65	3.70	3.75	3.80	3.85	3.90	3.95	4.00	4.05	4.10	4.15	4.20	4.25	4.30	4.35	4.40	4.45	4.50	
2.50	16.67	18.03	19.36	20.63																												2.50
2.55	15.00	16.39	17.74	19.05	20.31																											2.55
2.60	13.33	14.75	16.13	17.46	18.75	20.00																										2.60
2.65	11.67	13.11	14.52	15.87	17.19	18.46	19.70	20.90																								2.65
2.70	10.00	11.48	12.90	14.29	15.63	16.92	18.18	19.40	20.59																							2.70
2.75	8.33	9.84	11.29	12.70	14.06	15.38	16.67	17.91	19.12	20.29																						2.75
2.80	6.67	8.20	9.68	11.11	12.50	13.85	15.15	16.42	17.65	18.84	20.00																					2.80
2.85	5.00	6.56	8.07	9.52	10.94	12.31	13.64	14.93	16.18	17.39	18.57	19.72	20.83																			2.85
2.90	3.33	4.92	6.45	7.94	9.38	10.77	12.12	13.43	14.71	15.94	17.14	18.31	19.44	20.55																		2.90
2.95	1.67	3.28	4.84	6.35	7.81	9.23	10.61	11.94	13.23	14.49	15.71	16.90	18.06	19.18	20.27																	2.95
3.00	0.00	1.64	3.23	4.76	6.25	7.69	9.09	10.45	11.76	13.04	14.29	15.49	16.67	17.81	18.92																	3.00
3.05	.....	0.00	1.61	3.18	4.69	6.15	7.58	8.96	10.29	11.59	12.86	14.08	15.28	16.44	17.57	18.67	19.74	20.78														3.05
3.10	.....	.....	0.00	1.59	3.13	4.62	6.06	7.46	8.82	10.15	11.43	12.68	13.89	15.07	16.22	17.34	18.42	19.48	20.51													3.10
3.15	.....	.....	.....	0.00	1.56	3.08	4.55	5.97	7.35	8.70	10.00	11.27	12.50	13.70	14.87	16.00	17.10	18.18	19.23	20.25												3.15
3.20	.....	.....	.....	.....	0.00	1.54	3.03	4.48	5.88	7.25	8.57	9.86	11.11	12.33	13.51	14.65	15.79	16.88	17.95	18.99	20.00											3.20
3.25	.....	.....	.....	.....	.....	0.00	1.52	2.99	4.41	5.80	7.14	8.45	9.72	10.96	12.16	13.32	14.47	15.58	16.67	17.72	18.75	19.75	20.73									3.25
3.30	.....	.....	.....	.....	.....	.....	0.00	1.49	2.94	4.35	5.71	7.04	8.33	9.59	10.81	12.00	13.16	14.29	15.38	16.46	17.50	18.52	19.51	20.48								3.30
3.35	.....	.....	.....	.....	.....	.....	.....	0.00	1.47	2.90	4.29	5.63	6.94	8.22	9.46	10.67	11.84	12.99	14.10	15.19	16.25	17.28	18.29	19.28	20.24							3.35
3.40	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.45	2.86	4.23	5.56	6.85	8.11	9.33	10.53	11.69	12.82	13.92	15.00	16.05	17.07	18.07	19.05	20.00						3.40
3.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.43	2.82	4.17	5.48	6.76	8.00	9.21	10.39	11.54	12.66	13.75	14.81	15.85	16.87	17.86	18.82	19.77	20.69				3.45
3.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.41	2.78	4.11	5.41	6.67	7.89	9.09	10.26	11.39	12.50	13.58	14.63	15.66	16.67	17.65	18.60	19.54	20.45			3.50
3.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.39	2.74	4.05	5.31	6.58	7.79	8.97	10.13	11.25	12.35	13.41	14.46	15.48	16.47	17.44	18.39	19.32	20.22		3.55
3.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.37	2.70	4.00	5.26	6.49	7.69	8.86	10.00	11.11	12.20	13.25	14.29	15.29	16.28	17.24	18.18	19.10	20.00	3.60
3.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.35	2.63	3.95	5.20	6.41	7.60	8.75	9.88	10.98	12.05	13.10	14.12	15.12	16.09	17.05	17.98	18.89	3.65
3.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.32	2.63	3.90	5.13	6.33	7.50	8.64	9.76	10.84	11.90	12.94	13.95	14.94	15.91	16.85	17.78	3.70
3.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.32	2.60	3.85	5.06	6.25	7.41	8.54	9.64	10.71	11.76	12.79	13.79	14.77	15.73	16.67	3.75
3.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.30	2.56	3.80	5.00	6.17	7.32	8.43	9.52	10.59	11.63	12.64	13.64	14.61	15.56	3.80
3.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.28	2.53	3.75	4.94	6.10	7.23	8.33	9.41	10.46	11.49	12.50	13.48	14.44	3.85
3.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.27	2.50	3.70	4.88	6.02	7.14	8.24	9.30	10.34	11.36	12.36	13.33	3.90
3.95	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.25	2.47	3.66	4.82	5.95	7.06	8.14	9.20	10.23	11.24	12.22	3.95
4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.24	2.44	3.61	4.76	5.88	6.98	8.05	9.09	10.11	11.11	4.00
4.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.22	2.41	3.57	4.71	5.81	6.90	7.95	8.99	10.00	4.05
4.10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.20	2.38	3.53	4.65	5.75	6.82	7.86	8.89	4.10
4.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.19	2.35	3.49	4.60	5.68	6.74	7.78	4.15
4.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.18	2.33	3.45	4.55	5.62	6.67	4.20
4.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.16	2.30	3.41	4.49	5.56	4.25
4.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.15	2.27	3.37	4.44	4.30
4.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.14	2.25	3.33	4.35
4.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.12	2.22	4.40
4.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	1.11	4.45
4.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.00	4.50

Homogenized milk: Homogenized milk is milk which has been treated in such manner as to insure break-up of the fat globules to such an extent that after 48 hours storage no visible cream separation occurs on the milk and the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 5 per cent of itself from the fat percentage of the remaining milk as determined after thorough mixing (In accordance with the requirements of The Baltimore City Health Department).

BALTIMORE CITY HEALTH DEPARTMENT

Bureau of Laboratories

Prepared by:

E. Kaplan, Chief Division of Chemistry

PERCENTAGE DIFFERENCE BETWEEN FAT CONTENT OF TOP 100 CC. AND REMAINDER

$$\frac{(T-R)\ 100}{T}$$

MILK and FOOD SANITATION

QUALITY CONTROL IN THE MILK INDUSTRY

H. F. JUDKINS

President, Sealtest, Inc., New York, N. Y.

I. DEFINITION OF QUALITY CONTROL

WHEN speaking of quality I like to think of the quality of the finished product as it goes to the consumer. The appearance of the package makes the first quality impression on the customer. Paper packages of any product should be attractively printed and all packages should be free from smears of any kind when delivered. All types of packages should be filled to the prescribed fluid capacity of weight for the size in question. Badly chipped or etched bottles should not be used. The disc cap and pouring lip of the bottle under the hood of bottles that are hooded must be clean and dry. Nothing is more distasteful to the eye than to remove the hood from an otherwise attractive looking package and find a mess of clotted cream on the cap or pouring lip of the bottle.

In the case of unhomogenized milk, the consumer is still interested in a satisfactory cream volume and a uniform cream line.

Naturally the consumer is interested in clean products and foreign material of any kind has no place in dairy products.

The consumer wants to see a bottle of cream without skim milk separation at the bottom, without a plug of fat at the top and a cream that does not appear thin. In the case of buttermilk, the product must not appear too thick or too thin and must not show a gassy or wheyed off appearance. Chocolate milk or drink must show an even color and be free from a layer of chocolate fiber. Cottage cheese must appear uniform in structure from day to day and not be soupy one day and dry the next. Butter must be clean and uniform in color. Ice cream should have a normal color, good flavoring distribution, and should show a creamy meltdown.

If what the consumer can see is important, what the consumer, or at least the discriminating consumer, can taste is doubly important. Whatever the product, it must have a clean, natural flavor, and give the desired sensation of richness or of sourness in the case of products such as buttermilk, sour cream, or cottage cheese.

The consumer is interested in the safety of the product which, in addition to the above measuring sticks, means proper pasteurization.

The consumer is interested in the sort of housekeeping that exists in the barns and milk houses and in the processing plants where her products are handled.

While bacterial counts, tests for coliform organisms, acidity tests, phosphatase tests, sediment tests, butterfat tests, etc. mean little to the consumer as such, she has become aware that laboratory control is essential if the measuring sticks of sight, smell, and taste that she uses are to show results that satisfy her.

From what has just been said it can be seen that the word quality as applied to a product is not as simple as it sounds. Quality covers a wide field and consists of a number of factors. It is of course obvious that by the control of quality we mean establishing certain standards of same, the diligent application of certain physical and laboratory tests to determine whether said standards are being applied with, and finally and most important of all the taking of prompt action to correct such defects as the tests may reveal.

Talk presented at the 34th annual meeting of the International Association of Milk Sanitarians at Milwaukee, Wisconsin, October 17, 1947

II. PREREQUISITES OF A GOOD QUALITY CONTROL PROGRAM

1. *Company and/or plant management that—*

a. Understands what quality control means.

b. Is sold on a sales program supported by rigid quality control.

c. Is quality- and good housekeeping-minded and takes as much interest in quality reports as costs or profit and loss statement.

Recently I visited with one plant manager for an entire day in an endeavor to get all of the basic reasons why his plant had always had such a good quality record. He was a very modest man but in the course of his conversation he made one brief statement which might well be emblazoned on the wall of every plant manager's office as a motto. He said "I hate messes". That's it in a nutshell. We can stand more managers who hate messes. In fact, isn't it true that a large percentage of our population, and in this group can be numbered not only plant managers but plant employees, do not really hate messes? After prowling around the streets and the subways of a large city for sixteen years, I have certainly come to that conclusion.

2. *Supervision that—*

a. Possesses the same qualications listed above for management.

b. Has the knowledge and ability to teach employees those methods essential to good housekeeping and good quality, and uses that knowledge and ability.

c. Takes nothing for granted but is constantly checking to see if instructions are being followed and determining the causes of any quality defects and correcting same.

d. Commands the respect of his employees.

There is room for improved supervision.

3. *A sufficient number of employees of the right type.*

During the war it was difficult to fulfill this prerequisite and more difficult in some markets than others. Even today some plants that are working over capacity and more than the usual number of hours are finding it difficult to get enough employees of the right type, and the turn-over and absenteeism in some dairy plants as well as those in other industries is still too high for their own good.

4. *A plant that—*

a. Is of such size and so laid out as to make it possible to handle its volume of business with a reasonable degree of convenience.

b. Has the minimum major equipment and other facilities essential to product quality and sanitary operation. (Restaurant story.)

Some plants are very crowded for the volume of business they are doing and are not in such condition as to make it easy to do a good job in them. Many plants need major equipment and improved facilities to turn out a quality product under sanitary conditions. Such things as handling dairy products in equipment with exposed copper, trying to put out clean homogenized milk without a clarifier, trying to wash cans with can washers that are worn out, and trying to handle more product than there is refrigeration available to take care of, trying to transport ice cream to branches with inadequate transportation equipment, etc., certainly cannot help but affect product quality. The supply of these items still seems to be decidedly meager.

5. *A raw product and ingredient supply of high quality.*

It will take increased effort to improve the quality of the local milk supply in a number of instances. It appears now that it will be nothing short of criminal to have to waste a drop of milk during the next several

months because of poor quality. Unfortunately there has grown up in this industry a somewhat careless attitude on the part of those holding the rank of supervisor or foreman in that they sometimes do not worry too much if a product deteriorates because of improper care. The tendency too often is to cover up this carelessness by using this deteriorated product unbeknown to top management and I am afraid sometimes with instructions from top management. Certainly this practise should cease. Even though a deteriorated product may be used, shall we say "intelligently" by blending some quantity in with a larger quantity of good product so that the flavor of the finished product may not suffer noticeably, this is a practise that sound management cannot condone. There appears to be a general belief on the part of management that regardless of quality, the consumer must be supplied. This is the basic reason for sometimes using an ingredient that should not be used. Certainly that company will go farthest in the long run whose management has the courage to tell the consumer when necessary, "Sorry, we have no cottage cheese or whatever the product may be for you today because we were unable to get a sufficient supply of a type of ingredient that would make it possible to make a product of our usual high quality. We hope and expect to be able to take care of your requirements tomorrow."

6. *Good Cooperation Between Health Department and Company Quality Control Officers.*

Certainly the aims of the federal, state, and city milk quality control officers and the aims of the milk company that is sincerely interested in quality must be identical. It must therefore be true that where a company and regulatory officials can work together that the fastest and best improvement in quality must of necessity result. Over the years I feel that I have sensed at times an attitude on the part of some plant operators that the less they have to do with regulatory officials the better. It seems to me that no modern business man should have any sympathy with this attitude. There always have been and certainly there will be for some time to come a small percent of milk producers and plant operators who will never comply satisfactory with sound quality standards without the combined efforts of reputable company and regulatory officials being applied.

In some instances regulatory officials do not have sufficient funds to carry on their work in cooperation with reputable milk concerns much as they might like to do so. This is to be regretted.

III. Some of the Essentials of a Quality Control Program

So long as the milk remains in the healthy udder we have no quality problem. It is only when man takes hold of the teats that our troubles begin.

While the handling of milk and milk products may not be as dangerous as handling dynamite, it does demand plenty of care. Dirt, bacteria, and warm temperatures are milk's public enemies 1, 2, and 3, and it takes a group of F.B.I. men and women, i.e. heldmen, bacteriologists, and inquisitive minds, to keep them from raising havoc with our business. That is to say—product quality and good plant housekeeping and maintenance don't just happen. A company that wants quality must have a program of quality control that starts with the production and handling of the milk on the farm and follows it through to the receiving station, to the processing plant, to the consumer's doorstep or better yet, to her refrigerator. This program must consist of plant and product standards, and a procedure for enforcing them. Adequate personnel must be provided to carry out the necessary supervision. This personnel, in addition to having the ability to test and inspect should have had the experience that will make a practical suggestion possible whenever a criticism must be made. Such a program costs money, but it should be considered the companies' insurance policy covering its own physical and business health and the physical health of its customers. As one company president recently stated and I quote, "To me, quality is the corner stone of our business. It must be high. It must be maintained. It must not be tampered with."

Various laboratory checks are of course very essential. Some milk plant operators do not seem to realize that it costs money to equip, staff, and operate a laboratory. In order for a laboratory to be effective it must at least be headed by a college-trained individual who knows how to interpret the results of the various tests. These laboratory jobs are important and yet you will find many a plant where the porter who cleans toilets and locker rooms is paid a higher wage than the laboratory technician. Yes, it is one thing to want quality but it is quite another thing to want it badly enough to be willing to pay for it.

1. *Relation of Physical and Laboratory Tests*

It is my feeling that perhaps there is a tendency to lean rather heavily on laboratory tests in milk control work rather than to make the maximum use of physical tests or what might be called some of the more simple laboratory tests.

Physical tests are construed to be those which are made by the senses of sight, smell, taste, and sometimes hearing. Such tests as examining equipment for proper construction and cleanliness, noting the accuracy of operating methods, examining raw materials and finished products for appearance of package, visible sediment, flavor and odor, body and texture, etc., are good examples. All or nearly all of these physical tests can be correlated in some way with the commonly known laboratory tests such as the bacterial count, (if standard procedures are not changed too often) coliform count, the phosphatase test, chlorine strength test, butterfat and total solids test, sediment test, homogenizing efficiency test, etc. The physical test is easier and cheaper and quicker to perform and may be made in time to prevent trouble. Generally speaking the laboratory test is a check test, the result of which is not known until after the damage is done. In this respect it is like locking the barn after the horse is stolen.

The value of physical tests begins with those performed by the good field man at the farm where the milk is produced. I would like to offer a rather homely definition of good quality raw milk. It is milk which you can stomach after seeing it produced and handled on the farm. I was raised on a farm and did some milking and milk handling under conditions which I am not proud to look back on so I know whereof I speak in offering the aforementioned definition. Give me a milk that I know from observation comes from healthy, clean cows, and that is milked and handled in clean and properly sterilized equipment and promptly cooled to 50° F. or below and I shall have no worry and little interest about various platform and laboratory tests on this milk when it reaches my plant. Produced and handled under the conditions as outlined, it has just got to be good.

2. *Quality Control of the Raw Supply*

Now unfortunately, not all milk is produced and handled under the conditions just outlined and since it is necessary to have a field man look after a considerable number of producers his work is made more effective if platform tests are made so that he not only knows who the producers are that require most of his attention but he also has some idea as to what the producers' troubles are when he visits his farm. This information as we all know is supplied by certain platform tests made on each producer's

milk. While there are many tests that can be made, I feel that the following are the most important:

a. Carefully checking each can of milk for odor. If this work can be entrusted to a trained man it will tell much, not only concerning specific off odors but the most likely conditions on the farm that caused them. Unfortunately in the small or medium size plant this work is entrusted to the strong arm man who dumps the milk, and the odor check, if made at all, is frequently not intelligently done.

b. The sediment test. While it may be true that some sediment pads may grade No. 1 or No. 2 because an extra good straining job has been done at the farm, this test generally reveals a certain number of careless producers for the field man to work with. Incidentally, it is to be hoped that in time the method of making this test and the standards used in measuring results may become standardized throughout the country. At the present time there are certainly too many different standards in use.

Judging by the activities of the Food and Drug Administration it seems not unlikely that a microscopic examination of milk as it is received to determine more accurately the types or kinds of sediment found therein may come into vogue.

c. The laboratory pasteurization test. We are finding that this test is extremely helpful and the laboratory pasteurized count on the individual producer's milk probably has more significance than the total plate or Breed count. The reason for this is that the laboratory pasteurized count not only indicates what the plant pasteurized count will be but it is a strong indication of those faulty practises on the farm which would make it impossible for us to stomach the milk if we could observe them. I refer particularly to unclean and unsterilized equipment, notably milking machines. The milking machine constitutes a real sanitary problem as is shown by the increase in the laboratory pasteurized count of most milk supplies since so many of them have been installed.

Without question there is no point in the milk quality control problem where the combined efforts of company and health department regulatory officials are so necessary as in working with the producer toward an improved supply. In this connection the insistence that producer milk cans be kept in better condition is something that is being too often sadly neglected.

3. Quality Control in the Plant

Quality control in the plant is aimed at securing a neat, properly filled package, a product of good flavor, free from sediment, having good body or texture, no cream plug, correct fat test, satisfactory bacterial count, negative phosphatase test, and free from coliform organisms. Homogenized milk should meet the homogenizing efficiency test as measured by the top and bottom fat test. Vitamin D milk should contain at least the required amount of Vitamin D.

While laboratory tests such as butterfat, total solids, bacterial counts on the product and empty containers or equipment, acidity, phosphatase, homogenizing efficiency and Vitamin D assay are essential checks, I want to emphasize again the importance of the constant checking of operations as a means of preventing trouble and the using of these laboratory tests really as a check on the efficiency of our supervision of the operations. I think perhaps this will be made clearer if I cite some examples.

Let us first consider the matter of temperature. The temperature at which a product is handled at various stages in the plant probably has more effect on the quality and safety of the finished product than any other single factor. Such laboratory tests as acidity, bacterial count, the phosphatase test, and certainly the flavor of the product, are definitely affected by temperatures involved in processing and storage. Obviously an ample supply of correct thermometers is essential to temperature control. Furthermore, these thermometers, except as they automatically regulate the use of heat and cold, are not robots. To be of any value they must be read and checked for accuracy at the proper intervals. So closely related to temperature that it cannot be considered separately is the element of time. Certainly if the supervisor watches the temperature of the raw milk in the storage tank he may be quite sure that the quality of the milk as measured by flavor, bacterial count, and acidity will not have changed materially between the time of receipt and the time of processing, assuming that the time of holding is not too long.

The recording thermometer on the pasteurizer reveals to the operator the temperature and time of pasteurization, and if these are noted to be as per the established standard he knows that the major factor in preventing a high bacterial count, a cooked flavor, and the positive phosphatase test have been nullified.

Observance of the temperature of the finished product, storage box, and the arrangement of product so there can be no confusion as to age is the operator's guarantee that the quality of the product as it goes on the routes has been protected. The careful use of the thermometer on the bottle and can washer goes a long way in insuring a clean, sterile container.

The element of pressure is also important in controlling certain quality factors. For example, if the homogenizer pressure gauge is accurate and indicates a steady, prescribed pressure throughout the run, there is very little likelihood that the laboratory test for homogenizing efficiency will not be satisfactory. If pump gauges are kept accurate and jets are kept open on can and bottle washers so that the pumps are known to operate at the prescribed pressure, we are well on our way toward a clean sterile container.

In addition to these elements of temperature, time, and pressure, there are many factors embodied under the heading of good housekeeping and equipment maintenance that have a decided bearing on quality of product. A study of some of these items will show how well they may indicate what the results of various physical and laboratory tests on the product will be. For example, take the all important matter of cleanliness of equipment, which can be easily determined by careful observation. Is it not a waste of time to make a coliform test on milk, the results of which may not be available for 24 to 48 hours, until such time that a check has been made to determine whether equipment has been properly cleaned and sterilized? The finding of a dirty pump, which perhaps has not been taken apart for cleaning, is safe insurance that a positive coliform test, as well as a high bacterial count, will result in milk that is passed through such a pump. Or, here is the case of a certain plant that was constantly troubled with a positive coliform test in its bottled milk. Investigation which could have easily been made before it *was* made, revealed that the floats on one of the fillers had sprung a leak and was half full of old milk.

It is not easy to tell whether equipment has been thoroughly sterilized without seeing the operation and checking the temperatures of hot water involved or the strength of chlorine solutions after they have passed over or through the equipment. I have been much interested in the swab test described by Messrs. Robert and C. W. Anderson and N. O. Gunderson of the Rockford Department of Health, in the May–June, 1947, issue of JOURNAL OF MILK AND FOOD TECHNOLOGY. This appears to be a simple and practical test. Some other items which require good supervision to prevent trouble are

(a) the general habits of employees carrying on their work,

(b) the extent to which products are kept covered and hence protected from dirt contamination, drip, or insects during processing,
(c) the purity of the air used for agitating or moving a product,
(d) the method of handling paper gaskets,
(e) the cleanliness of rinse and sterilizing water,
(f) the date coding of containers to avoid a product that is too old getting out to that trade,
(g) the effectiveness of the vermin control program.

I want to say a word about homogenized vitamin D milk, which is finding such ready public acceptance. Failure to keep vitamin D concentrate refrigerated, failure to measure the milk accurately to which the concentrate is added, failure to measure the concentrate accurately, and inadequate mixing of the concentrate with the milk may result in unsatisfactory assays and/or increased bacterial counts.

Dr. Weckel's Report of Committee on Applied Laboratory Methods entitled "Control Practices Used in Supervision of Vitamin D Milk by City and State Milk Sanitarians" appearing in the May–June, 1947, issue of the JOURNAL OF MILK AND FOOD TECHNOLOGY certainly presents a distressing picture. You have probably all read it. It certainly presents a situation which does not tend to build confidence in a statement on the bottle cap to the effect "that this milk contains at least 400 U.S.P. Vitamin D units per quart." I must say that after reading Dr. Weckel's report, I took considerable extra pride in the performance of the various plants of our companies for the past several years. We require a minimum of three assays a year. A low assay has been extremely rare and whenever it has occurred it is always followed with investigation and a re-assay.

I may say in closing that I have a feeling that I have not contributed anything new to your knowledge. Possibly if my method of presentation has served to refresh your minds, my use of your time will have been justified and Dr. Shrader will not feel too badly that he got me into this job.

Washington State College Institute of Dairying

The 18th annual State College of Washington Institute of Dairying meets at Pullman, Washington, March 7 to 12, 1949. Among the guest speakers are the following well-known authorities:

Dr. H. A. Bendixen, in charge of the Institute
Dr. C. D. Dahle, of the Pennsylvania State College, on ice cream
Professor F. H. Abbott, of the University of California, on butter
Dr. E. W. Gaumnitz and Mr. H. L. Wilson, of Chicago, on cheese
Mr. N. C. Angevine, of St. Louis, on cultured buttermilk and cottage cheese
Mr. C. A. Abele, formerly of the Chicago Health Department and now with the Diversey Corporation
Professor J. C. Boyd, in charge of dairy manufacturing at the University of Idaho
Mr. E. F. Eldridge, Chief Engineer for the Washington State Pollution Control Commission
Mr. George W. Putnam, vice-president in charge of research and factories of the Creamery Package Manufacturing Co.
National representatives of the American Dry Milk Institute, the Milk Industry Foundation, and many others.

On Monday, Tuesday, and Wednesday of the week, there will be separate special sessions for fieldmen and sanitarians, emphasizing such production problems as managed milking, housing, feeding, disease control, significance of coliform counts, and the value of laboratory control work.

Programs, room reservations, and other information may be obtained by addressing Dr. H. A. Bendixen, Department of Dairy Husbandry, State College of Washington, Pullman, Washington.

SANITARY TECHNOLOGY IN THE ICE CREAM INDUSTRY *

F. E. UETZ
The Borden Co., New York, N. Y.

As a preface to this paper, I would like to say that I have been an avid reader of the JOURNAL OF MILK TECHNOLOGY since its first issue and I look upon it as a most desirable source of information on what is new in research; the practical application of what is already known; and the comfortable feeling that within its pages is contained the messages of kindred spirits, whose desires are to make our knowledge more complete so that mankind may be better served.

This Association through the report of its Committee on Frozen Desserts (May–June 1946 issue of the JOURNAL pages 156–164) paid the ice cream industry a great compliment in lauding its ability to withstand the temptation of filling an abnormal demand for its products through the use of inferior or substandard ingredients during the war years. It was also very generously conceded, "That manufacturers of Frozen Desserts did so well during this period despite almost insurmountable difficulties reflects great credit upon their training and integrity. Years of hard work and education by sanitary inspectors and the dairy departments in the various agricultural colleges had left its imprint on the industry to the extent that when the going got hard and temptations arose, their training told them there was only one thing for them to do—to make a sanitary, standard product of good quality despite the handicaps."

* Presented at the Thirty-fourth Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, INC., Milwaukee, Wis., October 16–18, 1947.

SANITATION MANAGEMENT

There are naturally two viewpoints in sanitary technology—the ideal and the practical. Where they can be made to coincide with a minimum concession to either viewpoint is the field of endeavor of the industry sanitarian. An exaggerated example of the ideal would be to produce frozen desserts under clinical conditions—sterile ingredients, aseptically sterile equipment, sterile garments, hospital masks, surgical techniques. Under these conditions the cost would be prohibitive and the consumer would turn to something less expensive.

By and large, the bulk of the frozen desserts sold in this country are manufactured by corporations. In large operations the personal gain by sharp practises on the part of individuals is practically non-existent. It stands to reason, also, that normal employees will give a day's work for a day's pay. Under normal supervision, properly instructed employees, and the emphasis is on properly instructed, whose jobs are carefully planned so that they are not required to do too much in too little time, should give satisfactory results.

It is highly desirable that the sanitary control of any operation should be the responsibility of an individual near the top of management. He must defend this phase of production from the ravages of economic retrenchment; he must be insistent that capital expenditures for plant and equipment shall not be pared when the savings shall be made at the expense of sanitation.

When sanitary control is a function of top management, the results are usually consistent. Employees are human, and they think, too. If management condones short cuts in established practises, the employee is very quick to perceive it. He immediately takes advantage of this laxness and uses it to his own ends in making his job less tedious. Management's attitude on what shall constitute a sanitary product and its adherence to a standard is, therefore, very important.

In my opinion the results of sanitary technology must prove themselves in the finished product. I would define sanitary quality in ice cream as an esthetic quality achieved by assembling ingredients which in themselves are and have been sound, are free from injurious or toxic materials except where permitted by specific regulation, the bacteria count is low and coliforms are conspicuous by their absence, and trash, insect parts, and rodent manifestations have never been present to be removed.

The compliance with the precepts of the foregoing definition comes within the scope of the sanitary technologist and as such I shall attempt to interpret it in the light of my own knowledge.

The esthetic quality is the overall result achieved by inherently clean people handling clean, wholesome products in a clean manner in clean surroundings. I would be remiss if I did not at this point suggest you read Judkins' paper on "Maintaining Quality and Good Housekeeping" published in the *Twentieth Annual Report of the New York State Association of Milk Sanitarians* in which he stressed some of the malpractices of which the dairy industry was guilty.

Ingredients which in themselves are and have been wholesome are distinguished by the fact that they have not been subjected to a doctoring up process prior to their incorporation in a frozen dessert. A good initial ingredient may be deteriorated by poor containers, improper storage, improper handling in transit, lack of refrigeration, and poor processing practise. Should regulations governing the interstate movement of unsound products become more stringent in the latitude permitted in salvaging deteriorated or unsound products, the producer or processor would soon realize, the hard way perhaps, that there was very little profit in substandard products.

INGREDIENTS

Inasmuch as sanitary technology of ice cream must concern itself with all ingredients, it has become practically mandatory that the technologist acquaint himself with the techniques and processing practises of the industries which constitute his source of supply. Basically ice cream is made up of water, sugar, butterfat, milk solids not fat, flavoring, and/or eggs and stabilizer. Fortunately, most ice cream manufacturing plants are located in urban areas where they have the advantage of a municipally supervised water supply. However, this is no excuse for minimizing the necessity for routine water check-ups. Even in the supposedly best regulated water supplies, we find evidences of decayed fish, visible sediment, and an absolute minimum chlorine content.

Sugar is becoming more widely used in the form of syrup. The minimum sugar concentration at which the syrup flows readily and still retains the property to inhibit bacteria, yeast and mold growth is 68 percent. Storage tanks of stainless steel or glass-lined have been found most satisfactory for storing this commodity. It has been found most necessary to have the vents properly equipped with suitable air filters to keep out airborne yeasts and molds which grow on the surface of the syrup which has become diluted by condensed atmospheric moisture. It has been found also that all lines from these tanks must be kept constantly full or must be of sanitary construction and cleaned after each use because of this dilution due to atmospheric moisture.

BUTTERFAT

Dairy products constitute about one-fourth of the weight of ice cream, of which over half is butterfat. The sanitary conditions surrounding the production of milk to supply this butterfat should be no less than that required for the best of fluid milk supplies. The usual sources of butterfat are fluid cream, frozen cream, whole concentrated milk, plastic cream, sweet butter, butter oil, and whole milk powder.

Unfortunately, economics play a large part in determining the forms of butterfat which are used.

Assuming that fresh, fluid cream, bottling class, makes the best ice cream, what are we confronted with. In many cases the source is a restricted milk shed established by a health agency. If the requirements are stringent and enforcement thorough, the producer demands a premium for compliance.

If the health agency is augmented by a Federal Milk Marketing Administrator, one of whose functions is to protect the producers' interest, we find in recent years that our source of fresh, fluid cream has disappeared into channels of higher return during the fall and winter months, without, in some cases, being permitted to reach out beyond the limits of the existing milk shed to offset the diversion. As a consequence, storage cream and sweet butter are and have been used in increasing quantities during the so-called short periods and now even longer. In the light of sanitary technology, we discovered that cream for storage in many cases originally constituted distress cream. Cream which was shipped to market found no buyer and was frozen as a salvage proposition. Needless to say, in many cases, the cream was on the verge of spoilage either through the growth of excessive putrefactive organisms or lactic acid organisms which rendered it unfit for frozen desserts. Inasmuch as storage cream was a desirable product, its production was given more consideration. The Market Administrator also recognized a service to the producer in preserving excess butterfat produced during the period of high production for later use and thereby reducing the tendency to depress the market with these surpluses. Fortunately, frozen desserts do not make the same demands of cream that bottled cream does. Primarily, we are not interested in body. Consequently, with our knowledge of modern, short time, high temperature pasteurization, we discovered that we could take cream of good quality, subject it to a temperature up to 178° F. for 23 seconds and render it practically sterile, together with the destruction of the lypase enzyme, eliminating any development of oxidized flavors during the storage period. In fact, we felt that our June cream frozen excelled December cream fresh for our frozen desserts.

Because of the economic factors involved, we did not feel that all our butterfat of necessity should come from one milk shed. Sweet butter often made from surplus bottling cream was found to be an ideal source of butterfat. However, we found that when this cream was churned something happened to it. Instead of a practically sterile product we found bacteria counts in the hundreds of thousands, and coliform counts in the thousands. Butter that went into storage with a clean, wholesome flavor came out with an abnormal flavor. It was again evident that sanitary technology was needed. Rather than cry in horror at the practises of any industry, we did the next best thing and set up specifications for the production of butter for our particular purpose.

I personally look forward to the day when equipment for the continuous production of butter is available. In the light of our knowledge of sanitary construction of equipment, it will not be any great hardship to produce butter of high sanitary and good-keeping qualities. The lesser used sources of butterfat, namely, whole milk powder and

butter oil, remain as such because of either the expense involved in producing them or the limited time they will keep in storage without apparent changes.

Ice cream, in general, contains 10 percent to 12 percent milk solids not fat. These milk solids are largely derived from condensing skimmed milk, and are, in general, considered pasteurized because of the heat treatment involved and the negative reaction to the phosphatase test.

MILK SOLIDS

Because very little condensing equipment in use today is of sanitary construction as we now understand it, the resulting unsterilized product has not shown up favorably, bacteriologically, as a completely sanitary product. So-called homemade ice cream made up of assembled pasteurized products without subsequent pasteurization of the mix are caused to suffer at the hands of poor quality concentrated skimmed milk or concentrated whole milk.

Appreciating the problem involved in improving the sanitary and thereby the keeping quality of our concentrated milk solids, we had built for our plant a stainless steel, continuous evaporator which was so constructed as to be readily cleanable. Where we had used hot wells heated with live steam, we resorted to a vacuum heater where skimmed milk was heated to a temperature of 240° F. in a matter of seconds prior to passing through the continuous pan. The net result was again a product approaching sterility, but still retaining that desired flavor which makes for good ice cream.

STABILIZERS

In some parts of the country, high egg content ice cream has become popular. Frozen egg yolks and dried egg yolks are principally used. Because of their greater solubility and better flavor in the mixes, a greater percentage of frozen yolks are preferred. Bacteriologically, egg yolks did not disclose a very sanitary product. In many cases, egg breaking apparently constituted a salvage proposition comparable to distress cream freezing, because of its cycle of high and low production. When bacteria standards were written into contracts it meant that the egg handlers, who made freezing and storing of shelled eggs their business, were required to exercise greater care and better sanitary control in their plants.

The use of stabilizers in ice cream has at one time or another caused concern among sanitarians. The accusations were that they were fillers in the form of starches, cereal flours, and questionable gelatins and gums which contributed nothing much of food value to ice cream, but did serve as a deceptive in making the product seem better than it really was. Today, stabilizers are by law limited to minute quantities, so that their use is confined to the purpose for which they were intended, namely, to inhibit the formation of large ice crystals.

PASTEURIZATION

Better than a decade ago, it was discovered that the time and temperature required to pasteurize milk and cream properly or adequately was not satisfactory for frozen desserts mixes. The sugar content was found to act as an insulating medium, thereby rendering the heat less effective for bacteria destruction. Although, the holding temperature was raised to 155° F. for 30 minutes as being a minimum, the industry found that temperatures exceeding 160° F. had no detrimental effect on its products so that in most cases it is the temperature commonly used today. Short time, high temperature equipment for pasteurizing ice cream mixes is reported in use, but thus far no data has been available as to its effective time and temperature requirements. Inasmuch as most health regulations stipulate that mixes must be cooled to 50° F. or lower, immediately after pasteurization, it has been our experience that the conventional heat exchanger or regenerator does not lend itself as readily to cooling mixes as it does to fluid milk and cream. Consequently, we have reverted to bigger and better surface coolers of the direct expansion type. This type of refrigeration eliminates the use of brine and thereby its cumbersome equipment which at best is no asset to plant sanitation.

Prior to embarking on its trip to the freezer, mixes are tested to see that they conform to the original formula. Even though mixes are the result of assembled ingredients which have been or should be weighed and tested, it is rarely that the end result is perfect. This requires then what is termed standardization. The addition of sugar, butterfat, or milk solids to a pasteurized product opens a wide avenue for contamination. It means disturbing sterilized equipment, and exposing the product to the atmosphere and excessive handling. In order to overcome this possibility, we add slightly excessive amounts of ingredients in the original mix so that any standardization necessary is achieved by the mere addition of calculated amounts of water.

FLAVORS

Flavoring is a most important item in the production of frozen desserts. In general, all mixes except possibly chocolate are flavored after pasteurization. Because of the excessive manipulation and handling of the mix from the pasteurizer to the final container, the sanitary technologist's work is cut out for him if he is responsible for the sanitary quality of the final product.

Because the greater amount of ice cream today is frozen in continuous freezers which accomplish much more satisfactorily, in a matter of seconds, what the batch freezer required seven to eight minutes to do, our problems again became somewhat more complicated. Liquid flavors have to be added before freezing—solid flavors after freezing. Fruits, such as strawberries, peaches, and cherries which normally contain a great quantity of juice and which are purchased and preserved frozen, require exact handling. Immediately upon thawing the juices are removed and transferred to other receptacles and thence to tanks used for flavoring the mix prior to freezing. The drained fruit is taken to the freezer where it is added by means of a mechanical device known as an "injector" or "feeder" directly to the semi-solid ice cream prior to its entering the final container in which it is to be solidified.

The sanitary technologist became considerably involved in this transition from batch to continuous freezing. In the first place it was discovered that mixes were carried considerable distances through sanitary pipes to the flavoring tanks. On hot, humid days, these mixes picked up five to ten degrees of temperature. Again the mixes were held in flavor tanks for periods of one-half to two hours prior to freezing. It could readily be seen that this heat absorption did little good to the mixes. In fact this became most apparent when some mixes, after the addition of acid fruit juices, immediately proceeded to set up as a form of pudding and would not flow to the freezers. These findings established the fact that all tanks used for storing mixes were more satisfactory when they were refrigerated rather than merely insulated. It also meant that tanks should be in close proximity to the point of ultimate usage to reduce the length of sanitary piping. Also it demonstrated that flavoring tanks, if not refrigerated, should be of the smallest size possible to eliminate long holding time of the flavored mix before freezing.

Generally speaking, processors of fruits, nuts, and flavors are people of considerable integrity. Over a period of years the sanitary technologist from the frozen desserts industry has made continual pilgrimages to the various

packing centers to inspect the premises and techniques of the packers. These trips were not made with any malicious intentions, but rather with the idea of improving the sanitary quality of the product by merely acquainting the operators with the ice cream manufacturers' problems and their findings at the ultimate point of usage. That much money, time, and effort was spent is quite apparent today by the quality of the product offered.

Inasmuch as the ice cream industry of necessity passes on to the consumer the products of these packers without intermediate processing, their cooperation was of vital importance.

CONTAINERS

Containers for ingredients have required considerable attention of the sanitary technologist. The ice cream industry probably gets into its plants the greatest number of diversified containers of any of the dairy industries. Fruits in barrels, tins, lacquered steel drums; dried fruits in boxes; and powdered fruits in bags, and concentrated extracts in bottles. Nuts in hermetically sealed tins, hot roasted nuts in fibre containers or unroasted in bags or boxes. Chocolate in barrels, bags. and boxes or syrup in drums, glass, or tins. Sugar in tank cars, tank trucks, drums, or bags. Dairy products in tank cars, tank trucks, cans, wooden tubs, barrels, fibre boxes or tubes, and tins, and, now, even in plastic bags. The problem of containers centers about the transferring of products out of the containers, the cleaning and sterilizing of re-usable containers, the minimum requirements of a satisfactory single service container, and sanitizing procedure when single service containers are used or are to be re-used as was required during the war. The greatest complaint we have had to make on containers in general was that the manufacturers did not follow through when the containers were put in use by the buyer. Single service tins, for instance, with slip covers which would not stay on or would not stand stacking in storage or rough handling in transportation, thereby exposing their contents to contamination, could hardly be considered as satisfactory food containers.

The sanitary problem of containers for frozen desserts was so great that by a concerted effort of the entire industry, I would guess that 90 percent of all metal cans were discarded in favor of single service paper cans. With the advent of paper bottles for milk, paper plant sanitation improved to the point where today we practically take for granted that we receive from the paper manufacturers sterile food containers.

INDUSTRIAL SANITATION

The value of the sanitary technologist has been materially enhanced by the transition from strictly utilitarian design of dairy equipment to our present day conception of sanitary equipment. Indeed, it has been costly from a dollars and cents point of view, but conversely it has made for better products by reducing the incidence of contamination and thereby making available to the consumer a product which he could relish with greater confidence. Today, the designers and fabricators of equipment look to the sanitarian as the final judge of the acceptability of their products rather than just the engineer or the operator of the equipment.

The ice cream industry is progressive. It does not want cheap equipment, it wants good equipment. It is ever alert to take advantage of good sound engineering that makes its job easier, cleaner, and more mechanical, if the net result is to simplify the manufacture of its products and reduce the human factor which contributes to its shortcomings.

We have heard discussed from time to time the matter of "self-policing" in industry. Regulations, standards, and codes have been drawn up by industry sanitarians for various dairy trade organizations, whose members felt that by working in their own behalf in eliminating conditions which were found objectionable by both themselves and official, regulatory agencies, it would eventually obviate the necessity of official agencies to do more than make periodic cross-section or spot inspections to verify the effectiveness of this "self-policing." The ice cream industry in New York City recently undertook such a program with its retailers. In cooperation with the local Health Department, which could and would provide the teeth in the program, the several hundred field men in the form of sales, service, and merchandizing personnel embarked on an educational campaign. Where the reaction to this effort was hopelessly negative, the industry had several alternatives. First, to stop service, which would be honored by all competitors, until conditions were found satisfactory. Secondly, to request the local health agency to verify the findings and act in its usual manner with such cases. The results of this program should be very interesting and I hope that at a future date a report will be made as to its effectiveness from a regulatory agency point of view.

Needless to say the techniques of daily cleaning of ice cream equipment are the primary concern of the ice cream sanitarian. Chemical companies specializing in the dairy cleaner field must be complimented for the excellence of their research in producing compounds and evolving procedures which, when followed, do a magnificent job. Also the Experiment Stations should be given a lot of credit for their aggressiveness in attacking problems which are of immediate concern. This statement is prompted by the fine work of Dr. Hucker at the New York State Experimental Station in developing the non-ionic quaternary and wetting agent cleaner which holds great possibilities in that it should take much of the drudgery out of cleaning.

These few remarks merely scratch the surface of the very interesting field in which the sanitary technologist functions. It is a very happy commentary that good production practise and good sanitary practise go hand-in-hand and that without one you cannot hope to have the other.

Wisconsin Dairy Manufacturers' Conference

The University of Wisconsin Centennial Year Dairy Manufacturers' Conference sponsored by the Department of Dairy Industry will be held on Tuesday and Wednesday, March 22 and 23.

The program will include the following subjects:

Fat Free Vitamin Fortified Milk
Cream Cheese for Retail Distribution
Tank Truck Hauling of Milk from Farm to Plant
Milk Powders Tailor Made for Market
Molds—What They Do—What You Should Do
Bovine Brucellosis to Date
Milk Proteins—What Can Be Done
A Symposium on Current Research In Dairy Industry
Dairy Bacteriology
Dairy Husbandry
Milk Fat—A Report on the Status of Oxidized Flavor
Ion Exchange—A New Tool in the Dairy Industry
Important Trends to Recognize When Marketing Wisconsin Milk
Emulsifiers—Nature, Action, Use
Fat Sampling; Fundamentals
Fat Testing; New Developments

Individuals desiring a copy of the program are requested to write to the Manufacturers' Conference Committee, Department of Dairy Industry, University of Wisconsin, Madison.

GRADING MILK WITH THE RESAZURIN TEST *

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Introduction

This talk and demonstration was given before the Oregon Dairy Manufacturers last February. It has more recently been prepared for publication now that the 9th Edition of *Standard Methods for the Examination of Dairy Products* of the American Public Health Association has been published, and the prepared sterile dry resazurin vials are available in quantity.

THE RESAZURIN TEST FOR MILK

The resazurin test is a reductase test in many ways similar to the well known methylene blue test which has been for a long time one of the official tests in *Standard Methods for the Examination of Dairy Products*. It is included in the 9th edition of Standard Methods.[6] Both tests measure, by means of a dye indicator, the reduction in milk caused by the growth of bacteria reducing cells (leucocytes) in abnormal milk or a combination of both. The methylene blue dye changes in color with reduction from blue to colorless, white in milk. The resazurin dye changes in color with reduction from blue to pink to colorless, white in milk. The blue to pink color change, which is not reversible, passes through the intermediate colors of mauve and mauve pink before full pink is reached. By matching these colors with four accepted color standards, much smaller changes in reduction in milk can be measured than in the methylene blue test. The resazurin test is thus a greater saving in time and is much more adaptable to the various grades of milk being received at the factory. Also, it calls attention to abnormal milks containing high cell counts much sooner than does the methylene blue test, as well as to slow reducing types of bacteria.

The Standard Methods [6] suggest an incubation period at 37° C. of 1 hour for factory milk, reading the color change after that period. For better grades of milk they suggest an incubation period at the same temperature, reading the color change at hourly intervals for three hours. Since the cells or leucocytes do not multiply after the milk leaves the cow, the reduction by the cells is practically completed in the first hour. Thus, low bacterial count milk, in which reduction is produced by leucocytes, will not greatly change in color on the second and third reading. A change in color of the resazurin test in the first hour to mauve pink that does not continue to pink or even white in the two subsequent readings is typical of milk with a low bacterial but a high cell count.

All bacteriological tests for milk quality have biological limitations; the major ones are given in Table 1. From this table, it is seen that all four tests have their limitations and no two measure the quality of milk in the same way. Therefore, a close correlation between any of the tests is not to be expected.[4] Objections have been raised that milk graded only fair by the resazurin test is sometimes due to a high cell count. This is abnormal milk and should not be reported as good. However, it is well to mention that the microscopic count can be used on the relatively few doubtful samples as classified by the resazurin test.[2] This count made either before or on the incubated sample containing the resazurin will easily differentiate the bacteria from the cell which are about five times as large.

When large numbers of samples of farmer's milk are to be tested for bacteriological quality, the technical limitations become very important. The major technical limitations are given in Table 2. To avoid discussing Table 2 in detail, it may be said that the simplest and cheapest test that gives results in the shortest period of time has much in its favor. The more complicated tests require greater skill by the operator and the relationship between complicated procedure and error has been amply demonstrated.[1-3] Furthermore, if all dairies examined all their patron's milk even once a month by either the plate or microscopic count, there would not be half enough trained help to do the work competently. To shorten and simplify without sacrificing accuracy, any test which is to be made frequently should be considered a part of the research work of the colleges and experiment stations.

With this thought in mind, we, at the Department of Dairy Husbandry at Washington State College, have worked with the resazurin test which has the shorter incubation time of the two reductase tests. Several of the dairies, including the Dairy Cooperative Association,[4] the Clark County Dairymen's Association, and the Whatcom County Dairymen's Association, have cooperated with us in this work and we are greatly indebted to them for their help. The last organization has made between thirty and forty thousand tests by the resazurin method and are continuing its use.

Out of this study has developed the use of prepared sterile vials containing the required quantity of resazurin dye in the dry form.[5] Thus, all the preliminary steps in the dairy laboratory of

* Presented at the Dairy Manufacturing Short Course, Oregon State College, Corvallis, February 18, 1948.

TABLE 1

BIOLOGICAL LIMITATIONS OF THE BACTERIAL TESTS FOR MILK

Plate Count	*Direct count (Microscopic)*	*Reductase tests*	
		Methylene Blue	*Resazurin*
Different temperatures of growth will give variable results.	Limited to counts above 300,000 organisms per ml.	Not all organisms have same reducing power.	Not all organisms have same reducing power.
Medium has to be exact.	Usually measures clumps not individual organisms.	With good milk, M.B. test over 8 hrs., the test becomes a question of multiplication not numbers.	Less a question of multiplying than M.B., *i.e.*, a shorter time of incubation.
Measures groups but not individual organisms.	Only the organisms which stain are counted.	Generally records a combination of numbers and growth.	Records both numbers and growth.
The colonies are not necessary organisms which grow in milk.	No measurement of rate of growth of organisms in milk. Even dead organisms may be counted.	Poor record of cell count (mastitis).	Records cell count but inclined to be mixed with bacterial content.
No measurement of rate of growth of organisms in milk.	A good record of cell count (detects mastitis milk).	.....	With triple reading cell count can often be separated from numbers and growth.
Suited to low count milk, but not as good for high count milk or mixed quality milk.			
No record of cell count.			

preparing the right concentration of the dye with sterile water at frequent intervals, and sterilizing the tubes and stoppers has been eliminated—this preparation of the vials being done at a central place using mass production equipment and technique. The test using these vials can now be made either in the factory or on the farm by just adding the sample of milk to the vial and incubating the required time, the color change being read with a standard color comparator. We expected the dry dye to be more permanent than the liquid. However, test made with an Evelyn electro colorimeter using a 540 filter have exceeded our greatest expectations for the dry dye in the vial shows no measurable change over a period of 6 months. Though we certainly would not recommend the practise, we have exposed the prepared vials to sunlight in a south window for two weeks and have not been able to measure a change by this apparatus.

TABLE 2

TECHNOLOGICAL LIMITATIONS OF THE BACTERIAL TESTS FOR MILK

		Reductase tests	
Plate Count	*Direct Count (Microscopic)*	*Methylene Blue*	*Resazurin*
Slow results. (48 to 60 hrs.)	Exacting if accurate results required.	8 hrs. for good milk. Less for poor.	3 hrs. for good milk. Less for poor.
Expensive in time and equipment.	2 hrs. for results. (Approximate)	Being simple to operate there is a better chance of uniformity in technique.	Being simple to operate there is a better chance of uniformity in technique.
Most complicated technique.	Requires a trained bacteriologist.	Just possible to operate on farm.	Liquid method just possible to operate on a farm.
Uniformity of technique not always obtained.[1]	More expensive in time than equipment.		*With prepared sterile dry vials.*
Cannot be done on the farm.	Fairly complicated technique.		Same test as above, except for technique, but simpler to operate.
	Uniformity of technique not always obtained.[3]		Greater uniformity in technique likely.
			Can be operated anywhere anytime and on any farm.
			Suited to fast receiving lines.
Most expensive test to operate per test.	About half as costly.	About half as costly as the direct count.	The cheapest test.

Recently our problem has become one of supplying larger quantities of prepared vials to the industry. Commercial organizations were approached for this service, but with increasing demands for their supplies and equipment after the war, they were not interested. On the other hand, we were practically given a quantity of most suitable war surplus equipment which with a few additions enable us to prepare 32 gross of vials at a time and when required make two runs in a day. We have this mass production equipment installed and operating and are able to supply the prepared vials at the very attractive price of $6.00 per gross with slight reduction for large orders.

We hope the use of the vials will result in saving time and cost for the dairies and will result in a more uniform test which fieldmen can demonstrate on the farm.

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Regular Corps Appointments for Sanitarian Officers

(Continued from page 18)

pay for the Director grade after 30 years' service or at the age of 64 is $4950 a year. Full medical care, including disability retirement at three-fourths base and longevity pay, as well as thirty days annual leave with pay, are provided.

An applicant for the Assistant grade must (1) be a citizen of the United States at least 21 years of age, (2) have a bachelor's degree, from a school of recognized standing, in one or more fields in the biological, chemical, or physical science which, in the opinion of the Examining Board, is related to milk and food sanitation, (3) have a Master's degree, from an approved school, in public health or in a science listed in (2) above, and (4) have had at least seven years of educational (exclusive of high school) and professional training and experience, including at least one year of experience which, in the opinion of the Examining Board, would qualify the candidate to perform the duties of an officer in the special field.

An applicant for the Senior Assistant grade must meet requirements (1), (2), and (3) stated for the Assistant grade, and in addition must have had at least ten years of educational (exclusive of high school) and professional training and experience.

Each applicant will receive (1) physical examination by a medical officer of the U. S. Public Health Service, (2) a written examination, and (3) an oral interview by a Board of Commissioned Officers.

The written examination for both grades will be in the fields of bacteriology, chemistry, physics, epidemiology, administration, and their relation to environmental sanitation in general and to milk and food control in particular.

Application forms and additional information may be obtained from the Surgeon General, U. S. Public Health Service, Washington 25, D. C.

THE QUALIFICATIONS OF A QUALITY FIELDMAN *

F. M. Birch, D.V.M.
White House Milk Co.

The purpose of this paper is to help those who are fieldmen to analyze themselves and take steps for improvement which all of us need; to assist those who hire fieldmen to have a guide; and to help those who work with fieldmen to be able to criticize them so they in turn may be helped. The problem in preparing a talk of this kind is the inability to thumb-nail sketch the typical fieldman—too many characteristics of a good fieldman appear to contradict each other. I propose to list for you a few general and special characteristics the good fieldman should have.

Under the heading of general characteristics would come the term aggressiveness. By aggressiveness, I mean vigorously active and willing to make ideas known, if necessary using a demonstration technique. A timid man finds himself at a disadvantage because his failure in taking and accepting the issue puts the former in the embarrassing position of not knowing what to say. Even worse than this, nothing can be accomplished.

Secondly, the good fieldman should be critical. The word critical is overused and misinterpreted. By its use I mean it not in the sense of being blunt or tough, but only in the sense of hewing to an accepted standard of excellence. The fieldman should have a mind's eye picture of good farm conditions as they affect milk quality and in his discussions with farmers keep this picture before him at all times. The standards of excellence may not be reached but if we do not have a standard to go by, we shall not approach excellence.

Thirdly, the fieldman can afford to be humble. By humble, I do not mean timid, fearful or meek; rather is meant with respect and regard for the farmers' feelings. As an uninvited guest on another man's property, we can afford to approach him with a friendly, respectful attitude. It is to our benefit as fieldmen to do this, because the producer will be more inclined to follow through our suggestions.

The fieldman must be able to explain, describe, demonstrate, talk, and teach. Here is the crux of the whole matter. Insofar as we train ourselves to teach—to put across good ideas so they are understood, to impart knowledge and skill—the more effective we become at this, the more effective will become our fieldwork. Our failure in this ability is reflected by lowering of farm standards and a producer resistence, both of which are not overcome easily.

The English statesman Disraeli once observed that God gave man two ears and one mouth. The fieldmen should learn to listen. The failure to listen is most common among new fieldmen who feel they must do all the talking all the time; and among fieldmen who lack the regard for other people's feelings. By cultivating this ability to listen, we accomplish two things—we hold the interest of the producer with whom we are working and we learn from him knowledge that we may carry to the next producer.

The good fieldman practises the art of self-examination. He considers what has gone before and tries to analyze mistakes so that he may prevent them. One must use care in this or he will get to the point of extreme self condemnation which is of no value to anyone.

We can all develop tactfulness—the realization and appreciation of what is fair, right, and correct. A show or flair of temper is never tactful. Constant use of the negative—don't do this and don't do that—is not tactful. I submit that even when we tell a producer that we can no longer use his milk because of its poor quality, we can do it in a tactful way, maintaining an even, fair attitude even in the face of any unpleasantness the producer may care to hurl at us.

Finally, the fieldman is responsible and has a sense of duty. The nature of his duties make it easy for him to appear to work and yet fail in the actual accomplishments. Men usually fail here because they are a round peg in a square hole, and the quicker they realize it, the better off they are—they should get out of the fieldwork.

The special training a quality fieldman should have are the subjects of Milk Bacteriology and Chemistry. These subjects are the working tools of fieldwork. Armed with this knowledge, the fieldman can better teach and explain the necessities of cooling milk and using clean equipment. The more knowledge of these subjects a man can have, acquired either through formal schooling or practical experience or both, the better off he will be. We fieldmen are not embarrassed on farms by what we know—we are embarrassed by what we do not know. By this, I do not mean we should use the technical terms in pointing out to the producer his failure to meet a quality standard. We should use terms with which he is familiar. This is not talking down to the producer. It is simple courtesy. The average producer has more knowledge of soils, crops, and machinery than I will ever have and he does me the same courtesy of describing these things in terms I can understand.

Furthermore, the fieldman should have at his command all the technical training and experience he can get in the knowledge of farm practises. It is a big help to have a farm background, to be able to milk, and to be willing to call on farms at milking time so that producers may be shown by actual demonstration. We have all made the mistake and we are still making it in judging the milk producer too much by what he has and not by what he does. Lowering of milk quality is more often the result of what the producer does than it is in his equipment. As we gain knowledge of general farm conditions, we are better able to figure what the producer is doing that causes his milk to fail to meet the proper standards.

In conclusion, the fieldman should strive constantly to develop these characteristics. None of us have them to perfection; all of us have them to a degree. By the constant striving to develop, the fieldman finds himself in the enviable position of rendering a needed service, of gaining the respect of the people in his community, of finishing at least some of the things he sets out to do, and the maintenance of his self respect by these accomplishments.

* Presented at the Fourth Annual Meeting of the Wisconsin Milk Sanitarians Association, Madison, September 7, 1948.

NEW BOOKS AND OTHER PUBLICATIONS.

Food Plant Sanitation, By M. E. Parker. Published by McGraw-Hill Book Co., New York. 1948. ix + 447 pages. Illustrated. Price $6.00.

Out of the fulness of his experience, the author has assembled a clear, comprehensive picture of the reasons for, the underlying principles of, and the effective procedures for applying a balanced, effective, and practical sanitation program to food handling operations. He has avoided frills of all kinds and kept down to practical matters. The presentation of the subject is from the standpoint of the industrial food sanitarian, giving of course official procedures, methods, standards and interpretations. The chapter headings follow:

1. Role of Sanitary Practice in Quality Control
2. Sanitary Aspects of Buildings and Equipment
3. Sanitary Aspects of Water Supply
4. Wastes Disposal and Utilization
5. Establishment and Development of Sanitary Practices
6. Employee Training in Sanitary Practices
7. Maintaining Sanitary Practices
8. Salient Legal Aspects of Pest Control
9. Safe and Effective Insect Control
10. Safe and Effective Rodent Control
11. Fungicides, Germicides, and Sanitizers
12. Effective Detergency
13. Effective Cleaning Practice and Operations
14. Sanitary Packaging Practice
15. Sanitary Aspects of Packaging Materials

Then follows an Appendix containing excerpts from

Federal Food, Drug, and Cosmetic Act
The Insecticide Act of 1910
Notice to Butter Industry
Notice to Producers and Shippers of Corn Meal
To Manufacturers of Tomato Products
Status of Foods Containing DDT

The illustrations are numerous although some seem to be used only for "dressing up" the text. The reviewer is unable to see consistency in proper name references in the index. Whitmire's name does not appear on page 175 as the index indicates; and no entry is made for a name whose work is discussed in several pages whereas other entries are made for casual contributions. Although every page was read in whole or in part, only one typographical error was noted. This is a good book, useful to the food sanitarian by its assemblage, with many references, of a breadth of practical information in food sanitation.

Dairy Information, by H. B. Cronshaw. Published by Dairy Industries, Ltd., 24 Bride Lane, Fleet Street, London, E.C. 4, 1947. viii + 1467 pages. 70/s.

This book is a veritable mine of information about all technical aspects of the milk and closely related industries. Its emphasis is that of a handbook, but its form is that of a treatise, full of references to the dependable literature. British and American practice receives most emphasis, although the author draws on that of other countries too. The chapter headings indicate the scope:

The Dairy Industry, 11 pp., international production
Milk Production, 94 pp., especially dairy husbandry
Milk Quality, 144 pp., composition, bacteriology, safety, "pasteurizability", flavor, and food value
Cleaning and Sterilizing, 115 pp., cleansing, water supply, and waste disposal
Processed Milks, 292 pp., pasteurized, sterilized, homogenized, soft curd, irradiated, frozen, fermented and flavored
Manufactured Products, 114 pp., condensed, evaporated, powdered, whey, lactose, lactic acid, casein
Cream, 65 pp., raw, pasteurized, sterilized, plastic, frozen, salted, clotted, sour, synthetic
Ice Cream, 125 pp., standardization of mixes, ingredients, processing, quality
Reference sheets to dairy section, 190 pp., machinery and equipment to ice cream section, 30 pp.
Advertisement section, 100 pp., miscellaneous commercial
Index, 22 pp.

An immense amount of statistical, technical and industrial information is compacted in easily accessible and usable form.

Food Regulation and Compliance, by Arthur D. Herrick, Vol. II. Published by Revere Publishing Co., New York 4, N. Y., 1947. Pages 649–1288. $10.00.

This book is the second volume of a treatise that deals completely, clearly, and instructively with the legal aspects of food handling from the standpoint of the current Federal Food, Drugs, and Cosmetic Act. The subject is developed under the following chapter headings:

Adulteration in Food Products
Harmful Substances in Foods
Contaminated Foods
Insanitary Premises and Processing
Deleterious Containers
Economic Adulteration
Adulteration in Confectionery
Administrative Regulations
Imports and Exports
Emergency Permit Control
Coal-Tar Colors
Inspections and Sampling
Enforcement Means and Methods
Offenses and Violations
Criminal Prosecution
Seizure Proceedings
Injunctive Proceedings
Appendix (including Acts and general regulations for enforcement)

The textual discussions of the above are illustrated with many cases, supported by references to the legal and technical literature.

Volume I was reviewed in this Journal, *8*, 177 (1945).

The Freezing Preservation of Foods. Donald K. Tressler and Clifford F. Evers. The Avi Publishing Company, Inc., New York. 2nd Ed. Revised and Enlarged. 1947. 932 pp.

The 25 chapters of this handbook cover thoroughly the technology and science of frozen foods. Chapters of particular interest to public health workers deal with nutritive values, microbiology, changes occurring in preparation, freezing, storage and thawing and the importance of quality control and standards. Full directions for the preparation, freezing and handling of fruits, fruit juices, poultry, meat, dairy products, fish and shellfish are included. The importance of the frozen food locker industry is shown by the increase in number of plants in the United States to about 8,000 in 1946. The subjects of freezing equipment, principles of refrigeration, and packaging are adequately covered. The book is up to date. The numerous literature references at the end of each chapter make the book particularly useful for the student who desires source material or greater coverage on a particular subject. The 209 illustrations aid materially in clarifying the text and in making the book easy to read.

CARL R. FELLERS

JOURNAL of MILK and FOOD TECHNOLOGY

(including MILK AND FOOD SANITATION)

Official Publication of the

International Association of Milk and Food Sanitarians

(Association Organized 1911)

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ASSOCIATION NEWS

Chicago Dairy Technology Society

At the December meeting, new officers for 1949 were elected as listed above. The speaker for the evening was Dr. Helen Oldham, Assistant Professor of Home Economics at the University of Chicago. Her subject was "Dietary Needs for Special Age Groups". She stated that whereas we do not know the whole truth, we do have enough information to make recommendations. Aging decreased caloric intake as those over 40 consume 300 to 500 less calories. Degenerative diseases become more prevalent as age increases. High protein and calcium intake is not harmful and the need for them is as great or exceeds that of young adults. With age, there is a decided need for increased calcium. N. F. dry milk is an excellent source of protein and calcium, and it should be more readily available. A low fat A and D vitamin fortified milk offered a good source of these protein and calcium. A noteworthy job of furnishing these needs economically to older people was done by New York State when the aged people were served iced milk. It not only furnished the needed protein and calcium but got away from the corn starch puddings and added variety to their menu.

H. P. SMITH
Recording Secretary

Kansas Association of Milk Sanitarians

The Kansas Association of Milk Sanitarians held its annual meeting at Manhattan, Kansas, on November 17th and 18th. A new constitution was adopted and the membership voted to affiliate with the International Association. The new officers are listed above.

HOWARD M. WEINDEL
Secretary-Treasurer

New Type Milk Heater Designed in Bureau of Dairy Industry

A new-type milk heater which is capable of heating fresh milk to above-boiling temperatures and producing changes that can be used to advantage in many dairy manufacturing processes has been developed by the Bureau of Dairy Industry, the U. S. Department of Agriculture has announced.

F. P. Hanrahan, dairy engineer who designed and patented the heater, said it can be used to treat milk or other liquids, such as fruit juices, where a continuous flow through the apparatus is desired. The heater is suitable for sterilizing, pasteurizing, forewarming, and preheating under pressure for the purpose of spray drying, he added.

In its present form, the heater can be used as a pasteurizer for small market milk plants or cheese factories where milk is pasteurized by heating to 160–162° F. for about 15 seconds. The inventor said, however, that the heater is a pilot-plant model and would need to be further developed for use in plants where a capacity of more than 2,000 to 3,000 pounds of milk per hour is desired.

Another use for the heater would be in institutional research on dairy products where milk is to be heated to as high as 300 degrees, and capacity is of secondary importance.

In general, the heater resembles a small box which houses a longitudinal stainless-steel tube containing a 12-inch removable helical screw through which the fluid to be treated flows continuously. The developed length of this helical passage is 12 feet. Heat is applied through the walls of the housing and also through the screw. The passage contains 136 square inches of heating surface, with a capacity of 6.59 cubic inches (108 c.c.). When milk is pumped through the heater at the rate of 1,000 pounds per hour, it goes through the helical heating passage in 0.87 second with a flow velocity of 13.7 feet per second. The capacity varies with the temperature to which the milk is heated, and the heater has withstood laboratory tests using up to 500 pounds of hydraulic pressure per square inch.

The heater was first exhibited publicly at the Dairy Industries Exposition at Atlantic City, N. J., October 25–30.

The heater is registered under a public service patent, available to anyone interested. More detailed information on the performance of the heater, or working drawings showing its construction, can be obtained on request to the Bureau of Dairy Industry, U.S.D.A., Washington 25, D. C.

New Process for Making Cheddar Cheese

The manufacture of Cheddar cheese by the process developed by U. S. Department of Agriculture dairy specialists starts with the pasteurization of the milk. A starter, containing an active mixture of *Streptococcus lactis* and other desirable bacteria, is added to the pasteurized milk, after which the milk is held for exactly 1 hour at 88 degrees Fahrenheit. Then rennet is added to "set," or curdle, the milk. The milk is held, without stirring, for 30 minutes at the same temperature to allow it to coagulate. The curd is then cut into small cubes and stirred gently for 15 minutes, according to the time schedule. During the next 30 minutes, the cut curd is heated slowly, with gentle stirring, to raise the temperature from 88 to 100 degrees. The curd is held at 100 degrees for 1 hour, with continuous stirring, or stirring every 15 minutes. At the end of the hour, the free whey is allowed to drain off and the curd is packed down in the bottom of the vat to a depth of 7 or 8 inches. When it has matted sufficiently to be turned without breaking, it is cut into slabs 5 to 6 inches wide, which are turned and reversed regularly every 10 to 15 minutes for 2 hours.

Two hours and 15 minutes after the whey first begins to drain, the curd is milled by running it through a curd mill which cuts it into small pieces; 15 minutes later the curd is salted. When the salt has dissolved completely —after about 30 minutes—the curd is placed in cloth-lined hoops and pressed for not less than 25 minutes. Then the cheeses are dressed and put under pressure again, remaining there for 24 hours.

The cheeses are removed from the press and kept in the drying room at a temperature of from 50 to 60 degrees Fahrenheit for several days. Then they are dipped in paraffin heated to 220 degrees and placed in the curing room, where the temperature may be as high as 60 degrees and the relative humidity 70 to 75 percent. Curing usually takes at least 3 months at 60 degrees, or 6 months or longer at 50 degrees.

(1) Determination of temperature of fresh milk as it flows from the forewarmer to the float tank. From the pasteurizer the milk flows to the cheese vat. (2) Addition of starter while stirring the pasteurized milk. (3) Stirring the milk while the rennet is being added. (4) Cutting the curd into small cubes. (5) Stirring the curd as it is heated. (6) Turning the slabs of curd. (7) Milling the curd. (8) Salting the curd, thoroughly mixing in the salt with a cheese fork. (9) Placing the salted curd into hoops. (10) Pressing the cheese-filled hoops. (11) Sampling the cheese as it is removed from the press.

Industrial Notes

Wyandotte Dairy Sanitation Program

Recently Wyandotte Chemicals Corporation initiated a nationwide sanitation program for dairy farmers. This new program is designed to cover every phase and detail of dairy farm sanitation. Wyandotte built this campaign around four of their products, G L X, a general equipment and household cleaner, Neosuds, a product for the "flush" method of cleaning, SR-10, remover of film and milkstone, and Steri-Chlor a general germicide and deodorizer. These products are now available to the dairy farmer in conveniently sized packages.

Accompanying their package products, Wyandotte has prepared two pieces of instructive literature, a circular *Profits Come Home,* covering the various uses and applications of the four products on the dairy farm and a 15" x 13" milkhouse card, *Correct Milking and Sanitation Method.*

New Steam Gun

Oakite Products, Inc., New York, have announced the addition to the company's line of steam-cleaning equipment of the Oakite Solution-Lifting Steam Gun, Model 481, designed to facilitate volume cleaning operations in industrial plants.

Solution-Lifting Steam Gun, Model 491

Two spade-type, insulated handles are provided on the gun, and are so situated that each of the operator's hands support the same weight during a high pressure steam-cleaning operation. The forward handle of the gun remains stationary in the operator's grasp as the gun is rotated, while the rear handle is easily turned to rotate the gun when cleaning "underneath" and hard-to-reach surfaces.

The gun develops sufficient vacuum to discharge cleaning solutions to a height of over 12 feet to permit rapid, thorough cleaning of large-equipment surfaces.

New Cedar Rapids Factory of the Cherry-Burrell Corporation

PROGRAM FOR ANNUAL DAIRY PLANT FIELDMEN'S CONFERENCE TO BE HELD FEBRUARY 2 AND FEBRUARY 3, 1949, AT T-16 BUILDING, UNIVERSITY OF WISCONSIN

(Everyone interested is invited to attend)

February 2.

1:30 P.M. Welcome
R. K. Froker, Dean of the Wisconsin College of Agriculture

1:40 The Dairy Outlook for 1949
Karl Shoemaker, Department of Agricultural Economics, University of Wisconsin

2:10 The Dairy Quality Situation as the Food and Drug Administration Finds It
Malcolm R. Stephens, Chief of Chicago Office of The Food and Drug Administration

3:00 Fieldwork Moves Ahead in Northeastern Wisconsin
J. T. Wetak, Supervising Dairy Inspector, Wisconsin State Department of Agriculture

3:20 Reciprocal Sanitary Milk Control
K. G. Weckel, Department of Dairy Industry, University of Wisconsin

3:50 Why a Program of Farm Inspection?
E. H. Parfitt, Evaporated Milk Association

4:30 Questions and Discussion

Evening Program

General Theme—"Patron Meeting Programs"

7:30 What Can We Accomplish by Patron Meetings?
Elmer C. Kleffen, Luick Dairy Company

7:45 Conducting Hauler Meetings
M. P. Welsh, Pet Milk Company

8:00 The Agricultural Extension System: Personnel and Other Aids Available to the Dairy Industry
Evert Wallenfeldt, Department of Dairy Industry, University of Wisconsin

8:20 Specific Visual Aids for Quality Improvement Meetings
Fred Steckelberg, Department of Dairy Industry, University of Wisconsin

8:40 Questions and Discussion

9:15 Adjournment

February 3

9:00 A.M. Changes in Standard Methods Procedures
Harold E. Calbert, Department of Dairy Industry, University of Wisconsin

9:30 The Milk Cooling Problem
L. H. Hodges, Department of Agricultural Engineering, University of Wisconsin

10:00 Recent Progress in Mastitis Control
G. R. Spencer, Department of Veterinary Science, University of Wisconsin

10:30 Insect Control Brought Up to Date
E. H. Fisher, Department of Economic Entomology, University of Wisconsin

11:00 The Pen Type Barn and Milking System Brought Up to Date
Stanley Witzel and John Wilkins, Department of Agricultural Engineering, University of Wisconsin

11:30 The Why and How of Cow Clipping
N. N. Allen, Department of Dairy Husbandry, University of Wisconsin

1:30 P.M. Cow Clipping Demonstration
(Arranged by N. N. Allen)

Tour of Experimental Pen Type Barns
John Wilkins and Stanley Witzel

NEW MEMBERS

ACTIVE

Billings, C. F., Food & Drug Insp., Oklahoma State, Ada, Okla.
Comer, Walter R., Sr., 314 E. Third St., Frederick, Md.
Dashiell, Walter N., U. S. Public Health Service, Dist. 4, 1539 Jackson Ave., New Orleans, La.
Hannack, Robert, Wisconsin Coop. Dairies, Inc., Elmwood, Wisc.
Hayes, William F., M.D., Oklahoma State Dept. of Health, 3400 N. Eastern, Oklahoma City, Okla.
Helvig, Raymond J., Dr., San. Engineering Div., U. S. Public Health Service, Federal Security Bldg., So. Washington 25, D. C.
Jackson, Calvin, Hughes County Health Dept., Holdenville, Okla.
Kirschenbaum, Donald M., 67 Wilson St., Brooklyn 11, N. Y.
Legrid, Lester I., State Dept. of Agriculture, R-320 N. State Capitol, Madison 2, Wisc.
Lobb, John E., 710 Oak St., Fargo, N. Dak.
Lueck, Bernard, Downing, Wisc.
Reeves, Eugene, 510 Interstate Bldg., U. S. Public Health Service, Kansas City, Mo.
Rickhard, Guy, Schoharie Dept. of Health, Schoharie, N. Y.
Schauf, Bernard, 490 Randolph St., Burlington, Wisc.
Solberg, Paul, 2716 E. Front St., Ashland, Wisc.
Steele, Harry A., Wis. State Dept. of Agriculture, 411 Dixon St., Stevens Point, Wisc.
Wiemann, John Orlen, R.F.D. 3, Eau Claire, Wisc.
Wiesner, M. W., Mgr. Western Condensing Co., Ripon, Wisc.
Wellens, Christian A., 1126 S. Jackson St., Green Bay, Wisc.

CHANGES OF ADDRESS

Bartlett, Carl J., City Laboratory, Ottumwa, Ia. to Carl *V.* Bartlett.
Booth, Edward, Town Hall, Hobart, Tasmania, to 420 Stikilda Road, Melbourne, S. C. 2, Vic., Australia
Collis, Harold W., Dayton's Bluff Sta.—Route A, St. Paul, Minn., to 2270 Western Ave., N., St. Paul 6, Minn.
Ganthe, Edmund C., San. Eng. Div., U. S. Public Health Service, Chicago, Ill., to Washington 25, D. C.
Hanson, F. E., Soil Conservation Commission, Webster, S. Dak., to Alcester, S. Dak.
Krog, Mr. A. J., Patterson, N. J., to Lily Tulip Cup Corp., 112 East 42nd St., New York 17, N. Y.
Lindeman, Milton E., Fairmont Canning Co., 230 S. Park St., Fairmont, Minn., to 1275 Beech St., St. Paul 6, Minn.
Needham, Ellsworth, 2237 N. W. 22nd St., Oklahoma City 7, Okla., to Milk Sanitarian, City of Oklahoma City, Oklahoma City, Okla.
Poole, E. L., 748 Wisconsin Ave., Beloit, Wisc., to 1230 Central Ave., Beloit, Wisc.
Priem, Wm. H., 417 E. Pine St., River Falls, Wisc., to 408 Goode Ave., Menomonee Falls, Wisc.
Pressler, Donald J., Dr., 2 Circle Lane, Stonehenge, Albany, N. Y., to Cambridge, N. Y.
Slingerland, Robert, R.D. Dundee, N. Y., to 207 E. Elm St., Penn Yan, N. Y.
Smith, Harold W., Andover, Mass., or Methven, Mass., to Essex County Agri. School, Danvers, Mass.
Taylor, John J., Osseo, Route 4, Wisc., to Pigeon Falls, Wisc.
Ten Eyck, Richard N., 1090 Culver Rd., Rochester, N. Y., to United Dairy Mach. Corp., 160 Deerfield Dr., Rochester 9, N. Y.
Valleskey, Norbert W., Fischl Ice Cream & Dairy Co., Manitowoc, Wisc., to 1419-1423 Marshall St., Manitowoc, Wisc.
Weaver, Irwin A., 524 Lakewood Ave., Youngstown 2, Ohio to Box 121, Cochranton, Pa.
Weishaar, Earl E., Box 112, Clintonville, Wisc. to Box 206, River Falls, Wisc.
White, H. G., 324 E. Bestrop St., Bellefonte, Penn. Also, R.D. No. 1, Spring Milk, Pa. to Troy, Pa.