FIFTH ANNUAL REPORT

OF THE

International Association of Dairy and Milk Inspectors

INCLUDING PAPERS READ AT THE ANNUAL CONVENTION
IN SPRINGFIELD, MASSACHUSETTS
OCTOBER 17-18-19, 1916

COMPILED BY
IVAN C. WELD, Secretary-Treasurer
1120 CONNECTICUT AVENUE
WASHINGTON, D. C.

Not a Substitute for Cleanliness but an Additional Safeguard

DE LAVAL

Centrifugal Clarification

Clean barns and clean cows do not necessarily mean clean milk.

The milk of practically every cow is at times, and of many cows is always, contaminated by the shedding of waste tissue from the inside of the udder. This waste tissue often includes the discharge of obscure udder inflammation, blood and pus cells, all heavily burdened with dangerously infectious bacteria, which are thus inherent in the milk, and which no amount of filtering and straining can remove and which no amount of inspection can keep out.

In a test of the De Laval Milk Clarifier by the health authorities of a large Pennsylvania city it was found that the Clarifier would remove from even "certified" milk produced under ultra-sanitary conditions an enormous number of pus cells and numerous chains of streptococci.

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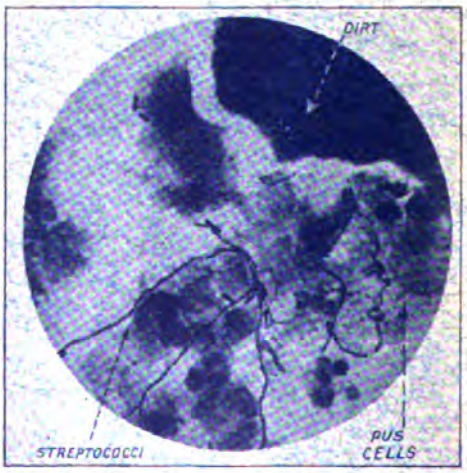
The De Laval Centrifugal Milk Clarifiers are made in various sizes and styles, with capacities ranging from 100 pounds to 12,000 pounds of milk per hour, depending on size, and they may be operated by belt power, steam turbine, electric motor or hand. Ask for complete information.



Microscopic view of sediment removed from certified milk by the De Laval Clarifier. Note the long chains of streptococci.

THE DE LAVAL SEPARATOR COMPANY

165 Broadway
NEW YORK, N. Y.

29 E. Madison St.
CHICAGO, ILL.

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Price One Dollar

W. F. ROBERTS CO. WASHINGTON D. C.

International Association of Dairy and Milk Inspectors

CONSTITUTION AND BY-LAWS

CONSTITUTION

ADOPTED OCTOBER 16, 1911

NAME

This Association shall be known as the International Association of Dairy and Milk Inspectors.

OBJECT

The object of this Association shall be to develop uniform and efficient inspection of dairy farms, milk establishments, milk and milk products, and to place the inspection of the same in the hands of men who have a thorough knowledge of dairy work.

MEMBERSHIP

The membership of this Association shall be composed of men who now are or who have been actively engaged in dairy or milk inspection. Any person who now is or who has been so engaged may make application to the Secretary-Treasurer, and if application is accepted by the

Membership Committee, said applicant may become a member of the Association upon payment of the annual dues of five dollars ($5.00).

OFFICERS

The officers of this Association shall be a President, three Vice-Presidents, a Secretary-Treasurer, and two Auditors, who shall be elected by a majority ballot at the Annual Meeting of the Association, and shall hold office for one year or until their successors are elected. An Executive Board, who shall direct the affairs of the Association when not in Annual Session, shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

AMENDMENTS

This Constitution may be amended at any Annual Meeting by a two-thirds vote of the entire membership of the Association. Any member proposing amendments must submit the same in writing to the Secretary-Treasurer at least sixty days before the date of the Annual Meeting, and the Secretary-Treasurer shall at once notify all members of such proposed amendments. All members voting on such proposed amendments shall register their vote with the Secretary-Treasurer on blanks provided by the Association before the date of the Annual Meeting.

BY-LAWS

ADOPTED OCTOBER 25, 1913

ORGANIZATION

The Constitution shall be the basis of government of this Association.

ARTICLE 1

MEMBERSHIP

SECTION 1. Any person eligible for membership under the Constitution who shall file an official application, accompanied by the first annual membership dues of five dollars, and whose application for membership shall have the approval of the Membership Committee, may become a member of the Association for one year.

SECTION 2. Any person having once become a member may continue membership in the Association so long as the annual membership dues are paid. Any member who shall fail to pay annual dues within thirty days after having been notified by the Secretary that said dues are due and payable, shall be dropped from membership. Any member so dropped may, within ninety days, be reinstated by the Membership Committee, upon application filed in due form and accompanied by the annual membership dues for that year.

SECTION 3. A member of the Association may be expelled for due cause upon recommendation of the Membership Committee and a majority vote of the members at

any annual meeting. Any member so expelled shall have refunded such *pro rata* part of his membership dues as may not be covered by his term of membership.

HONORARY MEMBERS*

SECTION 4. Members of the Association may elect as honorary members, at any stated meeting, on the recommendation of the Membership Committee, those whose labors have substantially added to the scientific knowledge of milk supply betterment, or those who have been of pronounced practical influence in the improvement of the milk industry. From such members no dues shall be required. They shall have the privilege of attending the meetings of the Association, but they shall not be entitled to vote.

ARTICLE 2

OFFICERS

SECTION 1. The officers of this Association shall be a President, a First, Second and Third Vice-President, a Secretary-Treasurer, and two Auditors, who shall be chosen by ballot at the annual meeting of the Association, and shall hold office for one year, or until their successors are duly elected.

SECTION 2. The Executive Board shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

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*Adopted October 29, 1915.

SECTION 3. The Membership Committee shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

ARTICLE 3

DUTIES OF OFFICERS

SECTION 1. It shall be the duty of the President to preside at all meetings of the Association. He shall examine and approve all bills previous to their payment, appoint all committees unless otherwise directed by vote of the Association, and perform such other duties as usually devolve upon a presiding officer, or are required of him by the Association.

SECTION 2. The Vice-Presidents, in the order of their selection, shall perform the duties of the President in his absence.

SECTION 3. The Secretary-Treasurer shall record the proceedings of the Association. He shall keep a list of members, and collect all moneys due the Association, giving his receipt therefor. He shall record the amount of each payment, with the name and address of the person so paying. He shall faithfully care for all moneys entrusted to his keeping, paying out the same only with the approval of the President, and taking a receipt therefor. He shall, immediately after his election to office, file with the President of the Association a bond in the sum of five hundred dollars, the expense of which shall be borne by the Association. He shall, at the annual meeting, make a detailed statement of the financial condition of the Association.

It shall also be the duty of the Secretary-Treasurer to assist in making arrangements and preparing a program for the annual meeting, and to compile and prepare for

publication all papers, addresses, discussions and other matter worthy of publication, as soon as possible after the annual meeting.

SECTION 4. The full management of the affairs of the Association when the Association is not in session shall be in the hands of the Executive Board, as provided in the Constitution.

SECTION 5. It shall be the duty of the Auditors to examine and audit the accounts of the Secretary-Treasurer, and all other financial accounts of the Association, and to make a full report of the condition of the same at the annual meeting.

ARTICLE 4

MEETINGS

SECTION 1. The annual meeting of the Association shall be held at such time and place during the month of October of each year or at such other time as shall be designated by the Executive Board.

SECTION 2. Special meetings of the Association may be called by the Executive Board, of which due notice shall be given to the members by the Secretary.

SECTION 3. Quorum.—Twenty-five per cent of the membership shall constitute a quorum for transaction of business at any annual meeting. Voting by proxy shall not be permitted.

ARTICLE 5

These By-Laws may be altered or amended at any annual meeting of the Association. Any member proposing amendments must seasonably submit the same in writing to the Secretary-Treasurer, who shall then give notice of the proposed amendments by mail to each member of the Association at least thirty days previous to the date of the annual meeting.

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INDEX TO ADVERTISERS

Those who advertise with us are clearly in sympathy with the work of our Association.

We are materially benefited by their patronage, and therefore our members and readers should correspond with them FIRST when in need of supplies.

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International Association of Dairy and Milk Inspectors

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Vice-President, WALLACE F. PURRINGTON.....Concord
Vice-President, DR. WM. S. GIMPER.....Harrisburg
Secretary-Treasurer, IVAN C. WELD.....Washington
Auditors—
SAMUEL G. SHARWELL.....Newark
HERBERT E. BOWMAN.....Somerville

COMMITTEES

Subjects which they will study and regarding which they will report at the next annual convention.

RULES AND REGULATIONS NECESSARY FOR SECURING A CLEAN AND SAFE MILK SUPPLY

Ernest Kelly, Dairy Division, U. S. Department of Agriculture, Washington, *Chairman.*

John B. Newman, Assistant Food and Dairy Commissioner of Illinois, Chicago.

George S. Hine, State Dairy Commissioner of Kansas, Manhattan.

DAIRY FARM INSPECTION

J. A. Gamble, Dairy Division, U. S. Department of Agriculture, Washington, *Chairman.*

E. F. Burke, Chief, Bureau of Dairy Products, Albany, N. Y.

Dr. H. A. Harding, University of Illinois, Urbana, Ill.

Prof. C. B. Lane, in charge Scientific Department, Supplee Alderney Dairy, Philadelphia, Pa.

A. W. Lombard, Dairy Bureau Agent, Boston, Mass.

CITY MILK PLANT INSPECTION

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C. H. Chilson, Chief Milk Inspector, Detroit, Mich.

Harry S. Lucas, Food Inspector, Washington, D. C.

Samuel G. Sharwell, Chief Dairy Inspector, Newark, N. J.

Fred J. Widmayer, Food and Milk Inspector, Scranton, Pa.

LEGISLATION AND LEGAL LIMITS FOR THE CONTROL OF MILK AND CREAM

J. S. Abbott, U. S. Bureau of Chemistry, Washington, *Chairman.*

Dr. James O. Jordan, Inspector of Milk, Boston, Mass.

A. W. Lombard, Dairy Bureau Agent, Boston, Mass.

Hermann C. Lythgoe, Director, Division of Food and Drugs, State Department of Health, Boston, Mass.

Wallace F. Purrington, Inspector, State Board of Health, Concord, N. H.

George B. Taylor, Dairy Division, U. S. Department of Agriculture, Washington.

DISEASES OF MAN—THEIR RELATION TO THE MILK SUPPLY AND TO THE PUBLIC HEALTH

A. F. Stevenson, Sanitary Chemist, U. S. Public Health Service, Washington, *Chairman.*

Stanton H. Barrett, City Bacteriologist, Chattanooga, Tenn.

Hoyes Lloyd, Chemist in Charge Milk Control, Department of Public Health, Toronto, Canada.

H. N. Parker, Boston, Mass.

W. H. Rothery, Milk and Meat Inspector, Auburn, N. Y.

BOVINE DISEASES—THEIR RELATION TO THE MILK SUPPLY AND TO THE PUBLIC HEALTH

Dr. Harry E. States, Veterinarian, Board of Health, Detroit, Mich., *Chairman.*

Dr. R. R. Ashworth, Food Inspector, Washington, D. C.

Dr. W. B. Billingsley, Veterinarian, State Department of Health of Maryland, Baltimore.

Dr. Thomas B. Carroll, Milk Inspector, Wilmington, N. C.

Dr. C. W. Eddy, Cleveland, Ohio.

Dr. William S. Gimper, Director of Milk Hygiene, State Live Stock Sanitary Board, Harrisburg, Pa.

Dr. A. L. Haggerty, Chief Food Inspector, Augusta, Ga.

Dr. A. H. Kerr, Milk and Dairy Inspector, Norfolk, Va.

Dr. L. F. Koonce, Milk and Meat Inspector, Raleigh, N. C.

Dr. H. B. Roshon, Milk and Meat Inspector, Reading, Pa.

Dr. R. C. Roueche, Chief, Bureau of Food and Dairy Inspection, Cleveland, Ohio.

Dr. F. P. Woolf, Chief Meat and Milk Inspector, Mobile, Ala.

CARE OF MILK IN TRANSPORTATION

Dr. James O. Jordan, Inspector of Milk, Boston, Mass., *Chairman.*

L. P. Brown, Director, Bureau of Food and Drugs, Department of Health, New York City.

C. H. Chilson, Chief Milk Inspector, Detroit, Mich.

Joseph X. Duval, Assistant Milk Inspector, Manchester, N. H.

A. N. Henderson, Chief Dairy Inspector, Seattle, Wash.

Arthur Hudson, Inspector of Milk, Newton, Mass.

Prof. C. B. Lane, Philadelphia, Pa.

Melvin F. Master, Inspector of Milk, Lowell, Mass.

Fred J. Moore, City Milk Inspector, Detroit, Mich.

Dr. R. C. Roueche, Cleveland, Ohio.

Willard E. Ward, Agent, Board of Health, for Milk and Food Inspection, Brookline, Mass.

J. W. Yates, Food and Dairy Inspector, Kansas City, Mo.

METHODS OF APPOINTMENT OF DAIRY AND MILK INSPECTORS AND THEIR COMPENSATION

L. P. Brown, Director, Bureau of Food and Drugs, Department of Health, New York City, *Chairman.*

E. Bourbeau, General Cheese Inspector, St. Hyacinthe, Quebec, Canada.

Dr. William S. Gimper, Director of Milk Hygiene, State Live Stock Sanitary Board, Harrisburg, Pa.

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Thomas Holt, Deputy Dairy and Food Commissioner of Connecticut, Hartford.

J. J. McGrath, Inspector of Milk, Salem, Mass.

M. J. Smisek, Milk and Dairy Inspector, St. Paul, Minn.

COST OF DAIRY AND MILK INSPECTION

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Gustaf L. Berg, Inspector of Milk, Worcester, Mass.

John J. Coughlin, Dairy Inspector, Elizabeth, N. J.

Thomas F. Flanigan, Food and Milk Inspector, Hartford, Conn.

E. R. Gauhn, Chief Milk Inspector, Rochester, N. Y.

F. L. Huxtable, Milk and Food Inspector, Wichita, Kan.

Frank A. Jackson, Chairman Dairy, Food and Drug Commission of Rhode Island, Providence.

Benjamin L. Purcell, State Dairy Commissioner of Virginia, Richmond.

Carl O. Seaman, Milk Inspector, Manchester, N. H.

A. G. Shaw, Milk and Dairy Inspector, Jacksonville, Fla.

Russell S. Smith, Dairy Division, U. S. Department of Agriculture, Washington.

Dr. O. P. Thompson, State Dairy Inspector of Iowa, Waterloo.

METHODS OF BACTERIAL ANALYSES OF MILK AND MILK PRODUCTS AND THE INTERPRETATION OF RESULTS

Dr. George E. Bolling, City Bacteriologist and Inspector of Milk, Brockton, Mass., *Chairman.*

Leon Banov, Assistant City Bacteriologist, Charleston, S. C.

Stanton H. Barrett, City Bacteriologist, Chattanooga, Tenn.

L. B. Cook, Dairy Division, U. S. Department of Agriculture, Washington.

COMMITTEE ON RESOLUTIONS

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Ernest Kelly, Dairy Division, U. S. Department of Agriculture, Washington.

Dr. Harry E. States, Veterinarian, Board of Health, Detroit, Mich.

Dr. O. P. Thompson, State Dairy Inspector of Iowa, Waterloo.

"If you would have things come your way, go after them."

MEMBERS

Abbot, J. S.	Chemist in Charge, State Co-Operative Food and Drug Control, Bureau of Chemistry, U. S. Dept. of Agriculture.	Washington, D. C.
Ashworth, R. R.	Food Inspector	Washington, D. C.
Banov, Leon	Asst. City Bacteriologist	Charleston, S. C.
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Billingsley, W. S.	Veterinarian, State Dept. of Health of Maryland	Baltimore, Md.
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Bowman, Herbert E.	Inspector of Milk	Somerville, Mass.
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Carroll, Thos. B.	Milk Inspector, Dept. of Health	Wilmington, N. C.
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Gimper, Wm. S.	Director of Milk Hygiene	Harrisburg, Pa.
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Hine, Geo. S.	State Dairy Commissioner	Manhattan, Kan.
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Kelly, Ernest	Market Milk Specialist, U. S. Dept. of Agriculture	Washington, D. C.
Koonce, L. F.	Milk and Meat Inspector	Raleigh, N. C.
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Master, Melvin F.	Inspector of Milk	Lowell, Mass.
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Palmer, Wm. P.	Chief Food and Dairy Inspector	Baltimore, Md.
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Rive, Henry	Dairy Instructor	Victoria, B. C.
Roshon, Harry B.	Milk and Meat Inspector	Reading, Pa.
Rothery, W. H.	Milk and Meat Inspector	Auburn, N. Y.
Roueche, R. C.	Chief, Bureau of Food and Dairy Inspection, Div. of Health	Cleveland, Ohio
Rowles, L. W.	City Milk Inspector	Topeka, Kan.
Salthe, Ole	Asst. Director of Bureau of Food and Drugs, Dept. of Health	New York, N. Y.
Seaman, Carl O.	Milk Inspector	Manchester, N. H.
Sharwell, Samuel G.	Chief Dairy and Food Inspector	Newark, N. J.
Shaw, A. G.	Milk and Dairy Inspector	Jacksonville, Fla.
Shea, F. B.	Health Officer	Nashua, N. H.
Siegmund, Harry B.	Supervising Inspector of Pasteurizing Dairies	Baltimore, Md.
Simpson C. W.	Dairy and Milk Inspector	Vancouver, B. C.
Smisek, M. I.	Milk and Dairy Inspector	St. Paul, Minn.
Smith, Russell S.	Market Milk Specialist, Dairy Div., U. S. Dept. of Agriculture	Washington, D. C.

Snellings, H. A.....	Formerly Milk Inspector.....	Norfolk, Va.
States, H. E.....	Veterinarian, Board of Health	Detroit, Mich.
Steffen, C. J.....	.....	Milwaukee, Wis.
Stevenson, Albert F..	Sanitary Chemist, U. S. Public Health Service	Washington, D. C.
Sturgis, Russell	Empire State Dairy Co.....	Brooklyn, N. Y.
Taylor, Geo B.....	Milk Specialist, Dairy Div., U. S. Dept of Agriculture..	Washington, D. C.
Thomson, James E...	Asst. Chief, Div. Milk Inspection, Dept. of Health.....	New York, N. Y.
Thompson, O. P.....	State Dairy Inspector.....	Waterloo, Iowa
Ward, Willard E.....	Agent, Board of Health, for Milk and Food Inspection..	Brookline, Mass.
Weld, Ivan C.....	Investigator for Chestnut Farms Dairy	Washington, D. C.
Widmayer, Fred J...	Food and Milk Inspector....	Scranton, Pa.
Woolf, F. P.....	Chief Meat and Milk Inspector	Mobile, Ala.
Yates, J. W.....	Food and Dairy Inspector....	Kansas City, Mo.
Young, Hulbert	Manager, Walker-Gordon Laboratory	Baltimore, Md.

HONORARY MEMBERS

Evans, Wm. A.....	Editor, Health Dept., *Chicago Tribune*	Chicago, Ill.
Woodward, Wm. C...	Health Officer, District of Columbia	Washington, D. C.

FIFTH ANNUAL CONVENTION

SPRINGFIELD, MASSACHUSETTS

TUESDAY MORNING, OCTOBER 17, 1916

The members of the International Association of Dairy and Milk Inspectors gathered for the first session of the Fifth Annual Convention in the Mahogany Room of the Springfield City Auditorium at 11 o'clock. In the absence of President Bossie, the convention was called to order by Vice-President A. W. Lombard, who continued to preside during the convention.

Acting President Lombard introduced his Honor, Mayor Frank E. Stacy, of Springfield, who, in behalf of the city, welcomed the Association. The Association was also welcomed to Massachusetts by Mr. H. E. Bowman, President of the Milk Inspectors' Association of Massachusetts. Acting President Lombard, in behalf of the Association, responded to the addresses of welcome, and briefly commented upon the work of the Association.

Prof. H. E. Van Norman, Dean of the Agricultural Department of the University of California, and President of the National Dairy Show Association, gave an address on the work of the National Dairy Show and the relation of various associations to the National Dairy Show and to the advancement of the dairy industry.

TUESDAY AFTERNOON

The afternoon session of the convention was held in the Council Chamber of the Springfield City Auditorium. Prof. C. B. Lane, Chairman of the Committee on Dairy

Farm Inspection, presented the report for the committee.

Mr. H. E. Bowman, Chairman of the Committee on City Milk Plant Inspection, presented a report.

Dr. J. S. Abbott, Chairman of the Committee on Legislation and Legal Limits for the Control of Milk and Cream, presented the report of his committee.

Through the courtesy of the Official Dairy Instructors' Association, and with their permission, a report of the committee of their association on Statistics of Milk and Cream Regulations, which had been presented at their convention on the previous day, was read by Mr. J. A. Gamble.

Dr. Lucius P. Brown, Director of the Bureau of Food and Drugs, Department of Health, New York City, discussed the matter of existing legal limits for the composition of milk.

TUESDAY EVENING

The evening session was held in the auditorium of the Springfield Y. M. C. A. Mr. Ole Salthe, Assistant Director of the Bureau of Food and Drugs, New York City Department of Health, read a paper on the grading of milk.

Prof. Fred Rasmussen, Professor of Dairy Husbandry, Pennsylvania State College, read a paper on "Some Financial Factors Involved in the Production of Market Milk," and Dr. E. C. Schroeder, Superintendent Experiment Station, B. A. I., U. S. Department of Agriculture, Washington, contributed a paper on "The Prevention and Control of Infectious Diseases Among Cattle."

WEDNESDAY MORNING, OCTOBER 18TH

As guests of the Milk Inspectors' Association of Massachusetts the entire morning was spent in an automobile

trip through the residential and business sections and the public parks of Springfield. While en route, visits were made to some of the city milk distributing plants and to the dairy farm of Mr. George Hendee. Mr. Hendee personally showed the party about his place, after which he further demonstrated his hospitality by serving luncheon for the entire party.

WEDNESDAY AFTERNOON

The afternoon session was held in the Mahogany Room of the Springfield Auditorium. Mr. Ernest Kelly, in charge Market Milk Investigations, U. S. Department of Agriculture, chairman of the committee appointed to study methods of appointment of dairy and milk inspectors and their compensation, presented the report of his committee.

Mr. Albert F. Stevenson, Sanitary Chemist, U. S. Public Health Service, Washington, D. C., presented a paper, "The United States Public Health Service and Its Interest in a Better Milk Supply."

Mr. George B. Taylor, Market Milk Specialist, U. S. Department of Agriculture, presented a paper on the sterilizing of dairy utensils on the farm. Mr. Taylor also gave a demonstration of a new steam sterilizer.

WEDNESDAY EVENING

The evening session of the convention was held in the auditorium of the Y. M. C. A. Dr. Charles E. Marshall, Microbiologist, Massachusetts Agricultural Experiment Station, Amherst, read a paper on "Some Aspects of Milk Inspection."

"The Reliability and Significance of Bacteriological Analyses of Milk" was the subject of a paper read by Dr.

H. W. Conn, Director of the Laboratory, State Board of Health, Middletown, Conn.

"The System of Recording and Tabulating the Analyses of Samples of Milk Collected by the Massachusetts State Department of Health" was the subject of a paper read by Mr. Hermann C. Lythgoe, Director, Division of Food and Drugs, Massachusetts State Department of Health.

THURSDAY MORNING, OCTOBER 19TH

As guests of the Milk Inspectors' Association of Massachusetts, members of the Association and their ladies enjoyed a trolley trip to Amherst, and paid a visit to the Department of Dairying and to the Department of Veterinary Science of the Massachusetts Agricultural College. On the return trip luncheon provided by the Milk Inspectors' Association of Massachusetts was thoroughly enjoyed.

THURSDAY AFTERNOON

The Association assembled in the Mahogany Room of the Springfield Auditorium. Dr. O. P. Thompson, State Dairy Inspector of Iowa, Waterloo, Iowa, addressed the Association and related some of his experiences and observations in the work.

Mr. W. H. Rothery, Milk and Meat Inspector, Auburn, N. Y., read a paper on a method of detecting milk-borne typhoid epidemics.

Mr. James J. Clark, Chief of Milk Division, Bureau of Food and Drugs, New York City Department of Health, read a paper on "Organization of New York City Milk Inspection Force."

The following papers were read by title:

"The Consumption of Milk in the United States," by Mr. L. B. Cook, Dairy Division, U. S. Department of

Agriculture; "Licensed to Kill," by Mr. C. W. Simpson, Dairy and Milk Inspector, Vancouver, B. C.; and "Value and Payment of Milk," by Mr. Russell S. Smith, Market Milk Specialist, U. S. Department of Agriculture, Washington, D. C.

Following the presentation of these papers the members assembled for the transaction of business. The report of the Secretary-Treasurer indicated total receipts for the year to have been $706.28; total disbursements for the year, $511.60; leaving a balance, cash on hand, $194.68. Mr. Wallace F. Purrington and Mr. John J. McGrath, who had been appointed to audit the accounts of the Secretary-Treasurer, reported that they found the same to be correct. It was then moved and voted that the report of the Secretary-Treasurer be accepted and a vote of thanks accorded him for his services during the year.

Mr. Ernest Kelly, Chairman of the Committee on Resolutions, reported for his committee, and the following resolutions were adopted:

1. WHEREAS, This Association has been most hospitably entertained during our Fifth Annual Convention in Springfield; therefore be it

Resolved, That we express our appreciation and gratitude for the favors extended by the Milk Inspectors' Association of Massachusetts, by the city of Springfield, by the National Dairy Show Association, and by the Young Men's Christian Association.

2. WHEREAS, The United States Government and the governments of various States and cities have recognized this Association by sending representatives to attend this convention; therefore be it

Resolved, That the International Association of Dairy and Milk Inspectors express its thanks to the U. S. Department of Agriculture, the U. S. Public Health Serv-

ice, and the various State and city authorities for their continued interest and active cooperation.

3. WHEREAS, This Association heartily favors the development of dairy inspection to the highest degree of efficiency; therefore be it

Resolved, That the International Association of Dairy and Milk Inspectors recommend that no dairy or milk inspector be employed by any State or city who derives any private income from the owners or employees of those dairies over which he exercises supervision.

4. WHEREAS, States and cities are apparently slow to recognize the need for well qualified and expert men for dairy and milk inspection; therefore be it

Resolved, That the International Association of Dairy and Milk Inspectors endorse the application of intelligent Civil Service regulations for the appointment of dairy and milk inspectors; and be it further

Resolved, That this Association urge that State and city departments be given authority to offer such salaries as may be necessary to secure thoroughly competent inspectors.

5. WHEREAS, The dairy cow is one of the greatest conservers of the fertility of the soil, without which there can be no permanent agriculture; and

WHEREAS, Milk is the most important of all foods, as well as among the most economical, and should be at all times available to every consumer; and

WHREAS, It is of the utmost importance to public health that milk be clean and safe; and

WHEREAS, Recent investigations have shown that the factors underlying the production of clean milk are few and simple; and

WHEREAS, Investigations have shown that the rules and regulations, laws and ordinances governing the production, care, distribution and sale of milk and milk products are

so lacking in uniformity and so complex and conflicting as to cause confusion that may seriously interfere with the development of the dairy industry and curtail the production of a sufficient supply of milk; therefore be it

Resolved, That this Association appoint a committee of three or five to draft rules and regulations based upon the minimum requirements necessary for securing for the consumers a clean and safe milk supply, and this committee be empowered to meet and confer with like committees of any other association interested in this subject, and to take action looking to the adoption of the rules and regulations recommended by them, subject to the approval of the Executive Board of this Association.

The Association then proceeded to elect officers for the ensuing year, with the following result:

President, William H. Price, Detroit.
First Vice-President, Alfred W. Lombard, Boston.
Second Vice-President, Wallace F. Purrington, Concord.
Third Vice-President, William S. Gimper, Harrisburg.
Secretary-Treasurer, Ivan C. Weld, Washington.
Auditors, Samuel G. Sharwell, Newark;
H. E. Bowman, Somerville.

The Association then, by a rising vote of thanks, expressed to Acting President Lombard its appreciation of the able and dignified manner in which he had presided during the convention.

THURSDAY EVENING, 8 O'CLOCK

The Association assembled about the banquet tables in the Rambler Rose Room at Hotel Kimball. Following a very enjoyable banquet, Acting President Lombard introduced as the special guest of honor Dr. Carl L. Alsberg, Chief of the Bureau of Chemistry, U. S. Department of Agriculture, Washington, who addressed the Association.

Remarks were also made by Mr. W. E. Barney, State Dairy and Food Commissioner of Iowa; Mr. John B. Newman, Assistant State Food and Dairy Commissioner of Illinois; Mr. J. J. Farrell, State Dairy and Food Commissioner of Minnesota; Mr. H. E. Bowman, President of the Milk Inspectors' Association of Massachusetts; and by Secretary Weld, of the International Association. Mr. Fred L. Robertson, of Springfield, favored the convention with several musical selections. Through the courtesy of the Milk Inspectors' Association of Massachusetts, Hosmer's Orchestra added much to the enjoyment of the evening. The vocal selections by Mr. Edward Hosmer were particularly pleasing, and at the close of his rendition of "The End of a Perfect Day" the convention finally adjourned.

"We need some outside force to impel us forward from time to time, and these conventions are the force that helps us along."—Van Norman.

ADDRESS OF WELCOME

HON. FRANK E. STACY, Mayor of Springfield

Mr. President and members of the International Association of Dairy and Milk Inspectors:

It is one of the pleasantest duties that a Mayor has, to say a few words of welcome to any convention. It has been one of the pleasantest duties I have had since I have been in office, and this morning it is especially gratifying to me because you gentlemen in your work have done so much, are doing so much, and can do so much for the people of the United States. We feel gratified that you are here—that you are with us, and I know I voice the sentiment of the entire citizenship of Springfield in bringing you the heartiest welcome that we can bring. I want to say to you that we are highly gratified at the results we have obtained here in the city of Springfield in the last few years in milk inspection. Of course you all know Mr. Gamble, who has advanced from our city to the nation's Capital and a national reputation. We are proud of him, and we are proud of his successors. They are doing good work, and what they have accomplished in the examinations, etc., shows Springfield is progressing, and this is one of the best moves that can be made. We are glad to welcome you gentlemen from all around the country, meeting here in one of our municipal buildings, a building that we think is truly beautiful. I would like at this time to invite you gentlemen to come over into the Mayor's quarters and the Council Chambers and see another beautiful building. If any of you have ambitions towards the Mayoralty, why, gentlemen, it will be my pleasure to resign my seat for the moment and I will let you be Mayor of Springfield.

We have other beautiful buildings; we have beautiful parks; you are in a rich and prosperous community; the city of Springfield is growing. In this city of 110,000 people we have assessed valuations of over two hundred millions, and the Mayor of the city of Springfield has the responsibility of spending each year eight million dollars. We have beautiful parks, we have beautiful schools; and, gentlemen, if you are interested, right down here on the corner is the finest fire alarm telegraph system in the United States. We have got the last one and consequently we have got the last word. Twenty fire alarms can come into that station the same second, and every one of them will be recorded. On the major portion of those circuits there could be another fire alarm sent in right over the same circuit and that would be recorded two seconds afterwards.

We want to have you take advantage of the city, gentlemen. We know you are here primarily for your convention and for the Dairy Show, and I know you are going to be busy, and I know you have a good live reception committee here in Springfield that are going to take care of your wants. I know this convention is going to be successful, and I hope you will go away with the feeling that you had a truly delightful time.

Knowing that you are going to be well entertained, I can only add, if there is any little special courtesy that I can personally show you gentlemen, as Mayor of the City of Springfield, I want to show it. When you return to your homes, I want you to be able to say, and to say truly, that you had a delightful time in the city of Springfield, that you found it a beautiful city, and that you all want to come here again.

"Feast on milk and honeycomb at will."

ADDRESS OF WELCOME

H. E. BOWMAN, *President,* Milk Inspectors' Association of Massachusetts

In behalf of the Massachusetts Milk Inspectors' Association I bid you welcome. We feel that it is indeed fitting that your Association, whose scope is international, should hold its annual convention at the time and in the same city where the largest dairy show on earth is being held. Springfield may well be proud of its many public parks, buildings and institutions of learning, both here and in the surrounding country, and I feel sure that all who take part in the automobile and trolley excursions prepared for you by the Massachusetts Milk Inspectors' Association will find it well worth their time. We inspectors of Massachusetts feel grateful to your executive committee for deciding to come to Massachusetts, as we realize that it is an exceptional opportunity to hear the various authorities who are to address this convention and also to learn more of the experimental work being carried on at the Government laboratories in Washington.

Through the interest and energy of two of our members, Mr. Stephen C. Downs, Milk Inspector of Springfield, and his assistant, Mr. Robertson, we are able to offer you an automobile trip about the city and suburbs on Wednesday morning and a trolley trip to the Massachusetts Agricultural College on Thursday morning, and I trust that you will all endeavor to take part. The larger the number the greater the success.

In closing I wish to compliment the officers of the International Association of Dairy and Milk Inspectors on your

program, which has been arranged with such painstaking care. I also want to assure you that the Massachusetts Milk Inspectors' Association has formed one large committee to welcome and to entertain the International members.

"A land of promise flowing with the milk and honey of delicious memories."

RESPONSE TO ADDRESSES OF WELCOME

A. W. LOMBARD

Each year as the harvest time draws near I look forward to the annual meeting of the International Association of Dairy and Milk Inspectors with a great deal of pleasure. My pleasure at this time is perhaps not quite as voluminous as ordinarily, for a reason which is very apparent. Our President Mr. Bossie, who was to address you and was also to have presided throughout the entire convention, was unable to come, and I most unexpectedly have been pressed into service to preside during this convention. The information came to me last night at ten o'clock, and, of course, I have not had time to prepare any response to this address of welcome; but I do want to say that after listening to His Honor, Mayor Stacy, and the very cordial way in which he welcomed us and the beautiful manner in which he set forth the advantages and beauties of this city, I must express to him in behalf of this Association our genuine appreciation and gratitude. I do not believe, however, any of us will accept his invitation to sit in the Mayor's chair and fill his position, because I don't believe any of us could do it as well as he does.

To Mr. Bowman, who has so cordially welcomed us on behalf of the Massachusetts Milk Inspectors' Association, I must also express our thanks and the appreciation which I know every member of our Association feels. Mr. Bowman is a personal friend of mine and I am very grateful and glad of this opportunity to thank him for this welcome which he has so cordially extended, and I feel sure that all the members of the International Association will avail themselves of the invitation which he

has extended to make use of the members of the Massachusetts Association to aid them and assist them in getting about the city, in seeing the Dairy Show, or in making arrangements for housing or anything else in which the Massachusetts men may be of service.

I can only say that I hope this convention will be as successful as all of the other conventions which this organization has held where I have had the privilege of attending.

"The atmosphere breathes rest and comfort, and the many chambers seem full of welcomes."

THE NATIONAL DAIRY SHOW

PROF. H. E. VAN NORMAN, *President,* National Dairy Show Association, *Vice-Director,* Agricultural Experiment Station and *Dean* of Department of Agriculture, University of California

Mr. President, and gentlemen of the Association:

One of the pleasures of my life is the relation which I have to the National Dairy Show, and one of the pleasant duties which it brings is that of saying a word to many of the associations which are affiliated with the Dairy Show.

Some ten or eleven years ago, or just about the time of the St. Louis Exposition, two or three men felt that it would be worth while to have an exposition of the Dairy Industry, and, as is so often the case, one man had no money but he had ideas; another man had money but he hadn't any time to spend in this particular enterprise. They pooled their issues, and the result was the first Dairy Show, which was largely a two-man proposition, the one doing the routine work, the other furnishing the funds and the guiding spirit; and the man who furnished that guiding spirit has dominated the organization of the Dairy Show to this day, and is the mind which, after all, steadies the ship as it progresses through the sea of troubles which a national show is bound to encounter.

The Dairy Show was established not as a money-making proposition. There have been one or two persons in the organization at various times who had ambitions to see the Show make money and declare dividends—there have been a few of the stockholders (for the Dairy Show is a stockholding corporation, in which a great many people have put in from twenty-five to a hundred dollars

and some a little more, to make possible the carrying on of this work), but those have been frowned on. They have been told that the Dairy Show is an organization to promote the industry out of which they make their living, and any money that the Dairy Show ever does make, and it has never made any yet, will be devoted to enlarging its sphere of usefulness; because, like a growing family, the needs of the Dairy Show have grown faster than the income and the resources. Each year when we think we have made a little money or taken a little step ahead, we find when we come to get ready for the next show we have so many more things to do that still there is no chance to declare a dividend, and we don't expect that there ever will be.

I wonder if you gentlemen who are engaged in inspection realize what a wonderful industry this is. I don't dare tell you how many millions or billions of dollars there are in it because I can't remember, but I am impressed with the diversity of the industry. We need to stop a moment and think of this, and it has been the ambition of the Show to try and tie these things together. You can have a meeting of milk inspectors, you can have a meeting of milk dealers, or you can have a meeting of the steel trust, or of almost any industry, and there is a tremendous closeness of interest, but when you talk about the dairy industry it is a different proposition. You men, if I understand your relation to this industry correctly, are largely concerned with seeing that some city receives a clean, wholesome milk supply; that is your chief concern. You are not worrying about the problems of ice cream manufacture; may be you are helping some ice cream man to get good milk, but the problems of the manufacture, of machinery, of distribution, of labor, even of milk supply, don't bother you very much. What do you men—especially here in Massachusetts—know of the problems of the butter maker who is taking in the milk from

the farmer? You don't know because your butter maker has been run out of business in this State by the demand for market milk. What do you know of the cheese man? What do you know of the problems of the man trying to make machinery to supply the needs of all these branches? I speak of these things merely to suggest the diversity of interest around the Dairy Show.

Then we go out into the country and find the man who keeps four or five cows; I remember the remark of the creamery man in Indiana when I said to him, "Why don't you make better butter?" Butter was scoring about 91 (you know it takes 93 to command top market price), and he was getting a cent below the market for his butter. I said, "Why don't you tell these farmers to make you better milk?" "Now," he said, "Professor, that's all right, but you know I buy this milk from the farmers and I take out four cents a pound for making butter; now," he said, "I have four thousand patrons in my three creameries, and the average number of cows per patron is four and a half cows, and," he said, "if that farmer with four cows drives up to my creamery and I say to him, 'Smith, that's awful poor milk you brought me this morning,' he says, 'Go to Hell, if you don't like my milk I'll take it home and feed it to the pigs,' and he would, and that's how I'm up against it when I try to get good milk." And, gentlemen, that has been the greatest problem that the creamery manager has been up against in many parts of the United States, the fact that the man he is buying milk from is making it a side issue and doesn't care particularly whether he does it or not, and if you don't like it he don't have to sell you the milk, he'll take it home and feed it to the pigs.

Now, then, this is a very different proposition when you get over into a real dairy section, where a man milks fifty or a hundred cows and where it is his living; where he is proud of his dairy, and where his success depends on

what you, as milk inspectors, permit him to do. It is a very different problem, and we have not only these different industries associated around the Dairy Show, but there have come into existence a lot of organizations, as well. The first meeting of the International Milk Dealers' Association was held at the Dairy Show. The American Dairy Farmers' Association was organized at the Dairy Show. There was organized here yesterday the Cow Testing Association Workers, the men who are conducting these cow testing associations in several States. We have had ever since the Show started contests in the judging of dairy products and dairy cattle; the contest this year brought three Agricultural College students from each of nineteen States, one of them as far west as South Dakota. Think what this Show means to the colleges—and it has meant a great deal to the teachers in those colleges as well. It has aroused an interest among the students, and next year some three students are going to be chosen to go out from their State college to attend this great convention.

Little did some of us realize when the first Dairy Show was held what was going to come out of it. We saw the need and we plugged away at the problem and so we are coming along now with these conventions that the Dairy Show has helped to make possible. Men combine business with pleasure, and these conventions have had a wonderful influence in unifying this dairy interest, in solidifying, in developing the spirit of toleration of the other fellow's point of view. I have seen it in the show ring when one man comes in and in judging animals is prejudiced in favor of large animals, and the next judge comes along and he wants to see an animal with a prominent eye, and the next fellow comes along and almost ignores the eye and size; he wants to see a large, fine udder. Now those men come over and stand around the ring and talk over their differences in point of view, and they all come out each with his radical notions modified a little,

and so it is in this association. Some of you have come into these association meetings with radical ideas; you are positive, you are earnest, you are striving to do something worth while, and yet after you sit here and hear the experiences and opinions of others wrestling with the same problems, you modify your views a little, even though you may not be conscious of it.

The result is each one perhaps is paying a little less attention to the unnecessary and extreme and giving a more wholesome attention to the vital things.

It is an interesting aspect of human nature that most of us don't do the best we know how without some outside influence. You know I think a good many of us are like the hoops the youngsters roll around the sidewalks; we need a swat now and then to keep us going. We have to keep hitting, and if the hits come often enough and straight enough the hoop rolls pretty fast and it rolls straight, but if the strokes lag and don't come, after a little the hoop gets wabbly and then falls over. Most of us are just about like that hoop. We need some outside force to come along and impel us forward from time to time, and these conventions are the force that helps us along. You, as inspectors, are the force that helps the producer along to do the thing he ought to do.

Have you ever stopped to think that we never had the highest grade of milk until we had the inspector come in from the outside in some form or other? Did you ever stop to realize that the railroads never put car couplers on their cars until the Interstate Commerce Commission made them do it? That we never have perfect order in a city until we have a police force? We seem to need some outside force to help us along, and this is the tremendous responsibility of the inspector—showing the other fellow how to live up to his opportunity and the duty which, if he is confronted with it, he really knows he ought to do of himself.

And yet in spite of the fact that we have inspectors and we need inspectors, yet I am convinced that most of the people are disposed to do the right thing; I believe that most inspectors are disposed to do the right thing too, in spite of the fact that many farmers don't believe it, but "times has changed," as the fellow said, and I believe that the inspection fraternity stands in a more favorable light today before the dairy industry than it ever has before, because of this growing tolerance, this growing understanding of the relation of our two duties.

Some of the evils of our inspection, if I may speak plainly, have arisen because in the early days of inspection men were appointed to the duty of inspection and given the power and authority and the club, who absolutely had no qualifications for that position. We have had men appointed as milk inspectors who didn't know the first thing about milk, who didn't know the first thing about cows, who didn't know the first thing about barns, and I sometimes think they didn't know the first thing about human nature, or they wouldn't have said and done some of the things they did. The only thing they did seem to know was that they had a good job and the job had authority, and they thought they had to show their authority. Well, the result of all this has been a changing and a modifying of the standards of the inspectors, and today the inspector goes out in the same spirit in which the Dairy Show was organized, to render a service. He uses his authority only as the last resort, as the surgeon or as the physician prescribes for his patient the cutting off of an arm or a leg to save his life, does the drastic thing; and so the milk inspector in certain cases and emergencies has to resort to the limit of his authority. The spirit of inspection today, I think, from coast to coast is the spirit of service; is the recognition that most men want to do the thing that is right and that is profitable.

You know we are awfully unselfish. I don't suppose

an inspector ever applied for a raise in salary; there may be such cases, but I have never heard of them. In most other departments of life we are interested in the financial side of it, and the dairyman is tremendously interested in the financial side. Sometimes his chief opposition to the inspector has been that he didn't see how he could follow out the inspector's instructions without financial outlay; and unfortunately there have been cases where one inspector would come along and say, "That's wrong, fix it this way," and the man fixed it, and before he could hardly get it into use the inspector would be changed and another inspector would come along and say, "This is wrong," and the man would have to spend more money to change it again. Well, things are improving and we are having less of that trouble.

There is another phase to this milk question, and that is we have laid too much emphasis on unimportant things in the past, and if the last three or four years have taught us anything in the science of handling milk, I believe it is this: That more depends on the method and the man than on the machinery, and that we have placed too much emphasis on whether our walls were white and whether our floors were concrete and not enough on the man and the way he did his work. Every inspector who has had any large experience knows that some men get splendid results under very adverse conditions.

Finally, and summing up what I may have tried to say to you this morning, I believe that the important thought for the dairy inspector today is a realization of the human element involved in his problem. I believe firmly that most farmers want to do what is right. If they haven't done what is right usually in the first place it is due to ignorance, and if that is so the inspector has got to be the instructor and show him. Then if he doesn't do what he can do and what he ought to do we have got to use the court of last resort and make him do it.

I am often reminded of what happened one day when I was speaking to a body of our students. We were in a building where sounds travel pretty rapidly and there were three fellows coming in late and coming up a wooden stairway, stamping their feet and talking and laughing, and as they came in the building two of the men became conscious that a meeting was in progress and stopped their noise, but the third was one of these rollicking, happy-go-lucky fellows who never stops to think, and he was laughing and shouting and pretty soon there was so much noise I stopped, and I heard one of the fellows say, "Shut up, Bill, they have begun the meeting." Just stop a moment and think what that meant. Bill had forgotten where his rights stopped and the other fellow's began, and it needed his friend beside him to say, "Shut up, Bill." And that is what the inspector does, is to help the fellow who forgets where his rights leave off and the public's begin. The public has a right to demand certain things of the farmer if he is going to sell milk, and of the milk dealer in the city if he is going to distribute milk, and usually he is ready to do what is right, only he sometimes forgets where his rights leave off and the other fellow's begin. So it is our duty as inspectors to help him to know where he must stop doing certain things because the man that is buying the milk has a right to expect those things won't be done.

I trust that out of the splendid meeting which you have outlined here there may come the fullest possible measure of benefit and inspiration. You know the finest thing in our work is the enthusiasm and inspiration which we get out of these associations.

"Take your part in the great collective struggle to make life more worth while for everybody. Study to combine your efforts with the efforts of others in this great enterprise, tactfully, intelligently and effectively."

REPORT OF COMMITTEE ON DAIRY FARM INSPECTION

Prof. C. B. LANE, *Chairman,* Philadelphia
J. A. GAMBLE, U. S. Dairy Division, Washington
Prof. H. A. HARDING, University of Illinois, Urbana

At the annual meeting of this organization held in Washington, D. C., a year ago, this committee was requested to communicate with the Boards of Health of the various cities throughout the country and obtain available information relative to milk regulations, milk consumption, and methods of handling milk in the city and country with the idea of noting the exact conditions and collecting data that might be of value in improving the milk supplies. It was particularly desired that information be secured showing the age and temperature of milk at the several points of handling between the producer and consumer during the hottest summer months. The committee formulated a set of questions covering the above points and sent them to officers of 440 boards of health, in most cases to the chief milk inspector, July 25, 1916. Eighty answered, returning the blanks filled out to the best of their ability. In most cases the figures obtained are the results of actual tests, and we believe they show the conditions actually existing.

The committee desires to take this opportunity to thank the members of this Association and others who sent in reports for their valuable cooperation and assistance.

Of the eighty cities that replied, sixty-four gave very full reports. These sixty-four have a population of 5,882,000, are located in thirty-two States, and are rather evenly distributed throughout all parts of the United States.

Number of dairies represented..... 32,391
Number of gallons of milk represented.....614,880

Amount from tuberculin tested cows*	16%
Amount milked into covered pails	37%
Amount cooled immediately after production	77%
Number of these cities having regulations relative to sterilization of utensils on the farm	30
Number of wooden sterilizers reported in use on farms	202
Number of concrete sterilizers reported in use on farms	130
Number of metal sterilizers reported in use on farms	1,528
Number of dairymen using steam jets on farms for sterilization	823
Number of cities advocating the use of wire strainers by dairymen	8
Number of cities advocating wire and cloth strainers	6
Number of cities advocating cotton strainers	13
Number of cities advocating cotton and cheese cloth strainers	8
Number of cities advocating cheese cloth strainers	7
Number of cities advocating canton flannel strainers	4
Number of producers reported as using wire strainers	5,208
Number of producers reported as straining through one thickness of cheese cloth	1,082
Number of producers reported as straining through more than one thickness of cheese cloth	4,654
Number reported as using filter cloth	169
Number reported as using cotton	1,224
Number of cities having regulations relative to aeration of milk	9
Number of dairymen reported as aerating their milk	14,361
Cities having regulations relative to cooling of milk on farm	49

*Based on total gallons represented.

Temperatures required by the above cities:

40 to 60, one.	58 to 65, one.
45 to 50, one.	60 to 70, three.
45 to 55, one.	62 to 65, one.
45 to 60, two.	48, one.
45 to 65, one.	50, five.
45 to 80, one.	52, one.
48 to 65, one.	55, four.
50 to 55, two.	57, one.
50 to 60, two.	60, nine.
50 to 65, one.	62, one.
50 to 70, one.	65, one.
54 to 70, one.	68, one.
55 to 60, two.	70, one.
55 to 65, one.	75, one.

Dairymen reported as having cooling tanks*	80%
Cooling tanks reported as being made of concrete†	37%
Cooling tanks reported as being made of wood	22%
Cooling tanks reported as being made of metal	17%
Number not specifying material used in tank construction	24%
Diarymen reported as using ice	19.5%
Maximum temperature of water supply, 1,991 farms, July and August	62° F.
Minimum temperature of water supply, 1,589 farms, July and August	51° F.
Average temperature of water supply during July and August in the cities given	57° F.
Percent of milk pasteurized in the 64 cities (based on total gallons represented)	66%
Percentage of milk iced on delivery wagons during summer months	60%

*Based on total dairies represented.
†Based on total dairies having cooling tanks.

Percentage delivered before 6 A.M. during summer months	60%
Percent bulk milk shipped in unrefrigerated cars	30%
Percentage received in refrigerator cars	8%
Percentage daily received by wagon or truck from country	43%
Percentage of supply regarding which no information on this point was secured	19%

Most of the cities represented in this digest have a population of under 100,000.

AGE REPORT (55 cities reporting)

1. Number of hours milk is in the farmer's possession after milking.

	Maximum	*Minimum*	*Average*
Night's milk	46*..13 hrs.†	41..7 hrs.	36..11 hrs.
Morning's milk	43 .. 5 hrs.	38..2 hrs.	38.. 4 hrs.

2. Number of hours milk remains at country milk receiving stations.

Maximum	*Minimum*	*Average*
21..9 hrs.	20..6 hrs.	18..7 hrs.

3. Number of hours milk remains at country bottling plants.

Maximum	*Minimum*	*Average*
12..10 hrs.	11..4 hrs.	13..7 hrs.

4. Number of hours milk remains on country railroad platform. (From delivery by farmers until loaded on cars.)

*Number of cities reporting this item.
†Average of those who reported.

	Maximum	*Minimum*	*Average*
Night's milk	22.2 hrs.	16.20 min.	20. 1 hr.
Morning's milk	22.1½ hrs.	13.45 min.	20.50 min.

5. Number of hours in railroad cars.

Maximum	*Minimum*	*Average*
27.2 hrs. 30 min.	26.40 min.	25.1½ hrs.

6. Number of hours between the time it is taken from cars in city and its arrival at city plant.

Maximum	*Minimum*	*Average*
27.1 hr. 12 min	22.20 min.	29.40 min.

7. Number of hours between arrival at city plant and loading for city delivery.

Maximum	*Minimum*	*Average*
30.13 hrs. 20 min.	27...5 hrs.	27...9 hrs.

8. Number of hours on city delivery wagons.

Maximum	*Minimum*	*Average*
38.5 hrs.	34.2 hrs.	35.3 hrs.

9. Total age of milk when delivered to consumer.

	Maximum	*Minimum*	*Average*
Night's milk	45.25 hrs.	40.12 hrs.	36. 16 hrs.
Morning's milk	43.16 hrs.	38. 5 hrs.	35.9½ hrs.

TEMPERATURE REPORT (57 cities reporting)

1. Temperature of milk when delivered by the producers to country railroad platforms, country milk receiving stations, or country bottling plants.

	Maximum	*Minimum*	*Average*
Night's milk	19*.65°F.†	20.51°F.	19.59°F.
Morning's milk	19 .68°F.	19.55°F.	19.62°F.

*Number of cities reporting this item.
†Average of those who reported.

2. Temperature of milk when delivered from the producers direct to the city milk plants.

	Maximum	*Minimum*	*Average*
Night's milk	27..69°F.	26..54°F.	28..60°F.
Morning's milk	24..70°F.	24..56°F.	28..64°F.

3. Temperature of milk when it leaves the country railroad platforms; or producers' milk, when loaded on cars.

	Maximum	*Minimum*	*Average*
Night's milk	16..64°F.	16..53°F.	17..59°F.
Morning's milk	15..66°F.	15..56°F.	16..62°F.

4. Temperature of milk when it leaves the country receiving stations. (Bulk milk.)

Maximum	*Minimum*	*Average*
15..62°F.	15..48°F.	13..59°F.

5. Temperature of milk when it leaves the country bottling plants. (Bottled milk.)

Maximum	*Minimum*	*Average*
11..53°F.	10..49°F.	11..51°F.

6. Temperature of "receiving station milk" when taken from cars in the city.

Maximum	*Minimum*	*Average*
17..69°F.	18..57°F.	15..65°F.

7. Temperature of "bottled milk" when taken from cars in the city.

Maximum	*Minimum*	*Average*
6...56°F.	6...47°F.	8...54°F.

8. Temperature of "shippers' milk" when taken from cars in the city.

Maximum	*Minimum*	*Average*
23..70°F.	23..55°F.	22..63°F.

9. Temperature of "receiving station milk" when received at the city plants. (Bulk milk.)

Maximum	*Minimum*	*Average*
15..66°F.	15..55°F.	17..64°F.

10. Temperature of "bottled milk" when received at the city plants.

Maximum	*Minimum*	*Average*
5...55°F.	5...44°F.	8...52.5°F.

11. Temperature of "shippers' milk" when received at the city plants. (When shipped by rail.)

Maximum	*Minimum*	*Average*
22..72°F.	22..55°F.	21..64.5°F.

12. Temperature when loaded into the city delivery wagons. (Bottled milk.)

Maximum	*Minimum*	*Average*
26..54.5°F.	26..42°F.	30..49°F.

13. Temperature when received by the consumers from the city delivery wagons. (Bottled milk.)

Maximum	*Minimum*	*Average*
31..60.5°F.	31..47°F.	33..55°F.

In making a brief survey of these figures and the letters received in connection with them, it may be said that many inspectors are working under difficulties on account of lack of men, equipment and funds, but in spite of this they are

going at their work courageously, determined to do all they can with such equipment as they can secure.

Many ways in which improvement could be made were pointed out, among them being better railroad service; more prompt handling of the milk; more refrigerator cars; more icing at the farm; more tuberculin-tested cows; more small-top milk pails, etc. It is evident from these reports that the smaller cities have the freshest milk. This is offset, however, in the larger cities by more refrigerator cars, a larger percentage of pasteurized milk, and better equipment generally.

It is unfortunate that the milk supply of most cities has too long and dangerous a journey for such a perishable product, in some cases covering four or five hundred miles. The *time* taken for the journey, however, appears to be less important than the *care* received previous to and during transit. This is also borne out by the fact that milk in the contest connected with the National Dairy Show this year travelled ten days and a distance of over 3,000 miles, yet from the standpoint of the best milk experts and scientists it was practically a perfect product, and had kept for this period with but little change. We are not advocating keeping milk long periods, because we believe that the fresher milk is when consumed the better, but we do want to point out the fact that care is more important than time in transit, and that in the future large cities must necessarily draw their milk supply from long distances and that therefore the greatest care should be exercised in handling it.

The reports indicate very clearly that progress is being made, and that while it is slow, it is progress nevertheless. We will all agree that even five years ago a report of this character would not have shown 16 per cent of the herds tuberculin tested, 37 per cent of the farmers using the covered milk pail, and 77 per cent cooling the milk supplied to the cities making these reports. It will indeed

be interesting to compare this report with one made five years hence.

There are many other interesting deductions that might be drawn from this data, but we will leave it for the members to study out at their convenience.

"The true object of science is to lead the mind of man towards its noble destination—knowledge of truth."

REPORT OF COMMITTEE ON CITY MILK PLANT INSPECTION

HERBERT E. BOWMAN, *Chairman,* Somerville
F. H. BOTHELL, Los Angeles
WM. P. PALMER, Baltimore

In presenting for your consideration a paper on milk plant inspection, your committee was handicapped from the start, as the U. S. score cards for milk plants do not seem to be very generally used. From the information accumulated, however, my associates on the committee have forwarded me their ideas and conclusions. Mr. Wm. P. Palmer, Chief Inspector, Bureau of Food and Dairy Inspection, Baltimore, Md., who covered the Southern States, confined his report to conclusions which will appear later. Mr. F. H. Bothell, formerly assistant in the U. S. Dairy Division in the western dairy investigations, wrote me at length, and I cannot do better than give you the main points he brought out in his communication:

"Your suggestion in regard to medical inspection I consider a very important one, as the health of those handling the milk certainly should be such that they are not contaminating the milk with disease germs. The only city in my territory that I know of where they are making any attempt along the line of medical inspection is Seattle, and they have carried it much farther than any city that I know of. They not only inspect the milk plant but also the dairymen supplying the plant with milk.

"The score card inspection I consider of value, but not to such an extent as some cities wish to use it. I do not consider that it is a fair index of the quality of milk which the plant may be turning out. The score card system,

as first inaugurated, was for a guide to the inspector more than it was to grade the plants, and I believe that that still should be the use to which it is put. In several of our western cities we have inaugurated the scoring of the milk which the dairymen are daily supplying the public, and this has had more effect toward improving the sanitary conditions of our plants and dairies than has the work of the inspectors themselves. I just received a letter from Dr. Hart, of Los Angeles, in which city the milk scoring has just been started. He states that the anticipation of the next scoring in August is doing more dairy inspection than the ten men of his force combined. Our attitude in regard to inspection in the past has been to compel the dairymen to do something, with the result that our improvement has been limited. The scoring of milk has furnished a financial stimulus for improvement in that the dairyman who receives a low score loses custom. One of the managers of a large milk plant told me two years ago that he lost two thousand dollars' worth of custom through a low score that he received, and since that time he has made some very rapid strides in the improvement of his milk."

The second letter came from Mr. Bothell a few days ago, and is as follows:

"In a previous letter to you I outlined the method I have been following preparatory to accepting my present position, and aside from the adoption of this method in the inspection by the Spokane Board of Health, I know of no other. Speaking from the side of the milk dealer I can say that this is one of the severest methods of inspection which can be introduced. It has a commercial value to us and keeps one on his mettle all the time.

"I am not very enthusiastic over the score-card method of inspection, although I assisted at the time in the forming of the score card used. This card does not score

the conditions which actually affect the milk. The scoring of milk is much to be preferred as it requires not only that the plant be kept in shape, but that the milk coming into the plant be such that a good product can be put out. Starting the first of October all the milk sold in California must be sold in grades. 'A' grade calls for milk below 200,000 before pasteurization and below 10,000 after pasteurization. Grade 'B' must contain less than 1,000,000 before pasteurization and less than 50,000 after pasteurization. This law is having a great effect on the improvement of the milk coming to the plant. We have been conducting a campaign with our shippers since the middle of June and have been able to get most of our shippers in the 'A' grade class."

In New England, an appeal was sent out to thirty inspectors, who were requested to state whether or not they used the U. S. score card for milk plants, and to express their personal views as to the value of same. This, I felt, was better than sending a questionnaire which would give us stereotyped answers; and I personally feel that the opinions of the men using this card and doing the actual inspecting would be of more value if they were free to express themselves in their own words. I received answers from five (5) cities where the milk plant score card is used, ten (10) where it is not used, and fifteen (15) did not respond. In my own case, no dealer is licensed to sell milk in Somerville, Mass., until a satisfactory score has been returned by the inspector on the U. S. score cards for milk plants. In the letters, opinions were fairly freely expressed, and as it may be of interest to you I will read a few which seem to me to be of value.

OPINION 1

I feel that scoring on some basis is a healthy stimulant to progress, but it seems to me the present score card

should be changed. I believe if a dairyman uses *care* at every point, he will be able to make clean milk, even though his barns are not of the expensive type, which might be inferred as necessary from the score card. (This man evidently thought we referred to dairy scoring.)

OPINION 2

Have used many of the score cards with great personal satisfaction. Their chief advantage is in being a complete summary of conditions as seen at the time of the inspector's visit, which may be filed for reference and comparison. The actual scoring is somewhat unsatisfactory, as it depends so much on the personal equation of the observer. One inspector's 60 may be another's 80. A man who has always been brought up in clean, light surroundings will unconsciously score a dairy barn lower than one who has been brought up in the milk business. A man with a fastidious nose might score a barn 30 on ventilation, while a man brought up on a farm would delight in the cow odor and score 100. If the personal equation could be eliminated, I think that this method of scoring, coupled with proper publicity, would work wonders.

OPINION 3

We are using the U. S. score card, both for the city milk plants and country dairies, and find them of great value in keeping track of conditions. The city milk plant card does not always cover all conditions which arise, but is nevertheless of value.

OPINION 4

I feel that city milk plant scoring would serve the purpose even better than in the case of dairy scoring, as you

know the dairy score card gives fictitious values to nice appearances.

OPINION 5

I am strongly of the opinion that the employment of the milk plant score card has many advantages, and feel that it is possible thereby to obtain the improvements with greater expedition than that which applies to the practical use of the dairy score card.

I received one other letter, which I considered worthy of note as it is the opinion of a man of wide experience. It reads as follows:

"The value of score cards, I believe, is exceedingly overestimated. In fact, beyond the convenience they afford for records with those who are empowered to regulate or control such matters to which they relate, they are practically devoid of any value; consequently, they are not used by this department. By the use of score cards an attempt is made too frequently to compare non-comparable things and give a numerical expression of value thereto and ultimately rely upon the subtle, coercive force vested in publicity to bring about improvements or abatements of nuisances which it appears to me would be much more quickly obtained and be of more credit to the authorities empowered with the maintenance of suitable standards by the direct demand for the immediate abatement of any undesirable conditions that may be found to exist at the time inspections are made. I recognize that I am rather a lonely mortal in this view, but I believe the passing of time will vindicate the judgment above expressed."

In concluding, this committee recommends:

1. Those who contemplate the operation of a dairy or milk plant should submit all plans to the Health Department so that a proper location can be obtained and a properly constructed dairy or milk plant erected.

2. All persons engaged in handling milk or milk utensils should be examined for communicable diseases, either by the physician of the Board of Health or one hired for that purpose by the company.

3. Compulsory sterilization of all dairy utensils and apparatus should be required.

4. The inspector should also see that the pasteurization of milk and cream is efficiently performed and that the milk is properly cared for until delivered to the consumer.

5. That the U. S. score card for milk plants BE USED and given proper publicity, as it supplies a valuable office record of conditions existing in the plant from time to time and the publicity given will create a healthy competition among the dealers to obtain a high score, and thereby improve conditions *permanently*.

"Truth, like a torch, the more it is shaken the more it shines."

REPORT OF THE COMMITTEE ON LEGISLATION AND LEGAL LIMITS FOR THE CONTROL OF MILK AND CREAM

J. S. ABBOTT, *Chairman,* U. S. Bureau of Chemistry, Washington.

DR. JAMES O. JORDAN, Milk Inspector, Boston.

GEORGE B. TAYLOR, U. S. Dairy Division, Washington.

We, your Committee on Legislation and Legal Limits for the Control of Milk and Cream, beg leave to submit the following report:

We have not had time to make a tabulation of the very numerous laws, rules, and regulations pertaining to the production, care, handling, and sale of milk, and to differentiate between those adopted by acts of duly constituted legislative bodies and those adopted by officials charged with the administration of food, dairy, or health laws. Moreover, we have been informed that a very complete study has already been made along these lines and that a report in great detail will be made this week to the Association of Official Dairy Instructors. For this reason we have deemed it unnecessary to duplicate the work of that committee, hoping that it will be published and made available to the members of this Association. Your Committee has, therefore, confined its consideration of this subject to what may be called the less important phases of it, those pertaining to definitions, standards, and legal limits which are easy to tabulate for ready reference and quick comparison. Even this sort of information has been confined to that enacted into law by the several States of this country, rather than to that of cities and foreign countries.

The U. S. Department of Agriculture is compiling this sort of information now, and when it has been finished it will doubtless be made available to the members of this Association. The legal limits for milk and cream in the several States of the United States have already been compiled as indicated in the following tables:

MILK

The following definitions and standards for milk are those which have been enacted into law by the legislative bodies of the States indicated. The definitions and standards adopted by the food and drug commissioners under their authority to adopt rules and regulations or standards are not included in this compilation.

Compiled by J. S. ABBOTT and H. S. BAILEY
Office of State Cooperative Food and Drug Control
Bureau of Chemistry, U. S. Department of Agriculture

States	MILK			Prohibitions						SKIM MILK
	Total Solids %	Solids not fat %	Fat %	Before Calving	After Calving		Bacteria Standard	Specific Gravity	Pasteurization	Total Solids %
California	....	8.50	3.00	15 days	5 days	a.	.....	.....	.....	8.80
Colorado	....	....	3.00	..	..	..	.....	.....	.....	....
Connecticut	11.75	8.50	3.25	..	..	..	1,000,000	.....	.....	....
Idaho	11.00	8.00	3.20	15	4	b.	500,000	1.029	.....	9.30
Iowa	12.00	....	3.00	15	5	c.	.....	.....	185° Sk-M	....
Kansas	....	....	3.25	15	5	e.	.....	.....	f.	....
Louisiana	....	8.50	3.50	14	5	..	.....	.....	.....	8.00
Maine	11.75	....	3.25	..	..	g.	.....	.....	.....	....
Massachusetts	12.15	....	3.35	..	..	..	.....	.....	h.	9.30
Michigan	12.50	....	3.00	8	4	..	.....	1.029 to 1.033	.....	....
Minnesota	13.00	....	3.25	..	..	i.	.....	.....	.....	....
Mississippi	....	....	....	..	..	j.	.....	.....	.....	....
Montana	....	8.50	3.25	15	5	k.	.....	.....	.....	....
Nebraska	....	....	3.00	15	5	l.	.....	.....	.....	....
New Hampshire	12.00	....	....	..	..	m.	.....	.....	.....	8.50
New Jersey	11.50	....	3.00	..	..	n.	.....	.....	.....	....
New York	11.50	....	3.00	15	5	o.	.....	.....	.....	....
North Dakota	12.00	....	3.00	..	..	p.	.....	.....	.....	....
Ohio	12.00	....	3.00	..	..	q.	.....	.....	.....	....
Oklahoma	12.50	....	3.00	..	..	r.	.....	1.029 to 1.033	.....	....
Oregon	....	8.50	3.20	15	5	s.	.....	.....	.....	....
Pennsylvania	12.00	....	3.50	..	..	t.	.....	.....	.....	....
South Dakota	....	....	....	15	5	v.	.....	.....	.....	....
Utah	12.00	....	3.20	..	..	u.	.....	.....	.....	9.00
Vermont	12.50	9.25	....	..	..	w.	.....	.....	.....	....
Wisconsin	....	8.50	3.00	8	4	..	.....	.....	.....	9.00

a.—Boron compounds, salicylic acid, formaldehyde, color.
b.—Pathogenic bacteria, boracic or salicylic acid, formaldehyde, or other foreign chemical or preservative.
c.—Water, saccharin, boron compounds, formaldehyde, or any other substance or thing.
d.—Milk for butter making may contain less than 3.25% fat.
e.—All preservatives, water or foreign substance.
f.—Pasteurized milk is milk that has been held at 149° for 20 min., or 158° for 10 min. and immediately cooled to 50° or lower.
g.—Water or any foreign substance.
h.—Heating above 167° unless labeled "heated milk" is prohibited.
i.—Prohibited: "any borax, boric acid, salicylic acid, formaldehyde, formalin, or any other anti-ferment, or preservative, any alcohol, viscogen, lime, saltpeter, sal-soda, soda ash, or other neutralizer."
j.—See prohibitions under *Cream*.
k.—Water, color, preservative, or any foreign substance.
l.—Water or any substance.
m.—Water, color, or preservative.
n.—Water, drug, chemical, preservative, color, condensed milk.
o.—Water, or any fluid, or any foreign substance whatever. Any animal fats, or animal or vegetable oils.
p.—Water, or any so-called preservative.
q.—Water or any foreign substance. Removal of cream, animal fat, animal, mineral, or vegetable oils, acids, or other deleterious ingredients.
r.—Water, chemicals, preservatives, or other foreign substances.
s.—Borax, boric acid, salicylic acid, formaldehyde.
t.—Added water or any substance to increase thickness, boracic acid salt, boracic acid, salicylic acid, salicylate of soda, formalin, formaldehyde, sodium fluoride, sodium benzoate, or any compound for the purpose of preserving or coloring.
u.—Color, preservative, boric acid, salicylic acid, formaldehyde, viscogen, or other compound.
v.—Artificial preservatives.
w.—12% total solids during May and June.

CREAM

The following definitions and standards for cream are those which have been enacted into law by the legislative bodies of the States indicated. The definitions and standards adopted by the Food and Drug Commissioners under their authority to adopt rules, regulations and standards are not included in this compilation.

Compiled by J. S. ABOTT and H. S. BAILEY, Office of State Cooperative Food and Drug Control, Bureau of Chemistry, U. S. Department of Agriculture.

States	Fat %	Definition	Prohibitions
California	18.00	..	..
Colorado	16.00	a.	b.
Connecticut	16.00	..	..
Idaho	18.00	d.	..
Iowa	16.00	a.	..
Kansas	18.00	a.	e.
Louisiana	.....	d.	g.
Maine	18.00	..	..
Massachusetts	15.00	..	..
Michigan	18.00	..	..
Minnesota	20.00	d.	..
Mississippi	.....	..	i.
Montana	20.00	..	j.
Nebraska	18.00	..	..
New Hampshire	18.00	..	k.
New Jersey	16.00	..	l.
New York	18.00	..	m.
North Dakota	15.00	..	n.
Ohio	.....	..	..
Oklahoma	18.00	..	o.
Oregon	18.00	a.	..
Pennsylvania	18.00	..	p.
South Dakota	18.00	a.	q.
Utah	18.00 24.00 30.00	..	..
Vermont	.....	..	..
Wisconsin	18.00	a.	..

A

a. —Cream is that portion of milk, rich in milk fat, which rises to the surface of milk on standing, or is separated from it by centrifugal force, and is fresh and clean.

b. —Boron compounds, salicylic acid, formaldehyde, color, gelatin.

c. —Homogenized cream made from butter and milk is imitation cream.

d. —Same as "a" except the words "fresh and clean" are omitted.

e. —Saccharin, formaldehyde, or boron compounds.

f. —(Note) Cream for butter manufacturers that is not delivered to point of shipment within 24 hours after milking must contain not less than 25% butter fat.

g. —Cream more than three days' old when delivered at the point of shipment during May to October, four days rest of year. Preservative or other foreign substance.

i. —Boric acid or borates, salicylic acid or salicylates, formaldehyde, sulphurous acid or sulphites (except small quantities that cannot be removed from syrup), hydrofluoric acid or fluorids, fluoborates, fluosilicates, or other fluorin compounds, dulcin, glucin, saccharin, betanaphthol, hydronaphthol, abrastol, asaprol, oxid of nitrogen, nitrous acid, or nitrites, compounds of copper or other added substances.

j. —Water or any foreign substance.

k. —Water, coloring matter or preservative.

l. —Water, drug, chemical, preservative, coloring matter, condensed milk.

m.—Any substance whatever.

n. —Water or any so-called preservatives.

o. —Cream produced within thirty days before or fifteen days after calving. Water, chemicals or preservatives, or other foreign substances.

p. —Condensed milk or cream, or any substance increasing its thickness or consistency.

q. —Artificial preservatives.

Idaho—Maximum acidity .25%.

Minn.—Pasteurization, intermittent at 140° F., continuous 180° F.

The addition of the following substances to food is specifically prohibited:

Illinois: formaldehyde, hydrofluoric acid, boric acid, salicylic acid, and all compounds and derivatives thereof.

Indiana: saccharin, formaldehyde, boron compounds.

Kentucky: any antiseptic or preservative which may render food injurious to health.

Maryland: preservative in milk.

Missouri: methyl or wood alcohol in any form, arsenic, calomel, bismuth, ammonia, alum.

No. Carolina: colors which contain antimony, arsenic, barium, lead, cadmium, chromium, copper, mercury, uranium or zinc, or the following colors: gamboge, corallin, picric acid, anilin, dulcin, glucin, or any other artificially or synthetically prepared substitute for sugar; paraffin, formaldehyde, betanaphthol, abrastol, benzoic acid or benzoates (except in catsups), salicylic acid or salicylates, boric acid or borates, sulphuric acid or sulphites, hydrofluoric acid or fluorin compounds, sulphuric acid or potassium sulphate or wood alcohol.

Texas: formaldehyde, boric acid or borates, benzoic acid or benzoates, sulphurous acid or sulphites, salicylic acid or salicylates, abrastol, betanaphthol, fluorin compounds, dulcin, glucin, cocain, sulphuric acid or other mineral acids except phosphoric acid, any preparation of

lead or copper. *Exceptions:* benzoate of soda may be used in catsups, fruit juices, etc. Oxids of sulphur may be used for bleaching, clarifying and refining food products.

Wyoming: talc, clay, paraffin, varnish, shellac.

STANDARDS COMMISSIONS

The State officials charged with the administration of food laws in the following States are authorized by law to "fix," "adopt" or "promulgate" standards, or "to make rules regulating minimum standards" for foods for which standards are not already fixed by law:

Connecticut,	Kentucky,	Nevada,
Illinois,	Louisiana,	North Carolina,
Indiana,	Maine,	Maryland,
Kansas,	Montana,	Ohio.

In the following States such officials "may fix" or are authorized by law to "fix" or "adopt" standards for foods "in accordance with" or "not more stringent" than those "adopted" or "promulgated" by the U. S. Department of Agriculture.

Alabama,	Mississippi,	Rhode Island,
Florida,	New Jersey,	Wyoming,
Georgia,	Oregon,	Texas.

STANDARDS PROMULGATED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE

The standards promulgated by the U. S. Department of Agriculture as found in Circular 19, Office of the Secretary, and in certain food inspection decisions of the De-

partment, have been adopted as official standards by the laws passed by the legislatures of the following States:

Arizona,	Maryland,*	Oklahoma,
California,	Missouri,	Utah,
Idaho,	Nevada,	Virginia,
	Washington.	

COURT DECISIONS

From Reprint No. 342, from the Public Health Reports
U. S. Public Health Reports

The following court decisions concerning the status in law of ordinances, as well as rules and regulations, definitions and standards promulgated by health and food and drug officials under authority conferred upon them by law to fix or promulgate such regulations may not be considered out of place in such a report as this. These are recent decisions and complete copies of them can doubtless be obtained from the U. S. Public Health Service, Washington, D. C.

An ordinance of the City of Chicago requiring that "a recording apparatus shall be installed on all pasteurizers to record during operation the temperature of the pasteurized product as it flows from the heater" has been held valid (104 Northeastern Reporter, 1104). The following extract from the opinion of the court in this case will doubtless be interesting to the members of this Association:

> "Not only may laws and ordinances require that milk offered for sale shall be pure, wholesome, and free from the bacilli of any disease, but they may and do, in order to produce this result, prescribe the manner in which such purity, wholesomeness, and freedom from disease shall be secured and made to appear. The cows may be required to be registered with a designated public authority; the dairies to be conducted

*Ice cream excepted.

and managed according to prescribed regulations, and, together with the dairy utensils, subjected to inspection; the receptacles in which milk is contained to be of prescribed character in capacity; the labels to be placed according to fixed regulations and to contain certain required information; the milk to be prepared in the manner, at the times, and by the means directed, and at all times to be subject to inspection. These may be drastic restrictions upon a private business, but experience and the increasing knowledge of the causes of disease and agencies of its propagation have demonstrated the necessity of such restrictions to the preservation of the public health, and, as a means to that end, the protection of the general public against dishonest vendors of milk; they all impose inconveniences and expense upon the dealers in milk, but they are not on that account unreasonable, unjust, or oppressive."

"Tuberculin test required.—The Supreme Court of Mississippi upheld a regulation of the State Board of Health which required that all cows used by dairymen selling milk should be tuberculin tested semiannually by a competent veterinarian. The court said that the purpose of the regulation was to prevent disease among human beings, and that therefore the regulation was properly made and enforced by the State Board of Health rather than by the State Live Stock Commission." (66 Southern Reporter, 71.)

"Tuberculin test required.—The Supreme Court of the United States upheld an ordinance of the City of Milwaukee, Wis., relative to milk produced outside the city for sale within the city. The ordinance required that each person bringing or shipping milk into the city for sale should file with the city Health Department a certificate showing that the milk was drawn from tuberculin-tested cows. It also provided that if the provisions of the ordinance were not complied with the milk should be confiscated and destroyed." (228 U. S., 572; 33 Sup. Ct., 610.)

"Nothing is so practical as an ideal in which men believe."—The Saturday Evening Post.

REPORT OF THE COMMITTEE ON STATISTICS OF MILK AND CREAM REGULATIONS OF THE OFFICIAL DAIRY INSTRUCTORS' ASSOCIATION

Presented at its meeting at Springfield, Mass., October 17, 1916, and by special request read before the convention of the International Association of Dairy and Milk Inspectors on the following day.

Committee :—Mr. Ivan C. Weld, *Chairman;*
Prof. E. H. Farrington, University of Wisconsin;
Mr. J. A. Gamble, Dairy Division, U. S. Department of Agriculture;
Prof. H. E. Ross, Cornell University;
Mr. Roy C. Potts, Bureau of Markets, U. S. Department of Agriculture.

In taking up a study of the milk and cream regulations of the cities and towns of the United States, the committee decided upon a classification of the cities into four groups according to their population, as follows:

Group I	5,000	to 25,000	population.
Group II	25,000	to 100,000	"
Group III	100,000	to 500,000	"
Group IV	Over	500,000	"

The survey includes 194 headings and sub-headings pertaining to laws and ordinances designed to regulate the production, care and sale of milk and cream, and presents and includes a mass of statistics that we hope may be care-

fully studied by all members of this Association and by others.

The handling of milk supplies during milk-borne epidemics has not been included in this survey.

In compiling these data, the committee has held strictly to the exact wording in the regulations covered and has made no note of matter implied but not specifically stated.

The committee is indebted to the Market Milk Section of the Dairy Division of the Bureau of Animal Industry for the opportunity to study the milk regulations of 694 cities now on file in that office. Some of these city regulations were adopted recently. Others were adopted several years ago.

The committee is also indebted to the Department of Agriculture for much of the clerical assistance necessary for compiling the data.

Your committee has endeavored to compile the data as systematically as possible, and in a way that will make possible a comparison of the requirements of cities within a single group, and requirements of cities of one group with requirements of cities of other groups.

Complete regulations were obtained from 409 of the 694 cities represented in our study; from 62, partially complete regulations were obtained; and 223 cities reported that they had no regulations pertaining to the sale of milk and cream. An exceedingly large proportion, or 218, of the cities having no regulations governing the sale of milk and cream were in the group containing from 5,000 to 25,000 population. These cities were located in 45 States, so may be considered as representative of the whole country.

Information in detail is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities and towns represented in this survey	511	133	42	8	694
Number of cities and towns reporting no regulations	218	5	0	0	223
Number of cities and towns from which partial regulations were available	59	3	0	0	62
Number of complete regulations of cities and towns represented	234	125	42	8	409

PERMITS OR LICENSES

The survey shows that over half of the cities require licenses, or permits, for the sale of milk, and of these about one-third do not require the inspection of the dairy or city milk plant before granting the license. In practically all of the cities permits or licenses are issued annually. The basis of charge for permits or licenses varies greatly, some charging a certain sum per annum, others a certain sum per wagon, others a certain sum per cow, and one city charges a certain sum for each thousand pounds of milk handled. The more common practice is to charge a specified sum per annum. This amount varies from 25 cents to $10.00 per annum. In other cities the rate varies from 50 cents to $10.00 per wagon, and from $1.00 per 15,000 pounds of milk sold per month to $20.00 per month, where over 320,000 pounds of milk is sold.

Information in detail is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities requiring licenses or permits for the sale of milk	207	105	37	8	357
Number of regulations failing to mention permits or requiring none	27	20	5	0	52
Number of regulations which state that permits are issued:					
annually	154	85	20	4	263
semi-annually	7	4	3	0	14
each three months	1	0	0	0	1
monthly	0	1	0	0	1
Number of regulations which fail to state how often permits are issued	72	15	14	4	105

CHARGES FOR PERMITS OR LICENSES

Number of cities requiring fees	106	50	15	2	173
Number of cities not reporting or not requiring fees	128	75	27	6	236
Number of cities charging:					
$3.00 per month	1	0	0	0	1
1.00 per six months	1	0	0	0	1
.25 annually	0	2	0	0	2
.50 "	20	7	2	0	29
1.00 "	21	10	1	1	33
1.50 "	1	0	0	0	1
2.00 "	23	2	1	0	26

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities charging:					
$ 3.00 annually	1	1	0	0	2
5.00 "	7	3	0	0	10
10.00 "	3	2	0	0	5
.50 per wagon annually	0	1	0	0	1
1.00 " " "	1	4	1	0	6
2.00 " " "	3	2	0	0	5
2.50 " " "	0	1	0	0	1
5.00 " " "	2	2	2	0	6
10.00 " " "	2	0	0	1	3
$ .50 per wagon; $1.00 each additional wagon, annually	1	0	0	0	1
$1.00 each wagon; $.25 each additional wagon, annually	1	0	0	0	1
$1.00 each wagon; $1.00 each plant, annually	1	0	0	0	1
$1.00 each wagon; $.50 license	0	1	0	0	1
$1.00 each wagon; $1.00 license	0	0	1	0	1
$1.00 each wagon; plant and store	0	2	0	0	2
$1.50 first wagon; $1.00 second; $.75 third; $.50 fourth	1	0	0	0	1
$2.00 first wagon; $.50 each additional wagon	1	1	0	0	2
$2.00 per wagon each six months; $.50 each additional wagon	1	0	0	0	1
$2.00 first wagon; $1.00 each additional wagon	1	0	0	0	1

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities charging:					
$2.00 per wagon; $1.00 each store	0	1	2	0	3
$2.00 per wagon; $2.00 additional wagon	0	0	1	0	1
$2.00 per wagon; $3.00 permit	0	0	1	0	1
$2.00 per wagon; $2.00 per cow; $5.00 license	0	1	0	0	1
$2.50 per wagon; $1.00 push-cart; $.50 hand carried	1	0	0	0	1
$2.50 per wagon; $.50 push-cart; $.50 can carried; $1.00 store; $5.00 each place	0	1	1	0	2
$3.00 per wagon; $1.00 each store; one to five cows, $.25; six to ten cows, $.50; above 10 cows, $1.00	0	1	0	0	1
$5.00 per wagon; $2.00 each additional wagon	1	0	0	0	1
$5.00 per wagon; $2.00 cart; $1.00 carried	0	0	1	0	1
$10.00 each wagon; $2.00 per dairy; $10.00 each place of business	0	1	0	0	1
$10.00 first wagon; $10.00 additional wagons: $1.00 each cow 1:10 cows; $5.00 less than 10 gal. milk	0	0	1	0	1
$ .25 per cow	1	0	0	0	1
.50 " "	1	0	0	0	1
.75 " "	1	0	0	0	1
1.00 " "	2	1	0	0	3

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities charging:					
$.50 per cow; $.10 each additional cow	1	0	0	0	1
$1.00 per cow, 1:10 cows; $.50 per cow over 10	3	0	0	0	3
$.50 per cow, 1:5 cows; $.40 per cow, 6:10 cows; $.30 per cow, 11:20 cows; $.20 per cow, 21:50 cows; $.10 per cow, 51:100 cows; $.05 each cow above 100	0	1	0	0	1
$.50 one cow; $1.00 two cows; $1.50 three cows; $2.00 four and above	1	0	0	0	1
$.50 per cow; $2.00 place of business	0	1	0	0	1
$1.00, 1:3 cows; $.50 each additional cow; $10.00 for license	1	0	0	0	1
Selling 15,000 lbs. milk per month, $1.00 per month; 15,000:40,000 lbs., $2.00 per month; 40,000:80,000 lbs. $4 per month; 80,000:160,000 lbs., $8 per month; 160,000:240,000 lbs., $12 per month; 240,000:320,000 lbs., $15 per month; above 320,000 lbs., $20 per month	0	1	0	0	1
Number of cities which require inspection of plant and dairies before granting licenses	69	35	20	2	126

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of cities requiring no inspection of dairies and plants	165	90	22	6	283
Number of cities specifying that a license be secured for each place of business	0	0	4	2	6
Number of cities not specifying this	234	125	38	6	403

CHEMICAL COMPOSITION

Legal limits for composition of milk and cream vary greatly. The regulations of about four-tenths of the cities specify legal limits for water content. Of those cities specifying a limit for water, we found the amount permitted to vary from 80% to 89%, one city having incorporated in its ordinance the following: "Milk shall not contain more than 80 per cent water." The majority of the cities permit a maximum water content of 88%.

Less than one-half of the cities have a requirement for a minimum percentage of total solids. The amount of total solids required varies from 10½% to 13%. Three-fifths of the cities have an established minimum of 12% for total solids.

Approximately one-fourth of the cities have an established requirement for a minimum percentage of solids not fat. The required amount of solids not fat varies from 8.0% to 10½%, with nearly six-sevenths of the cities having a minimum requirement of 8½%.

A requirement for a minimum percentage of fat in milk has been established by approximately five-eighths of the cities. The amount of fat required varies from 2½% to 4%. Three-tenths of the cities require not less than 3%

fat, and one-tenth require not less than 3¼%. Over half of the cities have established as the legal minimum 3½% of fat or less. Practically the same number of cities which have established a minimum percentage for fat in milk have also established a minimum percentage for fat in cream. Approximately one-half of the cities require not less than 18% fat. About one-eighth of the cities require not less than 20% fat. One-eighth require 16½ fat, and one-eighth require 15% fat. It will be observed that in the matter of chemical composition there is a very great variation in the requirements, and milk or cream that may be legally sold in one city may not be so sold elsewhere. The detailed information is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations limiting percentage of water	79	53	21	7	160
Number of regulations not referring to percentage of water	155	72	21	1	249
Number of regulations limiting water content of milk to:					
89.00 per cent	1	0	1	0	2
88.51 " "	0	11	0	0	11
88.5 " "	3	0	2	2	7
88.25 " "	2	2	1	0	5
88.0 " "	44	29	12	4	89
87.51 " "	1	2	0	0	3
87.5 " "	12	4	3	1	20
87.05 " "	0	1	0	0	1
87.0 " "	12	3	2	0	17
80.5 " "	1	0	0	0	1
80.0 " "	2	1	0	0	3
8.0 " "	1	0	0	0	1

TOTAL SOLIDS

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring a minimum percentage of Total Solids	106	60	25	7	198
Number of regulations not referring to percentage of Total Solids	128	65	17	1	211
Number of regulations having or calling for:					
13.0 % Total Solids	13	2	2	0	17
12.51% " "	2	2	1	0	5
12.5 % " "	15	1	3	1	20
12.15% " "	6	2	0	0	8
12.0 % " "	59	46	15	4	124
11.75% " "	2	2	1	0	5
11.5 % " "	7	5	3	2	17
11.0 % " "	1	0	0	0	1
10.5 % " "	1	0	0	0	1

SOLIDS NOT FAT

Number of regulations calling for minimum percentage of Solids Not Fat	38	24	16	1	79
Number of regulations not referring to percentage of Solids Not Fat	198	103	26	7	334

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations calling for:					
10.5 % Solids Not Fat....	0	1	0	0	1
9.5 % " " "	1	1	0	0	2
9.25% " " "	0	1	0	0	1
9.0 % " " "	6	2	1	0	9
8.75% " " "	1	2	4	0	7
8.5 % " " "	28	14	11	1	54
8.25% " " "	0	1	0	0	1
8.0 % " " "	2	2	0	0	4

FAT IN MILK

Number of regulations requiring a minimum percentage of fat.....	137	81	32	7	257
Number of regulations not referring to percentage of fat.	97	44	10	1	152
Number of regulations calling for:					
4.0 % fat.....	0	0	1	0	1
3.7 % "	2	0	0	0	2
3.6 % "	2	1	1	0	4
3.51% "	0	1	1	0	2
3.5 % "	35	10	7	1	53
3.4 % "	3	1	1	0	5
3.35% "	8	2	0	0	10
3.3 % "	0	1	0	0	1
3.25% "	20	19	6	1	46
3.2 % "	0	2	2	0	4
3.0 % "	67	43	12	5	127
2.5 % "	0	1	1	0	2

FAT IN CREAM

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring a minimum percentage of fat	87	49	20	5	161
Number of regulations not referring to percentage of fat	147	76	22	3	248
Number of regulations calling for:					
25.0% fat	3	1	0	0	4
22.0% "	1	0	0	0	1
20.0% "	13	3	5	0	21
19.0% "	1	0	0	0	1
18.0% "	42	29	12	2	85
17.5% "	1	0	0	0	1
16.0% "	10	6	3	0	19
15.0% "	13	10	0	3	26
14.0% "	2	0	0	0	2
10.0% "	1	0	0	0	1

SAMPLES

Number of regulations in which the amount of the sample to be taken was stated	15	8	9	0	32
Number of regulations in which the amount of sample to be taken was not stated	229	117	33	8	387
Number of regulations calling for quart samples	11	1	7	0	19
pint	3	4	2	0	9
½ pint	0	2	0	0	2
¼ pint	1	1	0	0	2

BACTERIA

Less than one-half the cities have regulations relating to the number of bacteria in milk. The requirements of cities providing a numerical limit for bacteria in milk range from a permitted maximum of 50,000 bacteria per cubic centimeter to a permitted maximum of five million bacteria per cubic centimeter. Approximately one-half of these cities have established a numerical limit of 500,000 bacteria per cubic centimeter as the greatest number that may be legally contained in milk that is offered for sale. About one-sixth of the cities have established a legal numerical limit of between 250,000 and 300,000 bacteria per cubic centimeter. One-sixth of the cities forbid the sale of milk having over 100,000 bacteria per cubic centimeter.

About one-eleventh of the cities have established bacterial limits for cream, and the number of organisms legally permitted in one cubic centimeter varies from 50,000 to 1,000,000. One-third of these cities specify 500,000 as the legal maximum number, one-third 1,000,000 as the legal maximum number, and the others, with one exception, require somewhat less than 500,000 bacteria per cubic centimeter in cream. The detailed information is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations having a legal limit for bacteria in milk	95	66	24	4	189
Number of regulations not referring to bacterial limits	139	59	18	4	220
Number of regulations having a numerical limit for bacteria of:					
50,000 per c. c.	1	1	0	0	2
100,000 " "	21	11	3	0	35

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations having a numerical limit for bacteria of:					
150,000 per c. c.....	1	3	1	0	5
200,000 " "	6	7	4	0	17
250,000 " "	7	4	2	0	13
300,000 " "	7	10	2	0	19
350,000 " "	0	0	0	0	0
400,000 " "	1	1	1	0	3
500,000 " "	49	27	11	2	89
1,000,000 " "	2	2	0	1	5
5,000,000 " "	0	0	0	1	1
Number of regulations having a legal limit for bacteria in cream	7	15	8	0	30
Number of regulations not referring to bacterial limits in cream	227	110	34	8	379
Number of regulations having a numerical limit for bacteria of:					
50,000 per c. c.....	1	0	0	0	1
100,000 " "	0	1	0	0	1
150,000 " "	0	1	0	0	1
200,000 " "	1	1	0	0	2
250,000 " "	0	0	0	0	0
300,000 " "	0	1	2	0	3
350,000 " "	0	1	0	0	1
500,000 " "	1	4	5	0	10
800,000 " "	1	0	0	0	1
1,000,000 " "	3	6	1	0	10

TEMPERATURE

Approximately five-eighths of the cities have established maximum temperature limits for milk. About one-half of these cities have fixed 50 degrees F. as the highest legal temperature for milk at the farm; nearly one-third of these cities have fixed 60 degrees F. as the highest legal temperature for milk at the farm. A few permit temperatures as high as 70 degrees, while others require temperatures not higher than 45 degrees. In about one-half the cities regulations fixing the maximum temperatures permitted for milk on common carriers have been provided. About one-half of these have prohibited a temperature higher than 50 degrees, and about one-fourth prohibit a temperature higher than 60 degrees. Other cities require temperatures not higher than 45 degrees, and some permit temperatures as high as 77 degrees. The temperatures of milk required at time of delivery are essentially the same as those required under transportation. The detailed information is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations having a legal temperature limit for milk at Farm	131	86	30	4	251
Number of regulations not having a legal temperature limit for milk at Farm	103	39	12	4	158

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations calling for a temperature not higher than:					
77 degrees F.	1	0	0	0	1
70 " "	2	1	1	0	4
65 " "	4	3	2	0	9
60 " "	42	19	8	1	70
58 " "	2	3	1	0	6
55 " "	11	14	1	1	27
50 " "	67	45	16	1	129
45 " "	2	1	1	1	5
Number of regulations prescribing temperature for milk on Common Carriers	95	75	27	4	201
Number of regulations not prescribing temperature for milk on Common Carriers	139	50	15	4	208
Number of regulations calling for a temperature not higher than:					
77 degrees F.	1	0	0	0	1
70 " "	1	2	2	0	5
65 " "	6	1	1	0	8
63 " "	0	2	0	0	2
60 " "	26	21	10	1	58
58 " "	0	1	0	0	1
55 " "	11	12	1	1	25
50 " "	49	36	13	2	100
45 " "	1	0	0	0	1
Number of regulations prescribing temperature for milk in City	95	74	32	7	208

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations not prescribing or stating temperature of milk in City.....	139	51	10	1	201
Number of regulations calling for a temperature not higher than:					
77 degrees F.....	1	0	0	0	1
70 " ".....	1	2	2	0	5
65 " ".....	6	1	2	0	9
63 " ".....	0	2	0	0	2
60 " ".....	27	19	11	1	58
58 " ".....	0	1	0	0	1
56 " ".....	1	0	0	0	1
55 " ".....	12	13	2	0	27
50 " ".....	46	36	15	5	102
45 " ".....	1	0	0	1	2

SPECIFIC GRAVITY

Only thirty-eight cities have established a minimum for specific gravity of milk. Of these, twenty-five state 1.029 as the minimum. The requirements of the other cities range from 1.027 to 1.033. (The regulation of one city calls for milk of a specific gravity of 10.29, one city 1029., and one city 1030.!)

Number of regulations prescribing a minimum specific gravity.....	0	31	7	0	38

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring a specific gravity of:					
1030.	0	2	0	0	2
1029.	0	4	0	0	4
10.29	0	2	0	0	2
1.030	0	1	1	0	2
1.029: 1.033	0	0	3	0	3
1.029	0	20	3	0	23
1.028	0	1	0	0	1
1.027	0	1	0	0	1

CONDITIONS WHICH RENDER MILK UNSALABLE

Three hundred and ninety-six cities forbid the sale of milk produced or handled under certain stated conditions.

Two hundred and eighty-seven declare milk unsalable when cows are diseased; 115 when cows are kept in filthy quarters; 82 when the milk contains visible dirt; 144 when cows are kept in crowded and unhealthy stables; 260 when milk is adulterated; 205 when milk contains foreign substance. There are in all about 58 conditions which render milk legally unsalable and which are included in one or more city ordinances. Some of the prohibited foods for milch cows are as follows: Swill, distillers' grains, garbage, vinegar waste, turnips, cabbage, garlic; and one prohibits feeding the cows on silage. Another regulation states: "No person shall sell, deliver, etc., 'Milk drawn from cows fed in whole or in part on green corn or silage, unless the person so selling or delivering shall first inform the person to whom it is sold or delivered of the nature of the milk so sold or delivered.'" Another regulation states: "No milk shall be sold from cows fed corn stalks before

the corn has blossomed." And still another regulation provides that "Milk is unsalable when produced in stables containing cattle or other animals."

The conditions in detail which render milk legally unsalable in these cities are as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations which forbid the sale of milk under conditions stated above	234	115	39	8	396
Number of regulations which do not mention when milk is unsalable	0	10	3	0	13
Number of regulations which mention:					
diseased cows	160	85	34	8	287
cows kept in filthy quarters	67	36	12	0	115
milk containing visible dirt	46	29	6	1	82
cows kept in crowded and unhealthy stable	79	43	20	2	144
milk when adulterated	150	77	30	3	260
when cows are fed distillers' grains	59	42	17	7	125
when cows are fed swill	58	41	14	3	116
from cows a certain number of days before calving	139	86	27	6	258
from cows a certain number of days after calving	138	89	27	6	260
foreign substance in milk	107	65	28	5	205
putrefactive feeds	57	38	21	4	120
feeds unwholesome	73	50	22	0	145
feeds impure	47	38	10	0	95

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations which mention:					
milk unclean	23	16	5	0	44
cows fed on refuse	41	28	9	2	80
cows fed on garbage	34	34	13	3	84
cows fed wet brewers' grains	32	22	12	2	68
cows given contaminated water	19	10	18	3	50
cows fed vinegar waste	6	6	6	0	18
pus in milk	8	4	1	0	13
cows fed beet pulp	5	1	0	0	6
cows fed turnips	2	2	0	0	4
cows fed starch waste	8	4	0	0	12
diseased cows	1	2	0	0	3
insanitary foods	1	0	0	0	1
frozen foods	1	0	0	0	1
ropy milk	8	6	0	0	14
bloody milk	14	11	4	1	30
milk above legal limits in bacteria	94	18	0	0	112
milk above legal limits in temperature	139	44	2	0	185
improper milk	2	4	3	0	9
watered	1	0	0	0	1
diluted	3	0	0	0	3
silage	1	1	0	0	2
unsound	1	0	0	0	1
tainted	1	1	1	0	3
musty	1	0	0	0	1
insects	1	0	0	0	1
hairs	1	0	0	0	1
flies	1	0	0	0	1

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations which mention:					
sediment	1	0	1	0	2
sour	1	0	0	0	1
sophisticated	1	0	0	0	1
mouldy	1	2	0	0	3
decayed	3	0	0	0	3
acid plus .2	1	6	1	0	8
garget	1	0	0	0	1
abnormal	3	0	0	0	3
unnatural	0	1	2	0	3
bitter	0	1	0	0	1
decomposed	0	1	0	0	1
glucose	0	3	0	0	3
garlic	0	1	0	0	1
unhealthy	0	9	4	0	13
stringy	0	2	2	0	4
cabbage	0	2	0	0	2
slimy	0	0	2	1	3
sugar waste	0	0	1	0	1

PARTURITION

The regulations in regard to parturition vary greatly. Four cities prohibit the sale of milk sixty days before parturition, and one city permits the sale of milk up to four days before parturition. One city prohibits the sale of milk sooner than twenty-one days after parturition, and one city permits the sale of milk as soon as three days after. Two hundred and thirty-five of the 261 cities having regulations on this subject prohibit the sale of milk from fifteen to thirty days before parturition, and 244 of the 261 cities prohibit the sale of milk from five to twelve days after parturition. Detailed information is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations providing for a specific number of days before and after parturition that the milk cannot be used	139	89	27	6	261
Number of regulations which do not cover this point	95	36	15	2	148
Number of regulations prohibiting the sale of milk:					
60 days before parturition	4	0	0	0	4
45 " " "	1	0	0	0	1
42 " " "	0	1	0	0	1
40 " " "	0	1	0	0	1
30 " " "	19	3	1	0	23
21 " " "	6	5	0	0	11
20 " " "	11	7	3	0	21
15 " " "	89	63	23	5	180
14 " " "	4	1	0	0	5
12 " " "	0	1	0	0	1
10 " " "	1	2	0	1	4
8 " " "	4	1	0	0	5
4 " " "	0	1	0	0	1
Number of regulations prohibiting the sale of milk:					
21 days after parturition	1	0	0	0	1
15 " " "	5	3	1	0	9

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations prohibiting the sale of milk:					
12 days after parturition....	7	7	3	0	17
10 " " "	28	12	5	1	46
9 " " "	3	2	0	0	5
8 " " "	4	0	1	0	5
7 " " "	10	8	2	1	21
6 " " "	4	3	2	1	10
5 " " "	72	52	13	3	140
4 " " "	3	2	0	0	5
3 " " "	1	0	0	0	1

TUBERCULIN TESTING OF COWS

Ninety-eight cities require the tuberculin testing of cows, and fifty of these ninety-eight cities require the cows to be tuberculin tested yearly. Three cities require cows to be tuberculin tested once in two years. One city requires cows to be tuberculin tested twice a year, and one city requires that cows be tuberculin tested at the discretion of the inspector.

Number of regulations specifying that cows					
be tuberculin tested.....	53	21	21	3	98
be tested once a year.....	20	16	14	0	50
be tested once in two years	2	1	0	0	3
be tested twice a year.....	0	1	0	0	1
be tested at discretion of inspector	0	0	1	0	1

CLEANLINESS OF COWS

Eighty-four cities require that udders be washed before milking. Eighty-one cities require that udders be wiped with a damp cloth before milking, and 147 cities simply require that the udders be clean. Thirty-three cities require that hair be clipped from the udders.

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations specifying that					
udders be washed before milking	51	23	10	0	84
udders be wiped with damp cloth before milking	48	25	8	0	81
udders be cleaned with dry cloth	17	4	2	0	23
hairs on udders be clipped	17	13	2	1	33
manure be removed from body of cow	30	15	7	3	55
udders be clean	70	53	20	4	147

STABLES

Two hundred and three cities specify that stables must be clean; 49 require that clean bedding be provided; 173 require that stables be well ventilated; 165 that stables be well lighted, and only 33 specify the amount of window space to be provided per cow. The glass so required varies from 2 to 6 square feet. Ten cities favored 3 square feet, and 12 cities 4 square feet window space for the space occupied by one cow. Eighty-six cities specify the minimum air space per cow. The required space varies from 100 cubic feet per cow to 1,000 cubic feet per cow.

Eighty per cent of the cities require 500 cubic feet or more. Fifty-two cities require 500 cubic feet. One city requires 1½ cubic feet of air space for every pound of live weight of the cow.

One hundred and seventeen cities require that stables be free from manure. One hundred and nineteen cities require tight, sound stable floors. One hundred and thirty-four cities require stable floors to be well drained. Only 51 cities require tight, clean ceilings. The regulations of 138 cities require the removal of manure from the stable, but 40 of these regulations do not specify how often manure shall be removed. Of 96 cities which require the manure removed each day, 50 require it removed once daily and 46 twice daily. Forty-two cities specify the distance from the stable to which the manure shall be removed. The distance varies from 10 feet to 300 feet, but most requirements specify a distance of from 30 to 50 feet.

One hundred and thirty-two cities specify that whitewashing of the stable is necessary. Some cities require it once in three months, and others once in two years. Approximately one-third of the cities require the stables to be whitewashed every year, and another one-third every six months. The detailed information follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that stable be clean.....	118	63	19	3	203
that clean bedding be provided.....	26	14	8	1	49
that stable be well ventilated.	86	64	21	2	173
that stable be well lighted...	88	54	20	3	165

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring 2 sq. ft. of glass per cow	6	2	1	0	9
3 sq. ft. of glass per cow....	4	4	1	1	10
4 " " " " "	6	2	4	0	12
6 " " " " "	1	0	0	1	2
Number of regulations in which glass area is not mentioned..	71	46	13	2	132
Number of regulations requiring that					
stable be free from cobwebs	29	17	6	0	52
stable be free from dust...	40	20	7	0	67
stable be free from manure	63	44	9	1	117
stable have tight, sound floors	64	36	16	3	119
floors be well drained....	71	39	21	3	134
walls be tight and clean...	14	15	2	3	34
ceilings be tight and clean	24	17	7	3	51
Number of regulations requiring "proper" air space.....	54	32	19	1	106
Number of regulations requiring:					
1,000 cu. ft. space per cow	2	1	1	0	4
600 " " " "	4	6	3	0	13
500 " " " "	30	11	11	0	52
400 " " " "	3	6	2	0	11
350 " " " "	1	1	0	0	2
300 " " " "	2	0	0	0	2
100 " " " "	1	0	0	0	1
demanding proper air space, but no amount specified...	0	0	2	0	2
1½ cu. ft. air space for every lb. of live weight.....	0	0	0	1	1

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring the whitewashing of stable	74	38	17	3	132
Number of regulations in which the time between whitewashings is not specified	16	7	9	2	34
Number of regulations requiring whitewashing of stable					
every 2 years	1	5	0	0	6
every year	27	14	1	0	42
every 6 months	29	12	6	1	48
every 3 months	1	0	0	0	1
frequently	0	0	1	0	1
Number of regulations requiring that no other animals shall be allowed in the stable	71	37	14	2	124

REMOVAL OF MANURE FROM STABLES

Number of regulations requiring the removal of manure	70	48	17	3	138
Number of regulations not stating how often manure must be removed	16	18	5	1	40
Number of regulations requiring removal of manure once daily	26	21	3	0	50
twice daily	28	8	8	2	46
weekly	0	1	0	0	1
frequently	0	0	1	0	1

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring manure to be removed					
300 ft.	0	2	1	0	3
200 "	0	1	1	0	2
100 "	1	3	0	0	4
75 "	0	0	1	0	1
60 "	0	2	0	0	2
50 "	2	4	4	0	10
40 "	1	4	0	0	5
30 "	4	7	1	0	12
10 "	1	1	0	0	2
away	0	0	1	0	1

STABLE YARDS

With reference to the barnyard, 93 cities require them to be clean, 66 require them to be well drained, 74 require them to be free from manure piles, and 50 require them to be free from stagnant water.

Number of regulations requiring barnyard to be					
clean	45	40	8	0	93
well drained	30	21	13	2	66
free from manure piles	29	31	12	2	74
free from stagnant water	21	20	8	1	50

WATER SUPPLY

Regarding the water supply for the dairy farms, 107 cities require that it be clean, 30 cities that it be fresh, 12 cities that it be convenient, 53 cities that it be abundant, 98 cities that it be free from contamination, and 14 cities that it be pure. The information in detail is as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that water supply be					
clean	70	26	11	0	107
fresh	23	3	4	0	30
convenient	7	0	4	1	12
abundant	29	14	9	1	53
free from contamination	54	30	12	2	98
pure	0	6	8	0	14
well chosen	0	1	0	0	1
suitable	0	1	0	0	1

MILKERS

The regulations of 190 cities require that milkers be free from disease. One hundred and thirty-one cities require that they be clean. One hundred and eight cities require that they wear clean clothes, and 111 cities require that they wash their hands before milking. Seventy-nine cities require the milking to be done with clean, dry hands.

Number of regulations requiring that					
milker be free from disease	109	54	22	5	190
milker be clean	78	40	13	0	131
milker wear clean clothes	61	34	12	1	108
milker wash hands before milking	52	41	16	2	111
milker brush nails before milking	8	4	2	0	14
milking be done with clean, dry hands	46	22	10	1	79
hands be not wet during milking	12	22	4	0	38

MILK HOUSE

Most cities requiring milk houses specify that they be located apart from stables or privies. The shortest distance from stable permitted varies from 10 to 100 feet. The average distance is 34 feet. The shortest distance from a privy at which a milk house can be legally located varies from 10 to 300 feet. The average distance is 90 feet.

Proper ventilation, lighting, screening, tight sound floors and good drainage are by far most frequently mentioned in the requirements regarding construction of milk houses. One hundred and fifty cities require that milk houses be used only for the handling of milk, and 232 cities require that milk houses be kept clean.

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that milk houses be					
clean	132	75	22	3	232
used for no other purpose	82	46	19	3	150
have tight sound floor	46	27	13	1	87
well ventilated	62	27	11	1	101
well lighted	51	24	11	1	87
well drained	36	20	14	1	71
Number of regulations requiring sterilizing equipment in the milk house	13	16	2	0	31
Number of regulations requiring that milk house be					
well screened	63	44	16	2	125
provided with suitable racks	5	4	6	0	15
provided with cooling tanks	8	12	5	1	26
located a certain distance from the stable	45	15	11	0	71

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring milk house to be located					
100 ft. from stable.....	3	2	0	0	5
50 " " "	4	0	1	0	5
40 " " "	1	0	0	0	1
25 " " "	1	0	1	0	2
20 " " "	1	0	0	0	1
15 " " "	1	0	0	0	1
12 " " "	0	0	1	0	1
10 " " "	1	0	1	0	2
away " "	28	10	2	0	40
at a distance from stable	2	0	0	0	2
with an air space between milk house and stable..	1	0	0	0	1
apart.....	1	3	0	0	4
distance not given.....	1	1	5	0	7
Number of regulations requiring that					
milk house be free from odors.....	52	22	6	0	80
no swine be within a stated distance.....	27	7	0	1	35
no swine be within 100 ft.	1	0	0	0	1
no swine be within 50 ft..	26	0	0	0	26
swine be "not near".....	0	0	1	0	1

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that milk house be					
a separate room	74	48	26	3	151
a distance from privy	56	40	13	1	110
300 ft. from privy	0	1	0	0	1
200 " " "	1	0	0	0	1
100 " " "	2	3	1	0	6
75 " " "	0	0	1	0	1
50 " " "	4	1	1	1	7
40 " " "	2	0	0	0	2
25 " " "	2	3	0	0	5
15 " " "	2	3	0	0	5
10 " " "	0	0	1	0	1
away " "	16	18	0	0	34
not near privy	6	1	0	0	7
distant	21	0	0	0	21
not mentioned	0	10	9	0	19

MILK UTENSILS

Fifty-eight cities require utensils of non-absorbent material. Thirty cities require that dairy utensils have round or smooth joints. Sixty-two cities require that dairy utensils be "well constructed." Only about 15 per cent of the cities fail to prescribe the use of clean utensils. The regulations of 206 cities specify that dairy utensils be clean. One hundred and sixty-five cities specify that they be washed, 93 cities specify that utensils be scalded, and 226 specify that dairy utensils be sterilized. One hundred and nine cities require that dairy utensils be used for no other purpose, and 120 cities require their protection from contamination.

CONSTRUCTION OF UTENSILS

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that only round-cornered utensils be used	6	5	0	0	11
Number of regulations requiring that only utensils with smooth joints be used	5	4	7	3	19
Number of regulations requiring that utensils be made of non-absorbent material	36	15	7	0	58
Number of regulations requiring that utensils be well constructed	30	17	14	1	62

CLEANING OF UTENSILS

Number of regulations requiring that utensils be					
clean	112	71	22	1	206
washed	94	52	17	2	165
scalded	48	28	14	3	93
sterilized	121	73	25	7	226
used for no other purpose	56	33	17	3	109
protected from contamination	52	51	16	1	120
Number of regulations represented in the above items	184	114	37	7	342
Number of regulations containing nothing regarding the cleaning of utensils	50	11	5	1	67

MILK STRAINING

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring milk to be strained in milk house only	38	31	5	0	74
Number of regulations requiring milk to be strained					
outside the barn	3	2	3	0	8
immediately	44	38	12	0	94
through cotton	6	4	1	0	11
through flannel	6	2	0	0	8
through cheese cloth	5	11	3	0	19
through wire	5	7	1	0	13

THE MILK

Number of regulations requiring that					
milk be removed immediately from barn	89	45	17	3	154
milk be cooled immediately	89	61	18	3	171
milk be aerated	23	11	6	0	40
fore milk be discarded	4	6	6	1	17
milk must not be strained in barn	4	4	2	1	11
milk must be stored only in milk house	9	33	6	0	48
milk be milked into covered pails	20	14	8	2	44
milk be graded	0	5	4	0	9

THE SCORING OF DAIRY FARMS

The dairy farm score-card system of inspection is required by 56 cities. The score card developed by this Association and generally introduced by the U. S. Department of Agriculture is almost universally used in the 56 cities. It is interesting also in this connection to note that the score-card system is used by 184 cities that do not have regulations requiring its use. Fifty-six cities require a minimum score as follows:

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Minimum score of dairy farms ..... 80...	2	1	0	0	3
75...	1	0	0	0	1
65...	2	0	1	1	4
60...	8	12	3	0	23
55...	0	2	1	1	4
50...	3	1	0	0	4
46...	0	0	1	0	1
45...	3	2	0	0	5
40...	6	4	0	0	10
not given	1	0	0	0	1

CITY MILK PLANTS

The principal requirements call for proper lighting, ventilation, screens, tight floors, drains, and proper equipment. Each of these conditions is included in about one-third of the regulations. Seventy cities specify that city milk plants must be clean. Ten cities specify that such plants be free from flies, and 15 cities require facilities for cleaning utensils in plant. Thirteen cities have adopted the score-card system of milk plant inspection, and require scores of from 40 to 75 points. A score of 70 points is required in 5 cities.

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that milk plant shall					
be well lighted	9	8	7	2	26
be well ventilated	6	7	6	2	21
be well screened	10	18	6	1	35
be well drained	7	8	6	2	23
be properly constructed	2	7	5	2	16
be properly equipped	8	6	8	0	22
be clean	19	27	19	5	70
be free from flies	5	1	2	2	10
be free from odors	4	1	2	1	8
be free from contamination	2	3	1	2	8
have sewer connections	2	3	2	0	7
have facilities for cleaning utensils in plant	2	5	5	3	15
have facilities for storing milk in plant	3	2	0	2	7
have running hot and cold water	2	5	1	1	9
have separate room for handling milk	4	2	5	1	12
have tight walls and ceilings	2	5	6	1	14
have tight floors	9	7	7	2	25
score a certain number of points	5	5	3	0	13
shall score not less than					
40 points	0	1	0	0	1
50 "	1	1	0	0	2
60 "	0	1	1	0	2

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that milk plant shall score not less than					
70 points	2	2	1	0	5
75 "	0	0	1	0	1
not mentioned	2	0	0	0	2

DELIVERY WAGONS

Two hundred and seventeen cities require the name of the dealer on delivery wagons. Two hundred and thirty-two cities specify that the number of dealer's license must appear on wagon. One hundred and fifty-eight cities require clean wagons and 85 require covered wagons. In 177 cities the drivers are required to be free from disease.

Number of regulations requiring					
drivers to be free from disease	110	53	14	0	177
wagons to be covered	42	30	12	1	85
wagons to be clean	88	52	15	3	158
wagons not to haul refuse or be used for any other purpose	61	41	14	0	116
name of dealer to appear on wagon	112	78	23	4	217
number of license to appear on wagon	123	74	29	6	232

LABELING AND SALE

Seventy-seven cities require milk to be sold in bottles only on the street, and 80 cities specify that milk be sold only in bottles in stores. Other cities permit sale from cans; 224 cities require skimmed milk to be labeled as such; and 132 cities specify the heights of the letters. Eighty-one cities require such letters to be one inch high, and 46 cities require the letters to be at least 1½ inches or higher.

Only 93 cities specify that milk tickets shall be used only once. Three hundred and sixteen cities fail to state how milk tickets, if used, shall be used. Forty-two cities require the name of the dealer to appear on bottle caps. Twenty-four require the license number to be printed on caps. Eighteeen require the date of bottling printed on caps. Twenty-seven require the grade of milk to be indicated on caps. Thirty state that bottle caps must be clean. Nineteen cities require the name of the dealer to be blown into the glass in making bottles. One hundred and seventy-nine cities permit bottles to be filled with milk only at the plant. Seventy-one cities require bottles to be cleansed by consumers immediately after emptying.

Forty-four cities require that pasteurized milk be labeled as such; and 67 cities specify the temperatures to which milk shall be heated and time milk shall be held when pasteurized.

STORE MILK

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring milk to be sold in bottles only	45	20	13	2	80
bottles to be covered in store	31	10	12	3	56
refrigerator to be clean	0	0	0	3	3

MILK TICKETS

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that milk tickets be used but once	49	34	9	1	93
Number of regulations not limiting the use of tickets	185	91	33	7	316

SKIMMED MILK

Number of regulations requiring cans and bottles to be marked	116	74	29	5	224
Number of regulations prescribing heights of letters	66	42	21	3	132
Number of regulations requiring letters					
4 inches high	2	1	0	0	3
3 " "	8	10	4	0	22
2 " "	5	7	4	0	16
1½ " "	4	1	0	0	5
1 inch high	44	21	13	3	81
½ inch high	3	0	0	0	3
⅝ " "	0	2	0	0	2

MILK BOTTLES

Number of regulations requiring that bottles be sealed before using	25	12	15	1	53

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that					
name of dealer appear in the glass	9	6	4	0	119
bottles be filled at plant only	76	72	28	3	179
bottles be cleansed immediately after emptying by consumer	27	29	12	3	71
BOTTLE CAPS					
Number of regulations requiring that name of dealer be printed on bottle caps	16	15	9	2	42
Number of regulations requiring that license number of dealer be printed on bottle caps	15	7	2	0	24
Number of regulations requiring that date of bottling be printed on bottle caps	7	6	5	0	18
Number of regulations requiring that grade of milk be printed on bottle caps	14	10	3	0	27
Number of regulations requiring that bottle caps be clean	10	14	3	3	30
STREET MILK					
Number of regulations requiring milk to be sold in bottles only	45	22	10	0	77
Number of regulations requiring that bottles be covered	30	10	10	0	50

PASTEURIZED MILK

	Population 5,000 to 25,000	Population 25,000 to 100,000	Population 100,000 to 500,000	Population Over 500,000	Total Cities
Number of regulations requiring that pasteurized milk be labeled	17	16	6	5	44
Number of regulations requiring that in pasteurizing milk be heated and held for a certain time and at a given temperature	27	22	13	5	67

PENALTIES

In providing penalties for the violation of rules and regulations, 241 cities provide for either jail sentences or fines, or both. The fines vary from $1.00 to $1,000 and the jail sentences from three days to six months. One hundred and sixty-eight cities do not provide for penalties.

Number of regulations prescribing fines or penalties	125	75	36	5	241
Number of regulations not prescribing penalties	109	50	6	3	168

Fines in the regulations studied varied in cities having populations as grouped above, respectively, from $1 to $500, $5 to $500, $1 to $1,000, $5 to $200, $1 to $1,000.

Jail sentences in the regulations studied varied in cities having populations as grouped above, respectively, from 3 days to 6 months, 10 days to 6 months, 5 days to 6 months, 60 days, 3 days to 6 months.

Two hundred and twenty-three cities with populations between 5,000 and 100,000 report they have no regulations of any kind governing the sale of milk or cream.

One health officer, apologizing for his inability to send a copy of his city ordinance, stated: "Our city council is ossified and waits on the tail of progress."

Another says: "We have no regulations regarding the sale of milk and cream, and I am unable to get the city council to do anything in the matter."

Your Committee on Statistics of Milk and Cream Regulations has also prepared in tabulated form the principal facts found in the laws and regulations of 29 States in so far as they pertain to the production, handling and sale of milk and cream. This tabulated summary is included as a part of this report, and is as follows:

SURVEY OF MILK AND CREAM REGULATIONS OF STATES

Number of States represented in this survey (including Philippine Islands)	29
Number of complete regulations of States studied	29
Number of States not reporting milk and cream regulations	20

MILK LICENSES

Numbr of States requiring licenses or permits for the sale of milk	11
Number failing to mention or not requiring a license	18
Number of regulations which state that license is issued annually	9
Number of regulations which fail to state how often license is issued	20

LICENSES AND FEES

Number of States requiring fees	8
Number of States not requiring fees	21

Number of States charging
- $ .50 annually 1
- 1.00 " 2
- 2.00 " 1
- 1.00 each wagon 1
- 1.00 each wagon and store 2
- 1.00 each wagon, store and depot 1

Number of States requiring license or permit for each place of business 4
Number of States not requiring such permits 25
Number of State requiring inspection of distributing plant and dairies before granting licenses 2
Number of States not requiring such inspection 27

CHEMICAL REQUIREMENTS

Number of regulations limiting percentage of water ... 7
Number of regulations not regulating or stating percentage of water permitted 22
Number of regulations limiting percentage of water to
- 89.00% 1
- 88.50% 1
- 88.25% 1
- 88.00% 1
- 87.51% 1
- 87.05% 1
- 87.00% 1

Number of regulations establishing legal minimum for Total Solids 12
Number of regulations not having or not stating a legal minimum for Total Solids 17

Number of regulations requiring a legal minimum for Total Solids of

13.00%	1
12.51%	1
12.50%	1
12.15%	1
12.00%	5
11.75%	2
11.50%	1

Number of regulations establishing a legal minimum for Solids-Not-Fat 15

Number of regulations not having or stating a legal minimum for Solids-Not-Fat 14

Number of regulations requiring a legal minimum for Solids-Not-Fat of

9.25%	1
8.75%	2
8.50%	11
8.00%	1

Number of regulations establishing a legal minimum for Fat 25

Number of regulations not having or stating a legal minimum for Fat 4

Number of regulations requiring a legal minimum for Fat of

3.50%	3
3.35%	1
3.25%	11
3.20%	2
3.00%	8

Number of regulations establishing a legal minimum for Fat in cream 22

Number of regulations not having a legal minimum for Fat in cream 7

Number of regulations requiring a legal minimum for Fat in cream of
- 20.0% 1
- 18.0% 17
- 16.0% 3
- 15.0% 1

Number of regulations in which the size of the sample to be taken was stated 1
Number of regulations calling for 8-oz. sample 1

BACTERIAL LIMITS

Number of regulations establishing a numerical limit for bacteria in milk 4
Number of regulations not having or stating a numerical limit for bacteria in milk 25
Number of regulations limiting the number of bacteria per cubic centimeter to
- 200,000 1
- 500,000 2
- 1,000,000 1

Number of regulations establishing a numerical limit for bacteria in cream 2
Number of regulations not having or stating a numerical limit for bacteria in cream 27
Number of regulations limiting the number of bacteria per cubic centimeter in cream to
- 200,000 1
- 500,000 1

TEMPERATURE REQUIREMENTS

Number of regulations requiring a certain temperature for milk on farm 2
Number of regulations not having or requiring a certain temperature for milk on farm 27

Number of regulations calling for a temperature not higher than
- 60 degrees F. 1
- 58 degrees F. 1

Number of regulations requiring a certain temperature for milk on common carriers. 3

Number of regulations not having or requiring a certain temperature for milk on common carriers. 26

Number of regulations calling for a temperature not higher than
- 70 degrees F. 1
- 60 degrees F. 1
- 55 degrees F. 1

Number of regulations requiring a certain temperature for milk in city. 3

Number of regulations not having or requiring a certain temperature for milk in city. 26

Number of regulations calling for a temperature not higher than
- 70 degrees F. 1
- 60 degrees F. 1
- 55 degrees F. 1

Number of regulations establishing a legal minimum specific gravity for milk. 3

Number of regulations requiring a legal specific gravity of—
- 1.029: 1.033. 2
- 1.029 1

Number of regulations which forbid the sale of milk under stated conditions. 29

Number of regulations which do not mention when milk is unsalable 0

Number of regulations which mention milk

from diseased cows	24
from cows kept in filthy quarters	15
containing visible dirt	3
from cows kept in crowded and unhealthy stables	16
when adulterated	21
from cows fed distillers' grains	11
from cows fed swill	2
from cows a certain number of days before calving	21
from cows a certain number of days after calving	21
containing foreign substance	22
from cows eating putrefactive feeds	14
from cows when feed is unwholesome	14
from cows when feeds are impure	9
from cows when fed on refuse	3
from cows when fed glucose	2
from cows when fed garbage	4
from cows when fed wet brewers' grains	7
from cows drinking contaminated water	12
from cows when fed vinegar waste	2
from cows when fed starch waste	2
from cows when fed sugar waste	2
that is diseased	1
that is bloody	1
that is tainted	1
that is unclean	8
that is unnatural	1
that is decomposed	2
that is unhealthy	8
that is stringy	2

Total number of conditions and feeds which render milk unsalable 29

PARTURITION

Number of regulations which state a specific number of days before and after parturition during which milk cannot be sold	21
Number of regulations which do not cover this point	8
Number of regulations prohibiting the sale of milk	
30 days before parturition	1
15 " " "	15
14 " " "	2
10 " " "	2
8 " " "	1
Total	21
Number of regulations prohibiting the sale of milk	
15 days after parturition	1
10 " " "	6
7 " " "	1
5 " " "	11
4 " " "	2
Total	21

FINES

Number of regulations prescribing fines or penalties	22
Number of regulations not prescribing penalties	7
Fines in regulations studied varied from	$5 to $300
Jail sentences mentioned	10 days to 3 yrs.

CONSTRUCTION OF UTENSILS

Number of regulations which require that only utensils with smooth joints be used	2

Number of regulations which require that utensils be made of non-absorbent material..... 2
Number of regulations which require that utensils be well constructed..... 6

CLEANING OF UTENSILS

Number of regulations requiring that utensils be
clean..... 17
washed..... 6
scalded..... 3
sterilized..... 3
used for no other purpose..... 7
protected from contamination..... 2
Number of regulations represented in the above items.. 21
Number of regulations not referring to the cleaning or care of utensils..... 8

MILK PLANT

Number of regulations requiring that milk plant
be clean..... 5
be free from odor..... 1
have a certain score (Score required, 50).... 1

WAGONS

Number of regulations requiring that driver be free from disease..... 5
Number of regulations requiring that
wagon be covered..... 1
wagon be clean..... 3
wagon not to be used for any other purpose.. 1
name of dealer must appear on wagon....., 6
license number must appear on wagon..... 4

STREET MILK

Number of regulations requiring that milk be sold in bottles only 1
Number of regulations requiring that bottles must be covered 1

STORE MILK

Number of regulations requiring that milk be sold in bottles only 2

MILK TICKETS

Number of regulations requiring that milk tickets be used but once 1
Number of regulations which do not limit the use of tickets 28

SKIMMED MILK

Number of regulations which require that cans and bottles be marked 15
Number of regulations prescribing heights of letters . . . 11
Number of regulations requiring letters
- 2 inches in height 1
- 1 inch in height 8
- ¾ " " " 1
- 1/10 height of container 1

MILK BOTTLES

Number of regulations requiring that bottles
- be sealed before using 2
- have name of dealer blown into bottle 4
- be cleansed immediately by consumer 2
- be filled at plant only 2

BOTTLE CAPS

Number of regulations requiring that date of bottling be printed on bottle caps 1
Number of regulations requiring that bottle caps be clean 2

FARM REGULATIONS

Number of regulations requiring that cows be tuberculin tested 1
Number of regulations requiring that minimum score of dairies be required 4
Number of regulations requiring that minimum score of dairies be
80 1
50 2
40 1

CLEANLINESS OF COWS

Number of regulations requiring that udders be washed before milking 2
Number of regulations requiring that udders be
wiped with damp cloth 1
cleaned with dry cloth 1
Number of regulations requiring that udders be clean .. 8

COW STABLES

Number of regulations specifying that stable be
clean 9
well ventilated 7
well lighted* 5

*Area of window space per cow not mentioned.

Number of regulations requiring that stables	
be free from dust	2
be free from manure and odor	5
have tight sound floors	1
have floors well drained	2
have tight, clean walls	1
have tight, clean ceilings	1
Number of regulations requiring the removal of manure	3
Number of regulations requiring removal	
once daily	2
twice daily	1
Number of regulations requiring that manure be removed not less than 200 ft. from stable	1
Number of regulations calling for whitewashing stable	3
Number of regulations calling for whitewashing	
every two years	1
annually	2
Number of regulations stating that no animals other than cows be allowed in the stable	3

MILK HOUSE

Number of regulations requiring that milk house be	
clean	6
used for no other purpose	4
well ventilated	2
well lighted	2
well drained	1
Number of regulations calling for sterilizing equipment in the milk house	1
Number of regulations requiring that milk house be well screened	3
Number of regulations requiring that milk house be located a certain distance from the stable	3

Number of regulations requiring milk house to be "away" from stable..... 3
Number of regulations requiring that milk house be free from odors..... 3
Number of regulations requiring that milk house
be a separate room..... 4
be a distance from privy..... 1
Number of regulations requiring a location
100 ft. from privy..... 1
50 " " " 1
away " " 2

THE MILK

Number of regulations requiring that milk be removed immediately from the barn..... 2
Number of regulations requiring that milk be
cooled immediately..... 3
aerated..... 1
milked into covered pails..... 1
Number of regulations requiring that fore milk be discarded..... 1
Number of regulations requiring that milk be stored only in milk house..... 3
Number of regulations requiring that milk be graded.. 1

MILK STRAINING

Number of regulations requiring that milk be strained immediately..... 1
Number of regulations requiring that milk be strained
through cotton..... 1
through flannel..... 1
through wire..... 2

THE MILKER

Number of regulations requiring that milker be
- free from disease 6
- clean 4
- wear clean clothes 2
- wash hands before milking, ... 1

Number of regulations requiring that milking be done with clean, dry hands 1

BARNYARD

Number of regulations requiring that barnyard be
- clean 3
- well drained 1
- free from manure piles 2
- free from stagnant water 2

WATER SUPPLY

Number of regulations requiring that water supply be
- clean 4
- fresh 2
- free from contamination 2
- pure 2

PASTEURIZED MILK

Number of regulations requiring that pasteurized milk be labeled 1

Number of regulations specifying that in pasteurizing milk be heated and held for a certain time and at a given temperature 3

In conclusion, your committee would state that it does not understand it to be within its province to outline or to present recommendations at this time for the correction of the glaring irregularities so frequently observed in regulations pertaining to the same subject; but out of this survey of milk and cream regulations of the cities and towns and States of the United States, with a full realization of the magnitude of the industry and the factors which make for improved quality, this committee has become convinced that—

First: there is a great and urgent need for further research and study on the part of our dairy investigators of some of the problems involved in the production and handling of milk; and

Second: there is a great and urgent need that definite information now available be placed in the hands of all who are responsible for the laws and ordinances governing the production, transportation, handling and sale of milk.

"A little knowledge is a dangerous thing."

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RELATION OF THE FAT IN MILK TO THE SOLIDS-NOT-FAT

By Lucius P. Brown and Clarence V. Ekroth

Received December 1, 1916

In the year 1910 the New York State standard for the chemical composition of milk was placed by the Legislature at its present figures, to wit: 3 per cent fat and 11.5 per cent total solids. No standard for solids-not-fat was fixed.

In making municipal standards the City of New York was empowered under the law to enact additional legislation but could enact no legislation conflicting with that of the State. In endeavoring to secure a good milk supply for the city and, at the same time, to make figures which would be useful in the detection of adulteration, the only additional legislation which the city could enact was to set a standard for solids-not-fat, which was accordingly placed at the difference between the State's standards for fat and total solids, namely 8.5 per cent. When a rigid enforcement of this standard was attempted it was objected by dealers that the standard was an impossible one and that the cattle in the city's milk shed could not supply it. An investigation was, therefore, set on foot to determine whether these claims were justified. In the course of this some very interesting facts developed.

In looking into the experiences of the several States as (presumably) set forth in legislation, it developed that apparently the standards for the different States had been made entirely without system. For instance, one State requires a minimum of 12 per cent total solids, but only

2.5 per cent of this need be fat. Whether any normal cow could be found in that State (or anywhere else) giving milk containing 9.5 per cent solids-not-fat and 2.5 per cent butter-fat is not only open to at least a reasonable doubt but it is quite certain that no unadulterated herd milk would even approach such figures. Another State requires 9.75 per cent solids-not-fat. We venture to say that a literal enforcement of this standard would leave the State without a milk supply.

The legal standards furnishing no help, nothing remained except to consult actual analytical figures. We were able to obtain the figures of herd milk and of that of a large number of individual cows of known purity in papers by Lythgoe* and Sherman† and from our own work. The results of all three of these sources, about 1,600 samples, were separately plotted. Using the fats as ordinates and the solids-not-fat as abscissæ, curves of the same general shape but on different portions of the chart were obtained. The making of a zone with the extreme curves as boundaries suggested itself to Mr. Ekroth, giving the interior zone bounded by the lines *K-K* and *P-P* as shown in Fig. I herewith. This seemed promising but it was recognized that with such a small number of samples the influence of the many factors of variation in the composition of the milk might not be eliminated, these factors being: difference in breeds, the season of the year, feeding practice in different sections of the country and in different countries, etc. The available literature furnished a large number of analyses of milk, the sources drawn upon being Richmond, Leach, Haecker, Woodward and Lee, and others. Altogether the figures from over 200,000 samples, including approximately 40,000 New York City samples (unpublished), were used. We exercised our best judgment in eliminating samples apparently adulterated and it

*Lythgoe, *J. Ind. Eng. Chem.*, 6 (1914), 899.

†Sherman, *J. Am. Chem. Soc.*, 25 (1903), 132.

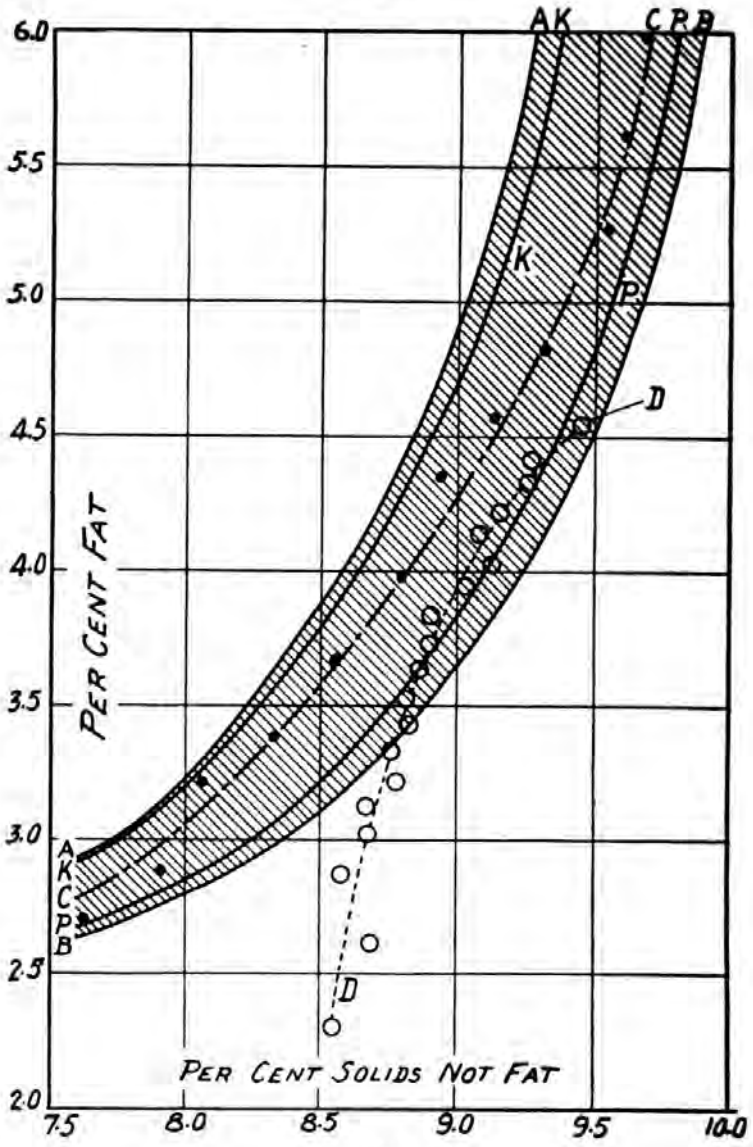

FIG. 1

is our belief that the influence of adulteration in the large number of samples examined is negligible. The result was the zone, bounded by the lines *A-A* and *B-B* of the greater area as shown. It is significant that in no portion of its boundaries does this zone exclude the smaller one. It is believed that this larger zone offers a practical means of determining, at least presumptively, whether or not a given

sample of herd milk or other mixed milk is adulterated. Thus, if a given milk in its fat and solids-not-fat falls within the zone it can, in the absence of other facts, be fairly considered to be unadulterated, but if the junction line of these two constituents falls outside the zone the milk is at least suspicious and the burden of proof is then to show that it is unadulterated.

There will, of course, be individual animals whose milk at times or continuously will not show the composition herein indicated, but inasmuch as milk supplies are made up of the milk of a number of individuals, it is believed that this chart will be of value not only to governmental milk controls but to dealers as well.

The curve *C-C* shown about the middle of the larger zone represents a smoothed curve obtained from 1,000 analyses of individual cows made by Dr. Lythgoe and placed by him in 12 groups according to the total solids. In plotting this curve, however, total solids were disregarded by us and were separated into fat and solids-not-fat.

At the time this paper was read no method of treatment of the chemical composition of milk, having to do with the limiting values of unadulterated milk, had been found by either of the authors in the literature but we have since seen Dr. A. G. Woodman's table on page 135 of his work on "Food Analysis," published in 1915. While the two methods are not strictly comparable, Dr. Woodman's idea of limiting values is that which we had already adopted independently in this treatment of the subject. It will be noted, however, that Woodman's table referred to is calculated from certain assumptions and analyses while we have endeavored to confine ourselves only to published tables. Inasmuch as this represents a somewhat considerable departure from ordinary methods of treating the matter, we do not wish to be considered as suggesting that the zone in its present form represents

absolutely true conditions, but we present it in the hope that it may be tested out by workers interested in these lines to the end that, if possible, a graph may be finally obtained which may be used to give us absolute results in testing the composition of any sample of milk. It is hoped, in addition to the use above suggested, that this figure may serve as a guide to our law-making bodies so that they shall not make the impossible standards we have noted above.

In making this chart we attempted to use analytical results from some 5,000 samples of milk produced in New York State as cheese factory supplies, but the average composition of these milks, when plotted according to the solids-not-fat, gave the curve *D-D* in Fig. I, of an entirely different form from any normal milk curve which we have been able to obtain, being convex to the ordinate. The conclusion is irresistible that a considerable portion of these samples had been skimmed.

A study of the proportions of the two milk constituents mentioned, as indicated by this figure, shows some very interesting inter-relations. In order to bring this out more clearly, Tables I and II have been made. In making both

TABLE I

FAT	SOLIDS-NOT-FAT (PER CENT)		TOTAL SOLIDS
Per cent	Av.	Extremes	Per cent
3.00	8.05	7.75—8.35	11.05
3.25	8.30	8.05—8.65	11.55
3.50	8.55	8.20—8.90	12.05
4.00	8.90	8.55—9.25	12.90
4.50	9.20	8.85—9.50	13.70
5.00	9.35	9.05—9.65	14.35
5.50	9.50	9.20—9.80	15.00
6.00	9.60	9.30—9.90	15.60

these tables, the fat has been used as the fixed point and the solids-not-fat and total solids corresponding thereto have been sought. For the lower percentages, fat has been selected in differences of ¼ of 1 per cent. The zone shows that corresponding to 3 per cent of fat, there may

be from 7.75 to 8.35 per cent solids-not-fat. The average of these gives the figure in Col. 2, Table I, while the total solids are, of course, the sum of this average and the fat. The limiting figure in this table should be of value to legislators.

In Table II the difference apparent by an examination of the chart in the increments of fat and solids-not-fat is reduced to figures. Thus, it will be seen that in the lower ranges the average fat increments are about the same as those for the solids-not-fat but with about 3.5 per cent of fat the increment of the solids-not-fat begins to decrease until on reaching the higher figures for fat the latter increment is less than one-third that of the fat. The difference between extremes, as shown in Cols. 7 and 8 of Table II,

TABLE II

Per cent Fat		Per cent Solids-Not-Fat		Increments Per cent		Difference between Extremes Per cent	
Averages	Approx. Extremes	Averages	Approx. Extremes	Per cent Fat	Solids-Not-Fat	Per cent Fat	Solids-Not-Fat
3.00	2.85—3.30	8.05	7.75—8.35	0	0	0.45	0.60
3.25	2.95—3.60	8.30	8.05—8.65	0.25	0.25	0.65	0.60
3.50	3.15—3.95	8.55	8.20—8.90	0.25	0.25	0.80	0.70
4.00	3.50—4.65	8.90	8.55—9.25	0.50	0.35	1.15	0.70
4.50	3.90—5.40	9.20	8.85—9.50	0.50	0.30	1.50	0.65
5.00	4.20—6.25	9.35	9.05—9.65	0.50	0.15	2.05	0.60
5.50	4.50—?	9.50	9.20—9.80	0.50	0.15	?	0.60
6.00	4.75—?	9.60	9.30—9.90	0.50	0.10	?	0.60

is also of interest, showing the fat to be much the more variable constituent. For any given average percentage of fat, it will be noted that the maxima and minima of the corresponding figures for solids-not-fat have a comparatively limited range, these figures in no case being more than 0.7 nor less than 0.6 of 1 per cent. For the higher average percentages of fat, on the contrary, the difference between maxima and minima may be over 2 per cent.

It will be apparent from these facts that standard requirements embracing only fat and solids are illogical

because it is possible so to water or skim a milk with high fat as to benefit considerably the dealer and, at the same time, leave the milk well within the requirements of the legal standard for both fat and total solids.

Table II likewise seems to show that the practice of paying for milk on the fat percentage basis will, when the cattle predominating in any given milk supply are of breeds or strains having a comparatively low percentage of fat, probably have the effect of markedly raising the "solids-not-fat" but that this effect will not be so marked with percentages of fat above about 4.50. Inasmuch as possibly most city milk supplies in the United States are now furnished by cattle having milk of low fat percentages, this method of payment is to be commended if a milk of given moderate nutritive value is desired; but, as has been pointed out by others, this method of payment is unfair to the man furnishing a low or medium grade milk, in that his cattle produce relatively higher total solids than cattle with a high fat content.

It will further appear, from an examination of the tables and figures, that in legislating, unless due regard is had to the inter-relations of the constituents of the milk, legislators will make trouble for administrators by suggesting such a composition for milk as is not normally produced by the cows themselves. Thus, for a standard of 3 per cent fat an average of 8 per cent solids-not-fat would be proper and for 8.5 per cent solids-not-fat, the fat should be placed at 3.5 per cent.

It is thus seen that the standard proposed by the Federal Government and in use by them of 3.25 per cent fat and 8.5 per cent solids-not-fat is open to criticism, the corresponding figure as shown by this curve being 8.3 per cent solids-not-fat as an average and the same thing is apparently true of the standards of most of the States.

It is worth while here to note Fig. II of our accompanying paper on the "Chemical Quality of New York City

Market Milk." This figure shows the percentage of the samples in certain groups of known purity milk, arranged according to the same scheme of percentages as indicated by the tables in this paper. It will be noted by reference to that paper that the groups of the higher fat content and of the corresponding solids-not-fat show a marked parallelism, tending to show the accuracy of the relationship indicated by the zone chart presented herein. This is further indicated by Fig. III of that paper.

SUMMARY

I—The zone chart devised appears to show the approximate chemical composition of normal milk.

II—This chart appears to be capable of use as a guide in fixing legal standards.

III—It appears also to be capable of use as a guide in detecting adulterated milk.

IV—A milk standard having regard only for the total solids is illogical.

V—Most of the legal milk standards in force in the several States of the Union as well as that of the Federal Government are unbalanced and, therefore, incapable of enforcement.

We desire to acknowledge our indebtedness to the sources of reference given herewith and to Dr. L. L. Van Slyke, J. B. Newman, Assistant Food Commissioner of Illinois, and others for valuable information furnished in private communications.

"In making observations be sure that you are right and then look again."

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CHEMICAL QUALITY OF NEW YORK CITY MARKET MILK

By Lucius P. Brown and Clarence V. Ekroth

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The size of the problem presented in an endeavor to control the quality of milk supplied to New York City is one which is, of course, equalled nowhere else in the United States and probably in only one other city of the world. The population of the city is 5,500,000. It consumes daily about 2,000,000 quarts of fluid milk and as much or a little more milk in other forms. The fluid milk is collected at about 1,200 country creameries and pasteurizing plants and supplied by some 45,000 dairy farms located in 7 different States and in Canada. When it arrives in the city, it is distributed by about 600 dealers using more than 7,000 delivery wagons and by 12,000 retail stores.

It is axiomatic that the cow producing the largest flow of milk will be the one favored by the dairyman dealing with a city milk supply, other things being equal. Unfortunately, this tendency can be pushed to extremes and it is conceivable that cattle may be so bred, with an eye single to the flow of milk, as to reduce greatly and injuriously the food value of this milk. For the past ten years the chief efforts of the New York City Health Department have been devoted to securing a safe milk supply rather than one furnishing a maximum of nutrients. It is obvious that the tendency to reduce the quality of the milk supply must have limits set to it lest the community suffer

from too great a reduction in the actual amount of food furnished by it.

In an attempt to get together, in an easily demonstrable form, information gathered during the past 40 years, we have made an exhaustive analysis of certain available data, hoping it may be of use to other food officials. Space, obviously, will not permit of detailed presentation of many of the facts which could be brought out.

In the years 1904 and 1905 this Department conducted a survey of the country creameries supplying the city, which resulted in the establishment in 1906 of a regular country inspection service. These investigations indicated that a considerable amount of skimming had been practiced in the country. A comparison of inspections in 1909 with those of 1905 showed that there had resulted, as the effect of closer supervision, a marked increase in the content of both fat and solids-not-fat, as shown by Charts *a*, *b*, *c* and *d* of Fig. I and as further indicated by Fig. III. Up to that time the standard for total solids of New York State milk had been 12 per cent, the Legislature of 1901 reduced this to 11.5 per cent, the fat being left unchanged at 3 per cent. Inasmuch as a certain proportion of the milk supply had been running below the standard for a number of years prior to this time, no marked change is indicated

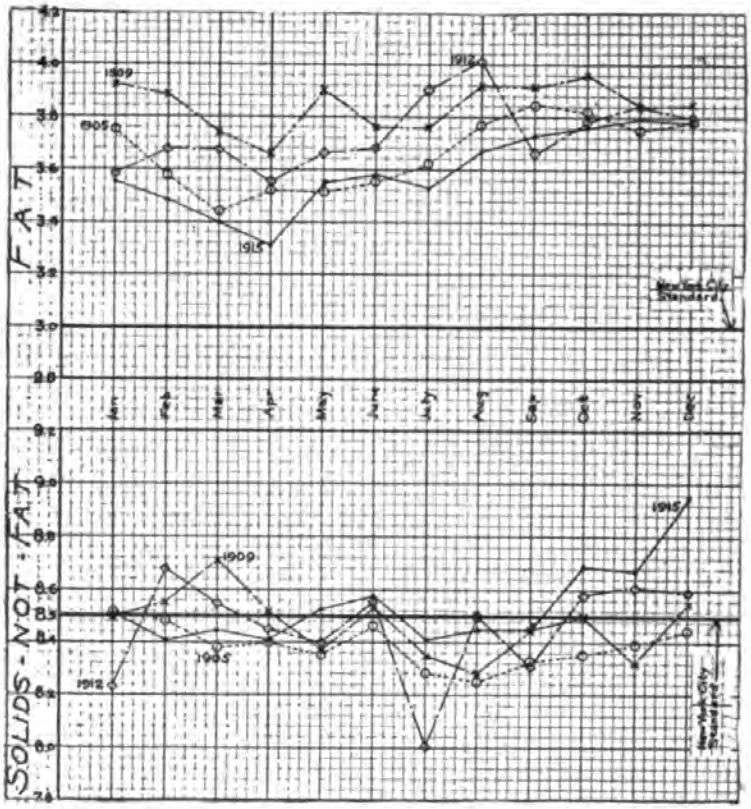

FIG. III—CHARTS SHOWING THE AVERAGE MONTHLY PERCENTAGES OF FAT AND SOLIDS-NOT-FAT IN NEW YORK CITY MILK FOR THE YEARS 1905, 1909, 1912 AND 1915

by the Charts *e* and *f*, Fig. I, for 1912, except a slight drop of fat content; this is significant, however, only because the figures for 1915, when the lower solids requirement had been in effect for 5 years, indicated a still further lowering of the content of this constituent, very notable as compared with the fat curve for 1909, the year when the maximum effect of the former high standards was observed.

An interesting feature of Fig. I is that the milk, as a rule, for the 4 years plotted, ran very much above the standard in fat. The solids-not-fat curves of this figure further indicate that during the greater part of these years, the milk was below the standard in solids-not-fat, an indication of the unbalanced character of this standard and the fact that the dealers in endeavoring to live up to such a standard were forced to give more fat than the standard called for. It also appears to indicate that the 3 per cent standard for fat is unnecessarily low, but, despite this fact, it is only natural to suppose that there was no great straining of the possibilities in this attempt, the effort being simply to get just within the standard. This is further indicated by Charts *k* to *n* of Fig. II, which are all of "known purity" samples and which all indicate a great preponderance of the higher percentages. Charts *o* and *p* are from routine milk supply samples but are supposed to be pure samples, and show the same thing.

In Fig. III the curve for solids-not-fat for 1915 is interesting, showing, as it does, a decided rise in the latter part of the year, coincident with the announcement by the Department of Health that a greater effort on the part of the dealers must be made to live up to the solids-not-fat standard. When compared with the corresponding curve for the fat the fact that the latter curve shows no perceptible change would lead to the supposition that an appreciable number of cows furnishing milks of higher fat content had been added to the milk shed, but that their milk had been partly skimmed and then added to lower grade milk, in such a way as to increase the solids-not-fat alone.

Charts *i* and *j* of Fig. II are of interest as representing about 150 samples taken from the herds furnishing one of the lowest grade milk supplies of the State and of

known purity. They indicate what the result of lack of attention to the quality of the milk supply may result in.

SUMMARY

I—The diagrams shown indicate a considerable betterment of the milk supply as a result of more rigid enforcement of the standards.

II—The fat standard of 3 per cent is a very easy one to live up to but will not result in a betterment of the nutritive value of the milk.

III—The suggestion in our other paper of this date as to the unbalanced character of the ordinary milk standard in effect in the United States is further indicated by these diagrams.

IV—As a corollary to the conclusions of both papers in question, it would appear that it is time that the chemical standards for milk in the United States were placed on a more rational basis.

"It is easier to hold a prejudice than to examine facts."

A PLAN FOR GRADING MILK AS USED BY THE NEW YORK CITY HEALTH DEPARTMENT

OLE SALTHE, *Assistant Director,* Bureau of Food and Drugs, Department of Health of the City of New York

In considering a plan for grading milk for a large city a thorough knowledge must be had of the amount of milk supplied to the city, where it is produced, how transported to the city, where received in city and how the milk is delivered to the consumer. The lines of division should not be drawn until a careful survey of the local conditions has first been made. In New York City, for instance, it is estimated that about 2,000,000 quarts of milk is received daily. This milk is produced by about 45,000 dairies located in six different States. The dairies do not ship the milk direct but deliver it to a creamery, pasteurizing plant or shipping station, from which it is shipped to the city. There are about 1,200 such plants located in the country. The milk is then either taken to a pasteurizing plant or a distributing depot in the city, where it is transferred to small delivery wagons for delivery to the consumer or else it is delivered to the consumer or retail store direct from the milk platform.

An important feature to consider is the distribution of the supply and the uses to which it will be put.

First, and of primary importance, we have the infants and children who are dependent upon milk as a food. In New York City, with a population of 5,600,000, there are 267,816 babies under two years of age, of which 60% are breast-fed, while there are 593,901 children under five years of age. Estimating that an infant under two years of age requires about one pint of milk each day and that

a child from two to five years of age consumes one quart of milk each day, it would mean that there should be at least 379,648 quarts of Grade A Milk available, which would be about 19% of the total supply.

At the present time there are approximately 250,000 quarts (or 12½%) of Grade A Milk sold in the city daily.

Second, we have the invalid or adult who is dependent upon milk as a food.

Third, we have the adult who uses milk as a drink.

Fourth, we have the milk which is used for the manufacture of other foods or is used for cooking purposes exclusively.

It is apparent that milk for the different uses noted above should not be forced to measure up to equal degrees of purity and bacterial cleanliness.

In the first instance, we should have a milk of the highest degree of purity, which should be known as "Grade A." If this milk is to be consumed raw it should be produced by cows giving a milk of proper nutritive value. The cows should be healthy, as revealed by a physical examination, and free from tuberculosis, as shown by a proper tuberculin test, which test should be conducted by a properly-licensed veterinarian. The milk should be produced under extremely cleanly conditions and handled only by persons who are in good health, as shown by a physical examination made by a practicing physician. The physical examination of a milk handler should include Widal and Wasserman tests and should be made yearly, and no employee should be permitted to handle milk of this grade until he has submitted to such examination and has been found to be free from disease. This would eliminate the possible danger of having a typhoid carrier handle such milk. A bacterial standard of 60,000 per c. c. should

serve as an accurate index to the methods used in its production.

Milk produced under such conditions is, of course, expensive, and is not within the means of the average consumer. Therefore, the situation resolves itself into the problem of producing a milk surrounded by all the safeguards, but which can be sold at a moderate price.

The tuberculin test is required so as to have the milk produced by cows free from tuberculosis; the physical examination is required in order to eliminate any danger from a typhoid carrier; proper pasteurization would be just as effective as either.

In addition to requiring that the milk be pasteurized, a physical examination of the cow, together with care and cleanliness in the production of such reasonably-priced milk, should be required. The bacterial standard of 200,000 bacteria per c. c. would serve as an index to the methods used in the production and handling of the milk before pasteurization, and the standard of 30,000 bacteria per c. c. after pasteurization would serve as an index of the efficiency of the pasteurization.

This milk should be protected from any other contamination by being placed in a sealed container and delivered in such container to the consumer within the shortest possible time and never more than 36 hours after pasteurization. Containers should be properly sterilized before use. The care of such containers after sterilization is an important feature which is very often overlooked, considerable expense and time being devoted to thoroughly cleansing and sterilizing them only to have them stand unprotected and subjected to many kinds of contamination.

The enforcement of such regulations would result in having a certain percentage of milk satisfactory for infant feeding and for the invalid or adult who is dependent on milk as a food; and as the cost of producing such milk would be materially less than the cost of production of

Grade A Raw Milk, it would be sold at a price within the reach of any consumer. Such milk is known to us as Grade A Pasteurized.

The third case covers milk to be used by adults who do not need milk of such special requirements. While the restrictions governing the production and handling need not be as stringent as in the milk for infants' use, every effort should be made to make this milk entirely safe for human consumption so as to prevent any possible transmission of disease. It must, therefore, not be sold raw, so that this milk, called by us Grade B, is all required to be pasteurized. It is interesting to note that since the compulsory pasteurization of milk of this character in New York City, practically no typhoid epidemic of any consequence has been attributed to milk. This is especially interesting as the incidence of typhoid fever was very frequent in the city before this regulation was enacted, and several of the large epidemics were traced to typhoid carriers handling milk.

There should also be a bacterial standard for milk of this grade both before and after pasteurization. In New York City milk of this designation shall not contain more than 1,500,000 bacteria per c. c. when pasteurized in the city and not more than 300,000 bacteria per c. c. when pasteurized in the country. The two standards are necessary for the reason that the milk which is pasteurized in the city is transported from 60 to 400 miles before it reaches the pasteurizing plant and is, of course, older than milk which is delivered by the farmer direct to the pasteurizing plant in the country. No milk of this designation shall contain more than 100,000 bacteria per c. c. when delivered to the consumer or any time after pasteurization.

The fourth and last instance to be considered is that milk which is used exclusively for manufacturing or cooking, and is called by us Grade C. It would include milk not

conforming to the requirements of either Grade A or Grade B. As the use of this milk for manufacturing might not always mean that it would be heated to a temperature to destroy the pathogenic bacteria, and in some instances it might be used for drinking by persons who have no regard for the efforts of the Health Department to protect them from disease, it should be pasteurized, or be boiled for at least two minutes. The milk should only be sold in bulk, and not in bottles.

The third grade is also of value in administering the control of a milk supply of a large city. As, for instance, in cases where milk of the highest grades is not being produced or handled in accordance with the regulations governing their respective grades, and while the milk is not fit for infant feeding or for adult use it would be safe for cooking purposes, the officials in charge refuse to accept the milk as of the grade claimed and require it to be sold as of the lowest grade. It is a peculiar fact that in New York City there is no demand for Grade C Milk, and that where the Department thus degrades a milk supply the dealer immediately gets busy to have the unsatisfactory conditions removed. It is also interesting to note that when the grading of New York City's milk supply was first inaugurated on January 1, 1912, 40% of its supply fell within the requirements of Grade C, and in July, 1914, the amount of Grade C Milk sold in New York City was negligible.

Summarizing what has been said, the following are the essential features of the gradings. Their essentials are similar to those which form the basis of the grading of milk in New York City:

Grade A Raw.

1. Healthy cows; physical examination; tuberculin test.
2. Highest degree of perfection in method of production.
3. Healthy milk handlers.
4. Clean containers.
5. Bacterial control of the finished product.

Grade A Pasteurized.

1. Healthy cows; physical examination.
2. Clean methods of production; dairies scored by Department, 68.
3. Pasteurization.
4. Clean containers.
5. Bacterial Control.

Grade B Pasteurized.

1. Healthy cows, physical examination.
2. Clean methods of production; dairy score 55.
3. Pasteurization.
4. Bacterial control.

Grade C for Cooking.

1. Healthy cows, physical examination.
2. Pasteurization or boiling.
3. Bacterial control.

It is obvious that the lines of division will necessarily differ in different communities. In considering a plan for the grading of a milk supply, emphasis should be given to the fact that the sanitary character of the product is the fundamental basis for grading, and the principal method of determining this fact is through the constant testing of the milk to determine its bacterial content. With a well-organized system of regularly sampling the various

supplies being shipped into the city, a very accurate knowledge can be had not only of the methods of production but of the efficiency of the pasteurization. This information should also be the controlling factor in determining the activities of the dairy inspector so that his efforts should be devoted to such supplies as need the most attention.

Requiring a dealer to take out a permit to sell the various grades of milk, together with the labeling of each container of milk with the grade or designation to which it conforms, has been found to be very effective in administering the grading of a milk supply. In the first place, the dealer before he can obtain a permit must comply with the requirements for the various grades and must then label his milk with the grade or designation into which the milk falls. Thus the consumer is enabled to obtain the quality of milk he requires and for which he can afford to pay, which is very important in the case of infants and children.

In conclusion, the advantages to be had by adopting a grading system which is properly enforced are, from the consumer's point of view, the fact that he can obtain at all times a safe milk, and that such milk is guaranteed by the label to be of a certain quality. In the case of milk for infant feeding, he can obtain a milk which is especially produced for such use.

From the dealer's standpoint it will serve as an incentive to sell milk of the highest standards, and permit him to sell his milk according to its quality.

As to the producer, it will result in encouraging him to produce milk of a higher grade in order to obtain the premiums offered by the dealers for the higher grades. The continued effort of the dairyman to produce this high grade of milk will finally result in educating him to such an extent that he will not know how to produce any other kind.

DISCUSSION

QUESTION. I have seen in the newspapers recently a statement that in the districts where the epidemic of infantile paralysis held full sway and where there were some 2,500 babies fed daily with pasteurized milk from the S—— Milk Station, not a single one of these infants was subject to the epidemic. Has that come under the notice of the Health Department or is it merely a newspaper report?

MR. SALTHE. From the investigations made by the Department there was nothing to indicate that infantile paralysis was due to the milk, either raw or pasteurized.

DR. BROWN. There are one or two little matters I would like to mention as supplementary from a practical standpoint to what Mr. Salthe has so well said. The dairies, as a matter of fact, are scored by the creamery companies, and that scoring is impelled to a certain extent by the fact that the Health Department reserves for itself the right to inspect those dairies at any time, and if at any time any of those dairies, as inspected by the Health Department Inspector, fall below the standard set, the milk therefrom may be shut out from the supply. That is a fairly strong impelling motive on the part of the dealer to see that his dairies are inspected. As a matter of fact, our supervision of these dairies and control of them is chiefly exercised by means of the bacterial count.

It may be of interest to the organization to know that our Grade A Raw is only between one and two per cent of the total supply. It is also, I fancy, of interest to know that as far as I am able to find out, in spite of more or less scare-head talk, there doesn't seem to be any epidemic of rickets or scurvy in New York City as a result of feeding pasteurized milk.

DR. BARNARD. I have followed this discussion of the milk inspection in New York City with a great deal of interest. I have noted that he has not referred at all to

the old-fashioned method of milk inspection, which consisted, of course, in getting a bottle away from the dairyman and taking it to the laboratory to determine the butter-fat and solids content. I should like to ask Mr. Salthe whether the Department pays any particular attention at the present time to the quality of the milk as determined by these factors, butter-fat and total solids.

MR. SALTHE. The Department has a standard for butter-fat and total solids and all milk coming into the city must come up to that standard. It is constantly being inspected to see that it does come up to that standard. The Department has recently adopted a new standard of solids-not-fat, and that, with the purpose of raising the quality of the milk, is set at 8½ for solids-not-fat. That brought about more or less agitation on the part of the dealers. They felt they couldn't meet that standard. Mr. Brown has already delivered a paper on that in which he shows that the standards throughout the country are more or less unbalanced, and even this standard of ours is unbalanced. But the adoption of that standard has done this much good, in that the dealers throughout have changed their method of buying milk and now buy on a butter-fat basis, and I think it will result in a higher grade of milk.

QUESTION. Is the grade of certified milk maintained?

MR. SALTHE. Certified milk goes under Grade A Raw. When a dealer desires permission to ship Grade A milk into the State we have to give him a permit and we give him that permit only on condition that all dairies supplying milk to that creamery come up to the standard, or else are handled in another part of the creamery distinct from the room in which the Grade A milk is handled.

MR. STEVENSON. As I understand this grading it is done wholly on a sanitary basis, a basis which has to do with health, and what I can't see is this: why with our knowledge of the possibilities of disease coming through raw milk, why there should be a Grade A raw milk. We

know that some of our finest certified dairies have experienced epidemics; we know that some of them every once in a while will have the tuberculin test sprung on them and sometimes will have to turn out a large percentage of their cattle; how is it we can allow any raw milk to fall into the Grade A class?

MR. SALTHE. Why, personally I agree with you that we should not have any Grade A raw milk. We should not have any raw milk sold in the city; I think it should all be pasteurized; but we have certified milk which has been sold in the city and is surrounded by precautions which seem to reasonably safeguard it from any possible danger of transmission of disease. In New York City we have no record of any typhoid epidemic or any disease that has been actually traced to certified milk, and until we do we really have no basis for requiring the pasteurization of that milk.

MR. BATES. I would like to say a word for certified milk lest it fall into disrepute, because I am a firm believer in certified milk. From my own experience with it I would say that we haven't found anything comparable to certified milk as yet. And so far as "springing" the tuberculosis test on the certified dairies, that is something impossible because the regulations for certifying require a semi-annual test of all cows producing certified milk.

MR. SHAW. I have a dairy in mind that has the semi-annual tuberculin test, and there was a little bit of doubt in the minds of the powers that be as to just how that test had been conducted, so a couple of months before one was due they happened around and commanded the test to be made, and threw out about thirty per cent of the animals that had been passed right along each year.

DR. STATES. That might happen, but as a general rule I think the tuberculin test is carefully done.

MR. WM. B. PALMER. We had an experience with certified milk and the tuberculin test in which the same condi-

tion existed of which this gentleman spoke; we had about five or six hundred head of cattle in the herd and when the investigation was made 242 were taken out.

DR. SCHROEDER. At a meeting a few years ago the father of certified milk, Dr. Coit, said it wasn't fair that anyone should dictate to him, he being a baby doctor, as to whether he should feed raw or pasteurized milk to babies. He said, "If I want to feed raw milk, I want raw milk for that purpose. Let me tell you what I feed them; I feed them certified milk"—and then he paused, "but," he said, "it's boiled."

DR. STATES. If the records of certified milk producers were gone into carefully, the few isolated cases mentioned by these gentlemen, as compared with the size of the industry, would be almost negligible.

PROFESSOR RASMUSSEN. I would like to ask these gentlemen a question in regard to the standardization of milk. As we look upon it it is bringing the fat content to a definite percentage. Now then, what are the objections, for instance, in New York City to have milk sold on the market with 1% fat if you so desire, with 2% or 3%, or with 4% or 5% or 6% fat? Now a great difficulty that arises in the city is to get a milk from the standpoint of cost that can reach the poorer classes, and a 2% milk, for instance, for the feeding of the children of the poorer classes could be sold cheaper and would be practically as valuable for them. It is not a new thing, it is done in several European cities just for the sake of the class of people that can't afford to pay additional for butter-fat which is not as essential as some of the other constituents, and I hope in the further development of this grading of milk and labeling of milk that it may be graded and labeled not only as to its sanitary nature but also as to its fat content. And then we will gain one other point; we will eliminate all this great difficulty that we have in regard to so-called standards or legal limits, and whether milk

should be 3.5% or 3.2% or 3.1% fat in order to be sold, and according to the law.

DR. STATES. I would like to ask in the recent troubles during the milk strike in New York whether the price that the farmers get for their milk is regulated by the grade that it is sold as, as for example, Grade A and Grade B milk, sold for a different price; does the farmer or the producer get a different price for those grades?

MR. SALTHE. Yes, they do, most of the dealers pay a different price; they give a premium of perhaps 10 cents per 100 pounds for milk from dairies producing Grade A milk.

DR. BROWN. New York State has a very absurd law preventing the sale of skim milk, and it is a very peculiar law. It was evidently enacted in the old days of pan setting, because it doesn't allow the sale of skim milk at all in the counties of Kings and New York, which means the Borough of Manhattan and the Borough of Brooklyn at this time. It only allows the sale of skim milk in counties adjacent to that in which it was produced. Another thing, New York State has a law providing that milk shall be sold as it is produced, in other words, that it may not be manipulated, which would seem to prevent standardization, but still permit the mixing of the poor and high standard milk. I foresee one trouble, if standardization were practised and that would be the labeling trouble, particularly in the poorer parts of the larger cities, where "2%" on a label would not mean a great deal to the Italian woman in our upper East Side; or it might be that we would adopt such qualifications or classifications as "standard," "sub-standard" and "above standard," or such other classifications as might be determined.

QUESTION. Does each milk dealer score the dairy farms supplying him?

MR. SALTHE. We are requiring the dealers to score them.

QUESTION. And furnish the score to the Department?

MR. SALTHE. No, we check their scoring by taking samples of the milk as supplied by the farmers at the creamery to see that it complies with our standard; we do not require them to submit their reports to the office. We score all dairies supplying Grade A milk.

MR. KELLY. In that connection it occurs to me when you depend on the dealers to score dairies supplying Grade B milk, it might happen that some time a dealer would be getting all the Grade A milk he had a sale for, and a dairyman who had been producing Grade B milk would improve so as to score in Grade A class, but it would not be to the financial interest of the dealer to put him in Class A. Has that man any recourse? Can he apply to the Department to be scored?

MR. SALTHE. If such a request came in we would certainly score his dairy for him, but it probably would be hard under such market conditions as you mention for that dairyman to find a market for his milk. If his milk came up to the requirements of Grade A Raw we would give him a permit if he applied for it and he could ship his milk in himself, if he had a market; we would give him the permit; but if he came up to the requirements of Grade A Pasteurized, he would have no means for pasteurization.

DR. BROWN. May I suggest that we have within the past twelve months started a system requiring handlers of foodstuffs to undergo examination, and various tests. We applied them first to the hotel men and now we have issued orders to the milkmen that they shall furnish health certificates for their men—this side, we might say, of pasteurization, and in the raw milk plants.

"It is comparatively easy to perform almost any kind of work, but the value of any work is in having it performed so that the desired results may be most speedily reached."

SOME FINANCIAL FACTORS IN THE PRODUCTION OF MARKET MILK

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The editorials in the May issue of the *Milk Dealer,* a paper devoted principally to the city milk trade, commented upon the following topics:

1. The effect upon the price of milk in other parts of the country of the recent milk strike in Chicago, which resulted in an increase in price of milk to the farmer from 1.33 to 1.55 per hundred pounds.

2. The effect of an increase in the price of milk to the consumer from eight cents to nine cents per quart, which it is said was disapproved by the Chicago Board of Health.

3. In Cleveland the Housewives' League and other women's organizations, numbering 15,000, are up in arms because the producer asked for a higher price, which will make it necessary for the milk dealers to increase the retail price of milk.

4. The Massachusetts Legislature again gets honorable mention this year as having introduced its full quota of bills affecting the dairy industry.

5. Attention is also called to the fact that Waukesha Spring water, which comes from a territory which supplies a great deal of milk for the city of Milwaukee, is selling at the rate of 15 cents for a two-quart bottle, while pasteurized milk is selling for 6 cents per quart.

Today the newspapers in the east, especially in New York, Pennsylvania and New Jersey, are commenting daily on the milk situation. Meetings are held throughout these States discussing the various problems in production and distribution, and investigations are being made by agricul-

tural agencies. The chambers of commerce of the large cities are holding hearings before farmers and milk distributers and are trying to investigate this whole milk problem. Even the Congress of the United States has been appealed to and has asked the Department of Agriculture to make an investigation of the economic condition in the production and distribution of milk.

The writings in the newspapers, the meetings and investigations indicate to the public that the production and distribution of milk is in an unsatisfactory condition and that the milk business of this country is no longer just the problem of the dairy farmers and a few milk distributers, but that it is one of the nation's serious food problems. The serious condition which has arisen reflects, on the one side, the dairy farmer struggling to get an increase in the price of milk to meet the increased cost of production; on the other side, the consuming public rapidly becoming organized trying to prevent an increase in the price of milk and at the same time clamoring for a better product, both from the standpoint of composition and sanitation, without knowing how much it costs to produce and deliver milk or knowing how the food value compares with that of other products. Between the producer and consumer stand the Board of Health and the milk dealers. The Board of Health is a part of the city or town government, and its sympathies are more generally with the consumer. The milk dealer's position is not always to be envied. On the one hand, there is a continuous demand from the farmer for higher prices, on the other hand a concentrated effort and unreasonable attitude on the part of the consumer against an increase in price of milk. In addition to this, the milk dealer never knows when changes in State laws or Board of Health regulations in regard to the sale and distribution of milk will increase the expense and difficulty of handling and distributing milk.

The financial factors in the production of milk may be divided into two classes, direct and indirect. The direct factors are those necessary for actually obtaining a certain amount of milk from a cow, while the indirect factors are those which determine the conditions under which the milk should be produced and handled and the quality of milk which can be sold. Under indirect factors should also be classed general economic factors in the development of the dairy industry and agriculture.

Direct Factors. In figuring the cost of producing milk, the items of expense are generally divided into feed, labor and overhead charges, which latter includes interest and depreciation on money invested in dairy buildings, equipment and cows, taxes, insurance, cost of keeping bull, veterinary services, bedding, ice, coal or wood, perishable tools, such as cards, brushes, books, etc., and delivery of the milk.

The following table will show the relative importance of each factor to the total cost of producing milk. In comparing these factors it will be seen that the feed cost represents about one-half the total cost, the labor a little over one-fifth, and cattle about one-tenth. In other words, feed, labor and cattle represent 85 to 90 per cent of the total cost of keeping a cow, while all other items represent the other ten to fifteen per cent.

It should also be noted that of the three sources of income from the cow, the milk, the calf and the manure, the milk must represent from 85 to 90 per cent of the total expenses to make the cow pay for her keep.

PERCENTAGE COST OF FACTORS IN PRODUCTION OF MILK

	Mass.	Conn.	N. J.	N. H.	Larson Col. Univ.	Del. Co. N. Y
Feed	54.3	57.6	63.3	49.4	52.7	67.8
Labor	21.5	21.8	22.4	21.8	18.9	18.6
Taxes, cattle	10.1	11.3	7.8	9.0	6.5	2.0
Miscellaneous	5.5	1.3		3.0	4.5	0.9
Buildings	4.6	2.5	2.6	6.1	5.7	4.4
Keep of Bull	2.4	1.9	1.0	2.5	2.5	
Equipment	0.7			0.3		0.4
Bedding		3.2	2.7	2.7	2.3	0.8
Hauling milk				4.8	6.9	5.0

PERCENTAGE RETURN OF FACTORS IN PRODUCTION

	Mass.	Conn.	N. J.	N. H.	Larson Col. Univ.	Del. Co. N. Y	
Manure	9.2	6.5	10.4	10.1	13.2	7.5	
Calf	1.2	3.2	3.1	2.0	1.9		
						2.7	(Other return)
Balance for milk	89.6	90.3	86.5	87.9	84.9	89.8	

COMPARISON OF INCREASE IN COST OF PRODUCTION WITH INCREASE IN PRICE OBTAINED FOR MILK

The following table shows the increase in the cost of the most common feeds and the increase in price of milk to the farmer covering the period from 1904 to 1915, a period of twelve years. The prices for hay and grain have been obtained from quotations of the Boston Chamber of Commerce; the price per quart of milk to the farmers is the price paid in the middle zone by one of the large milk contractors in Boston:

Articles	Prices in 1904	Prices in 1912	Increase in per cent 1912	Prices 1915	Increase in per cent 1915
Hay, grade No. 2, per ton	$13-$16.50	$21.50-$28	57.7-64.7	$22.10	50.0
Linseed meal per ton	25.17	39.30	56.2	37.38	48.5
Distiller's grain per ton	24.31	39.94	35.5		
Bran per ton	20.87	27.96	34.4	25.20	20.7
Gluten feed per ton	24.24	31.51	29.9	30.70	29.0
Corn meal per ton	23.68	30.20	27.5	32.22	36.1
Cottonseed meal per ton	26.52	31.20	17.6	33.45	26.1
Milk: Farmer's price per quart (cents)	3.24	3.90	20.4	3.9	20.4

This table shows that the food cost of producing a quart of milk, which is one-half the total cost, has increased over 30 per cent, while the increase in the price of milk is only 20.4 per cent. (Since these figures were compiled, the costs of feed, cattle, labor and milk have greatly increased.) Farm labor has increased during the same period about 50 per cent, taking into consideration the fewer hours worked and the higher cost of living. Cows have increased in value about thirty per cent. Not only have the various factors entering into the cost of producing milk increased far in advance of the increase in the price of milk, but at the same time the necessities of the farmer and his family have increased in price.

Indirect Financial Factors. Besides the constant increase in the cost of feed, labor, cows and other direct factors entering into the cost of producing milk indirectly, the cost has been further increased through municipal regulations and State laws. In certain sections of the country the dairy farmers have suffered financially from unwise and unwarranted legislation. As an illustration can be cited the legal limits for milk in Massachusetts and New Hampshire. The Massachusetts standards for milk for several years were 13% total solids and 3.7% fat from October to April, and 12% total solids and 3% fat from April to October. Here is a piece of legislation which not only

injured the industry economically, but it is also the kind of legislation which today is responsible for the suspicion with which the dairy farmer looks upon the many health and dairy laws which are continually introduced into our legislatures.

What did this law mean? It meant that the legislatures had decided that milk of probably over 90 per cent of the Holstein cows and from a large number of Ayrshire cows kept in New England could not be sold for human consumption. It had discriminated against breeds of cattle that for centuries had enriched the farmers in Holland and Scotland, made possible a profitable agriculture, and yielded a cheap and healthful human food. This law said to the farmer, "If you sell milk from these breeds of cattle you are dishonest and you will be brought up into the criminal court and prosecuted along with robbers and thieves."

The fact that this standard has been repealed and changed is an acknowledgment of its being unjust. It is comparatively easy to change a standard which is found unjust, but it is not so easy, and in many cases it is impossible, to compensate those who suffered injustice under such a law. Have those who paid the fine under this unjust standard received their money back? Have those who were humiliated by being pulled into a criminal court been exonerated? Has anything been done to help the industry which suffered under this standard? Some farmers became discouraged and quit the dairy business; others, in order to produce milk up to the unreasonable requirement, started to cross the Holstein and the Ayrshire breed with Jersey and Guernsey. The results are still evident in the many poor, unprofitable dairy cows on the New England farms. The farmer suffered, the dairy industry suffered, agriculture suffered, and no one was benefited, not even the consumer.

It is also interesting to note that it was lawful to sell milk containing 3% fat and 12% solids September 30th,

but on the first of October the man who sold such milk was a criminal. There was no logic, no wisdom nor necessity for such legislation.

The question of chemical standards specifying the legal limits for composition of milk is gradually being settled throughout the country. Today the attention is centered upon another class of standards dealing with the conditions under which milk is produced and the number and kinds of bacteria in milk. It is only a few years that efforts have been made to apply bacteriological principles to dairy work, and although considerable experimental work has been done to determine the sources and significance of bacteria in milk the knowledge on the subject is still limited. Scientists disagree as to the relative importance of different sources of bacteria as well as the significance of various kinds of bacteria in milk. The question arises, are the dairy farmer and the dairy industry to suffer from the introduction of a sanitary standard based upon very limited knowledge, the same as was the case when chemical standards were first introduced, and is the industry to suffer from misinterpretation of bacterial analysis?

The number of bacteria found in milk offered for sale is limited by regulations in many cities throughout the country. Bacterial counts are of extreme value to Health Officers and Boards of Health in locating undesirable conditions; but arbitrary bacterial standards should not with our limited knowledge be made a basis for prosecution, unless the offender has had an opportunity to improve his conditions.

Although numbers of bacteria may indicate the general condition under which milk has been produced and handled, the number alone is not always an indication of the safety of the milk, so at present efforts are being made to judge

the wholesomeness of milk by considering the kinds of bacteria found.

The significance of the colon ærogenes group and the streptococci in milk is not fully established. According to recent work of the Dairy Division, the presence of colon bacilli in milk can not have the same significance as the presence of colon bacilli in water, which is generally associated with sewage contamination, and yet such interpretations are being made. A positive laboratory test for colon bacilli does not, apparently, absolutely prove fecal contamination from bovine origin, as types of colon bacilli have been found on corn, oats, wheat and barley. Streptococci in milk is taken as an indication of inflammation of the cow's udder and the possible source of sore throat. Epidemics of sore throat have been traced to the cow based upon the finding of streptococci in milk, and yet investigations at the University of Wisconsin and Pennsylvania State College show that many normal healthy cows have streptococci within their udders, which, as far as can be determined, are identical with those which cause inflammation of the udder and septic sore throat. These organisms have been found frequently in certified milk and other high grade milk from healthy herds. From very recent work by Dr. Sherman, of Pennsylvania State College, it appears that the present methods of differentiating between lactic acid streptococci and pathogenic streptococci, which is commonly used in health laboratories, is unreliable.

If mistakes have been made in tracing the source of these diseases to milk or other dairy products a financial injury has been inflicted not only upon the individual dairy farmer or milk dealer, but upon the dairy industry as a whole.

There are many economic factors which have contributed to the dissatisfaction in the production of milk. The milk industry is going through a period of transition and adjustment. Owing to the low price paid for milk the territories

supplying milk for the large cities have been constantly widening. The farmer who changes from selling milk or cream to a creamery to selling milk for direct consumption knows very little, if anything, in regard to the cost of producing milk under new conditions and regulations. With the change in the market for the milk there generally follows a change in farm operation. Having no skim milk on the farm the number of calves, pigs and chickens formerly kept is decreased and the decreased revenue from this source may not be equalled by the slightly higher prices received for the milk.

Furthermore, the method of buying milk by milk distributers has been unsatisfactory in two respects:

First, milk has until very recently been paid for without regard to quality; the cheapest and poorest milk determines the price.

Secondly, in few places in this country have the milk producers had an opportunity to bargain in regard to the price of milk. It has nearly always been a case of accepting on short notice a certain price offered. The fact that farmers have not made use of collective bargaining and the fact that it has been possible for the milk buyer to find new fields to exploit, has made it possible for a time to continue business with methods which are contrary to good business principles.

Farmers, as a class, are slow to change and slow to organize. It has been the history throughout the world that cooperation among farmers only develops under economic pressure. The fact that the milk producers in the eastern part of the United States are today organizing to save their industry from financial ruin is the best evidence of the intensity of the economic pressure the industry is suffering.

In this paper I have tried to present some of the direct and indirect financial factors in the production of milk and their relation to the present crisis in which we find

the milk business today. Reference has been made to unwise legislation and doubtful laboratory methods. In making these statements I wish to make clear that it is not in any way my intention to reflect discredit to public health work. Personally I have the highest regard for the work of boards of health, health officers, and milk and dairy inspectors in their effort to protect the public health. Information and judgment believed to be correct and reliable have sometimes been proven to be wrong. Those who, prompted by an earnest desire to serve the public, used this information, believed to be correct, should not be blamed. The mistakes of the past should be a warning for the future, and my plea to the members of the International Association of Dairy and Milk Inspectors in the splendid work they are doing is to remember, strange as it may seem to some of you, that dairy farming and the dairy industry are still in their infancy, undeveloped and unadjusted to economic laws. During the readjustment which is going on the financial rewards are very small and the risks are great.

Use your influence and best efforts to have milk sold on the basis of food value and quality and at the same time help to make the public recognize quality in milk. An increase in the price of milk is sure to come. In the regulations and laws which you will help to formulate be deliberate and conservative and consider the economic as well as the health problem.

DISCUSSION

MR. LYTHGOE. I think perhaps some explanation might as well be made with reference to Professor Rasmussen's remarks concerning the peculiar double standard that Massachusetts had some years ago. This was passed some forty years ago when our Legislature was controlled by the farmers of this State; the farmers made the standard,

and the standard wasn't changed until the time came when the farmers lost control of the Legislature. I was informed by my predecessor in office that the farmers said their cows didn't give as good milk in summer as in winter and therefore they demanded a little more leeway. The 13% standard was never enforced in this State, the enforcement of the law was based on 12% total solids, and when it came to the Legislature they raised the summer standard from 12 to 13 and lowered the winter standard to 13. Twelve and fifteenth one-hundredths total solids is our standard at present, and our fat standard should be 3.8%. The milk sold throughout this State has an average basis of 12.7% solids and 3.9% fat. Those figures are based on the analysis of some seven to nine thousand samples of commercial milk, made by the State Department of Health every year.

PROFESSOR RASMUSSEN. Mr. President, the farmers don't know what is good for them when it comes to milk legislation. When you say that you want to have a fat standard of 3.8% and you claim that is the average, do you realize that when you make such a standard you are eliminating half of the cows whose milk is now being shipped into Boston? When you make it a standard which is limiting the sale of that milk the chances are you eliminate more than half of all the cows producing milk for Boston, and if such a standard were enforced you would all be crying for milk in the city of Boston, and I hope you will look at that in some other light. It is not the question of the milk, it is not the standard you are after, but it is a legal milk, a minimum legal limit for the sale of milk, and even if you put that legal limit at 3.35% there is a great deal of milk sold that is above that and it would be most unfortunate for the people of the city of Boston if such a standard of 3.8% should ever be enforced, and it never will, I can assure you of that.

MR. LYTHGOE. What I meant was that a standard for fat corresponding to our total solids standard should be 3.8% fat, and as a matter of fact 95% of the milk sold in Boston is above the standard of 3.35% fat, and the average throughout Massachusetts for the year is 3.8% to 3.9%. I am not advocating that standard, but I am stating the character of the milk which is being sold in Massachusetts. A milk dealer told me yesterday that when milk falls below or much below 4% in fat the consumer kicks, and the consumer in Massachusetts is accustomed to look for a fat content of about 4%, that has been the kind of milk sold in Massachusetts for years.

MR. BOWMAN. I would like to ask this gentleman whether, in his opinion, if Massachusetts should pass grading laws similar to those in force in New York, whether it would improve the condition of the dairymen materially in his State?

PROFESSOR RASMUSSEN. Well, I have not advocated that; it all depends on how it is worked out. You have got to have this in mind; that as long as the farmer is producing milk and he doesn't get paid for it in proportion to the effort that is put into production, into the quality of the milk, so long will the lowest grade of milk determine the price. In other words, you will not get a 4% milk at a low price when you can sell 3.5% milk for the same price, and so you see you must pay the farmer, and that is what the milk dealers are coming to now after they have for many years to their own satisfaction taken in that 4% and 5% milk and paid just the same for it as they paid for 3.35% milk. Now that is one of the great troubles today; the farmers were not paid for that good milk and so they have gone out of the business or they have changed to keeping Holstein cows. That is what brought the Holstein cows into the milk sections of this country, is the low price paid and the fact that they never paid on a basis of fat and solids. Now this matter will

be adjusted; it can't go on any further, they will have to pay according to quality.

You can't make the consumer see the difference in milk. A bottle of milk is white. If it is clarified there is no dirt in the bottom and it all looks alike. You can go into a store and you can see three kinds of apples, some are good and some are bad, and the consumer can see it; you can go to buy meat and if it becomes decomposed it will smell, and the consumer can smell, so he doesn't buy it. Now, then, here you have this product of milk; the only way the consumer can recognize the quality of that milk is to have the quality indicated on the bottle. We will never have milk sold on quality until we get it labeled, and you see now the dairies beginning to buy on the fat content, exclusively, and it isn't such a great step to selling on fat content, it would be just as practical as buying on a fat content, and I hope that this gentleman from New York will interest himself, as he says he is doing, in getting that ridiculous law changed in New York State that you can't sell skim milk, a most valuable food product, especially in these times of high prices. You could do no greater service to the farmers of New York State and to the consumers in New York City than having such a ridiculous law eliminated from the statutes.

"It is well to have a high ideal, but an idealism too lofty to take into account the hard facts of life can be of no practical service."

THE CONTROL AND PREVENTION OF INFECTIOUS DISEASES OF CATTLE

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The control and prevention of infectious diseases among cattle is a large subject for a short paper, and one which has received so much attention and has been so often and so widely discussed that you must not be surprised if I fail to say anything radically new on it, or anything with which you are not already acquainted.

To deal with each disease separately would require more time than we have at our disposal, and this really is not necessary, as the various infectious diseases of cattle may be divided into a comparatively small number of groups, each with several members that require practically identical measures for their control and prevention. The groups I have in mind are as follows:

1. Diseases which are infectious but not contagious and require an intermediate host for their transmission from infected to susceptible animals.
2. Diseases which are superlatively contagious and may spread over an enormous territory with uncanny readiness and rapidity.
3. Diseases which are charged to the pathogenic activity of virtually ubiquitous bacteria.
4. Diseases which are regional or enzootic in their character; and,
5. Diseases that are caused by bacteria which are, as far as we know, obligatory parasites.

In the first group, the diseases which require an intermediate host, we have only one of great importance among the cattle of our country; namely, Texas or Southern

Cattle Fever. The only agent through which the infectious material of this disease is known to enter the bodies of cattle is the cattle tick, and the work now in progress to exterminate the tick promises that the disease will soon cease to exist in the United States. All those who are interested in the welfare of animal industry, and owners of cattle in tick-infested territory above all others, should cooperate in every reasonable way with government and other activities for the extermination of cattle ticks, so that this excellent work may be pushed forward as rapidly as possible.

Apart from the harm cattle ticks do as carriers of a serious infectious disease, which has made it necessary to quarantine the cattle in one portion of the country against those in another, they are parasites which cause great losses through irritating the skin and sucking the blood of the cattle they infest. How great the irritation is may be judged from the fact that it is not uncommon in a heavily-infested region for thousands of ticks in all stages of development to be attached to the skin of an animal at one time, and the quantity of blood they abstract may be judged from the fact that an adult female tick is approximately five thousand times as heavy as a larval tick, and that this enormous multiplication in weight, entirely at the expense of the tick-infested animal, requires only about three weeks. Even if the cattle tick were not the unique carrier of an important infectious disease, true economy would require its extermination.

A good example of the second group of diseases, the superlatively contagious, is foot and mouth disease. Other, fortunately also foreign, members are rinderpest and contagious pleuropneumonia. Most of us know from recent experience the readiness and rapidity with which foot and mouth disease may be disseminated over an enormous territory. The evil may spread so quickly, indeed, that we are almost prompted to believe that its specific, etiological

material is capable of traveling from place to place without tangible means for its transportation.

The control and prevention of diseases which belong in this group require, first of all, the stringent enforcement of broad, comprehensive quarantine measures, directed not only against all cattle and other susceptible animals located in either permanently or temporarily infected countries, but likewise against all products of such countries in which the infection may be hidden and retain its virulence.

When a disease of this group, notwithstanding the barriers erected to exclude it, enters the country, a possibility experience has repeatedly proved, and an occurrence which those who know how long disease germs may persist and remain virulent in some media and what the dangers incident to apparently healthy carriers and disseminators of disease germs are constantly bear in mind, I can think of nothing better to recommend than the unfaltering, courageous use of the methods through which contagious pleuro-pneumonia of cattle was finally eradicated in the United States something more than a quarter of a century ago and which, more recently, succeeded in suppressing outbreaks of foot and mouth disease, and prevented this great, destructive plague, not only of cattle but also of other species of animals, from permanently establishing itself.

We cannot afford to temporize with plagues like foot and mouth disease, rinderpest and contagious pleuro-pneumonia. The slaughter and safe disposal of every infected and exposed animal; the sterilization of every infected premises and all infected or possibly infected material; the restrictions which must be placed against the movement of animals and animal and farm products, etc., will impress no one as extravagant after a comparison between the cost of these measures as practiced in our country and the losses which have been suffered in countries where less

radical measures were deemed sufficient or were prompted by economic conditions.

It is hardly necessary to add that strict, obligatory notification laws should be enforced regarding all members of this group of diseases.

The third group comprises those diseases about which our knowledge has remained vague and uncertain, and which are commonly charged to the pathogenic activity of virtually ubiquitous bacteria, or bacteria which occur almost everywhere as saprophytes with facultative, parasitic qualities, and which at times assume a virulent, specific, pathogenic character. In this group belong the septicæmias, sapremias or septic intoxications, the pneumonias, diarrheas, etc.

For the time being we must seek to control the members of this group by providing the economically best obtainable, sanitary conditions for our cattle.

Why saprophytic bacteria which are abundant everywhere should at times assume or acquire virulent, pathogenic qualities is a question for which I have not been able to find a satisfactory answer. We may assume that various strains of saprophytes are ready to become parasitic and to acquire pernicious, pathogenic qualities when they enter the bodies of animals in which normal disease-resisting vitality has been lowered through exposure to adverse conditions. In the bodies of such animals the bacteria, it seems, may become true pathogenic parasites, with their power to multiply as parasites enhanced and that of living as saprophytes probably decreased; and when this occurs, animals in normal, vigorous condition, with their disease-resisting powers unimpaired, may become their victims.

The fostering causes of this group of infectious diseases, unless my conception of their etiology is erroneous, are dirty, wet and poorly-ventilated stables, in which cattle breathe an atmosphere saturated with ammonia and other volatile products of decomposition; spoiled, mouldy and

innutritious food; drinking water contaminated with decomposing animal or vegetable matter; repeated exposure to great variations of temperature and humidity, such as would occur through turning cattle out from tightly-closed, crowded and humid stables during cold weather; unduly taxing the energies of animals by long journeys or otherwise; gross irregularities in the time of feeding and watering; carelessness in treating and disinfecting cuts, scratches, punctures, bruises and wounds of other kinds, etc.

The third group, as it impresses me and as I have tried to define it, seems to form a link between the true, specific, infectious and the non-infectious diseases. Unlike the non-infectious diseases, the members of the group do not occur without the agency of specific, living viruses, but the viruses, unless their parasitic tendencies and their pathogenic virulence are first greatly reinforced, as a rule lack the potency required for successful attacks unless they act in co-operation with one or more of the causes of non-infectious diseases.

The periodic free use of simple disinfectants like lime in and about stables and yards; avoidance of the fostering causes; segregation of all sick animals the moment symptoms are observed, and careful disinfection of places which may have become contaminated with facultative pathogenic germs which have enhanced their virulence through a parasitic, pathogenic career, should do much to control and prevent diseases of the third group among cattle.

In the fourth group of diseases, the regional or enzootic, I place anthrax, blackleg, malignant edema, etc., the ravages of which are largely restricted to definite regions or districts. We must not assume from this statement, however, that the diseases of this group do not occur beyond the limits of the regions to which they are more commonly restricted, and in which they cause the greatest losses, because the contrary is true; and, further, we must keep in mind that many regions now free from infection

offer ideally perfect conditions in their general character to long harbor the germs of anthrax and blackleg once they are introduced.

In badly-infected regions I know of no better way to control and prevent anthrax and blackleg than through the use of vaccines.

At times the occurrence of these diseases in infected regions is due to the existence of the infection in relatively small areas, in some instances in single fields or pastures. Where this is the case no effort should be spared to clean up the danger spots through drainage, cultivation, etc.

As carelessness in dealing with material infected with the bacteria and spores of anthrax and blackleg, diseases intimately related to the soil and infectious through the soil rather than through contact between healthy and affected animals, will gradually enlarge the already infected regions and establish the infection in more or less remote, previously uninfected regions, it seems only reasonable to insist on the strict enforcement of obligatory notification laws, supplemented by the employment of qualified agents to supervise the safe disposal of the carcasses of all anthrax and blackleg animals and the proper disinfection of all infected premises and materials.

Relative to the disposal of the carcasses of animals which have succumbed to disease much can be said. The practice of leaving such carcasses on the surface of the ground or burying them in shallow graves, even when it is definitely known that the cause of death was an infectious disease, is altogether too common and cannot be too severely condemned. Every animal that dies of anthrax or blackleg, diseases due to germs which produce spores that are remarkably resistant to natural germ-destroying agencies, the carcass of which is left on the surface of the ground to be disposed of by scavengers, dogs among others, or

which is buried in a shallow grave from which scavengers may easily exhume it, is a serious, potential danger.

We may reasonably say, the carcass of a foot and mouth disease animal left on the surface of the ground in a cattle or hog country is like a spark in a powder mill; the carcass of an anthrax animal under similar conditions like an ember in a tinder house. In one instance we may not get an explosion; in the other we may escape a conflagration, but I am confident that no one acquainted with the facts would care to shoulder the responsibility for the safety of either the mill or the house.

When an animal dies and no better way to dispose of the carcass is economically possible, it should be buried deeply, preferably with an abundance of unslaked lime. On the surface of the ground or in a shallow grave, even though it is the carcass of an animal wholly free from infection, it is a disease menace, because it attracts and forms a center for the congregation of scavengers which may recently have fed on infected carcasses.

Dogs are gregarious animals; their social instincts are strong; they are naturally carnivorous scavengers and prefer thoroughly-ripe to fresh meat. Add to this that regurgitation of food to relieve an over-distended stomach is a voluntary act with them and that they have the habit of carrying off and hiding surplus food in shallow burrows, and it will require neither a highly-imaginative nor credulous mind to realize that the accessible body of a dead cow or horse is quite apt, almost certain, to originate a canine joy-party and feast, with immense possibilities in the line of contributions to the persistence and wider prevalence of infectious diseases among cattle and other animals.

I do not say this because I dislike dogs or am trying to find fault with them; I own several and my affection for them is quite warm, but it has not occurred to me to

leave the disposal of the dead animals for which I am responsible to them, and I do not intend, if I can possibly prevent it, that they shall indulge themselves in the pleasure of feasting on the carcasses for which my neighbors are responsible.

We all owe our neighbors a fair degree of consideration, amply sufficient at least to inspire the wish that they may escape such losses through disease among their animals as we may prevent by doing our plain duty; hence, we should not be careless or indifferent about this matter of disposing of dead animals. And we should have sufficient self-interest, and the courage to assert it, whenever a neighbor, through carelessness, indifference, selfishness, parsimony or laziness, fails to do his duty in this respect. He should be called to account and it should be made evident to him that we will not tolerate a disposal of the dead carcasses for which he is responsible that threatens us with losses.

I have gone into this matter at considerable length, because I am convinced that the proper disposal of the bodies of dead animals is an extremely important link in the chain of things that urgently require attention in our fight for the suppression of infectious diseases among animals.

And now we will take up the last of the five groups into which I have divided the infectious diseases of cattle, or the group reserved for diseases induced by bacteria which are, as far as we are informed, strict, obligatory parasites, or bacteria that multiply nowhere in nature separated from the bodies of the victims of the pathological lesions they cause. The two important members of the group, probably the most important diseases with which the cattle of our country are ordinarily plagued, are tuberculosis and infectious abortion disease.

It may be well to introduce my remarks concerning these diseases by saying: About one, tuberculosis, much can be asserted with confidence and assurance, because we know a good deal about it; but about the other, abortion disease, our assertions must be made with hesitation and uncertainty, because we know very little about it beyond the fact that it is an expensive, infectious evil of which the magnitude has increased in recent years with alarming rapidity.

Both diseases are chronic in their general character; their occurrence requires the exposure of uninfected to previously-infected animals or to something that has emanated from the bodies of previously-infected animals. Tuberculosis, as a rule with relatively few exceptions, is not easily or readily transmitted from animal to animal; its development commonly requires prolonged or severe exposure to infection or exposure under conditions especially favorable for its development. Regarding abortion disease we don't know; we can simply theorize on how infection occurs and what the conditions that favor its occurrence are. We have learned something about how abortion bacilli are carried in and expelled from the bodies of infected animals, but to assert, either, that slight contact with infectious material is sufficient, or that prolonged contact is required, to impart the disease, is not fair, unless we qualify the assertion by saying that we are trying to aim, but are not certainly pointing, at the truth.

Tuberculosis has become the most widely disseminated of all infectious diseases not because it is intensely contagious like foot and mouth disease; not because its specific, etiological factor can multiply as a saprophyte like the germs of the third group of diseases; not because its germs can be transported great distances without loss of pathogenic virulence on the bodies of flies or other insects or in the form of dust, and not because its germ produces spores, like the bacteria of anthrax and blackleg, which are almost indestructible through natural, germicidal agencies, but,

plainly, because in most instances it is a very chronic disease, the victims of which fail to manifest symptoms of impaired health until long after they have become active, dangerous disseminators of virulent tubercle bacilli. I can compare this insidious plague to nothing better than an assassin who strikes down an unsuspecting victim in the dark, and who, therefore, requires neither superior courage, skill, strength or weapons. An unguarded victim, darkness and a common club is all the villain needs to do murder.

From some points of view the same statements seem to apply to abortion disease. Either or both diseases may be introduced into a herd through the addition of a single animal which shows no physical signs of its singly or doubly dangerous character, or no signs which can be detected through other methods than special tests for tuberculosis and abortion disease.

Much work has been done to find methods of treatment for and immunization against tuberculosis and abortion disease, but so far nothing truly satisfactory has been found. Cattle may be made strongly resistant to infection with tubercle bacilli through a method of vaccination about which much more was heard a few years ago than now. The method was justly discredited because it was not without danger for cattle and moreover implanted in their bodies tubercle baccili of a kind which are particularly virulent for human beings. We cannot afford to protect the health of domestic animals through practices that endanger human health; the price is too high.

The statements made by different investigators regarding the treatment of cattle for, and their immunization against abortion disease are so contradictory that little practical reliance can be placed on them for the present. The best results seem to have been obtained with injections of living cultures of abortion bacilli, but this impresses me

as a superlatively mischievous procedure unless it is practiced exclusively in herds in which abortion disease actually exists, because cows injected with living abortion bacilli may easily become chronic or long persistent carriers and disseminators of abortion bacilli. Once the disease has entered a herd, of course, anything, including the injection of living cultures of abortion bacilli, may be tried to reduce losses, and if such injections prove satisfactory in the course of time it may be well to make them into uninfected animals which are intended for introduction into infected herds.

If I were the owner of a herd of cattle free from tuberculosis and abortion disease, I would take no chances with methods of immunization, or specific preventive treatment, in any sense connected with the use of living disease germs. Tuberculosis and abortion disease, to be sure, are uncomfortably common diseases among the cattle of our country, but they are not common enough to justify the adoption of wholesale vaccination against them. As a general principle, healthy animals should be kept healthy by measures which protect them against the causes and sources of disease, and not through artificially-induced immunity against attacks of disease germs.

I have referred to special tests for tuberculosis and abortion disease, concerning which I may add that when they are properly and conscientiously made, they are a better and far more reliable means for detecting these diseases than the most searching physical examination. The tests are the tuberculin test for tuberculosis and the agglutination test for abortion disease.

The tuberculin test gives no information relative to the age and extent of tuberculosis disease in a tuberculous animal, and does not record the presence of tubercle bacilli from which no disease has arisen but may shortly arise, and the agglutination test does not record whether a cow has aborted or will abort. The tuberculin test records the presence of lesions of tuberculosis and the agglutination

test the presence of infection with the germs of abortion disease, and the animal which reacts with either test is not safe for introduction into a healthy herd. Possibly, and quite probably, the agglutination test for abortion disease may not record the presence of infection until abortion bacilli have been in the body of an animal long enough to stimulate the production of agglutinating substances. If we take the defined limitation of the two tests into consideration, it will at once become apparent that an animal, shortly after removal from exposure to tuberculosis or abortion disease, may fail to react and yet soon develop either or both diseases and become positively dangerous; hence, if I wished to keep my herd free from the two diseases, I would set apart a quarantine pen in which every animal from without would be required to spend a period of time long enough either to expel all tubercle and abortion bacilli which may have entered its body without establishing themselves in it, or until those changes had been caused in its body by possibly present germs upon which the tuberculin and abortion tests depend, and then, and not until then, I would make the tests or have them made.

If the animal failed to react, it would be regarded as fit to enter my herd; if it reacted, I would congratulate myself that it had not had a chance to infect my herd.

This procedure is not expensive, and it is certainly worth something to keep such destructive evils as tuberculosis and abortion disease out of our herds, and to aid in this way in checking their general spread. The period of quarantine in the special pen should be approximately three months.

In addition to this precaution, I would keep my herd as nearly as possible in a true state of segregation from other herds. This may sound like a difficult proposition, but when we bear in mind that domestic animals are normally

prisoners, and more or less perfectly segregated, it should not be difficult.

Where the safety of my own herd was concerned, I would not place too much reliance on tuberculin and agglutination test certificates, or historical records of animals, prepared under the supervision, or for the use of, substantially interested parties, because, though I am convinced that most men are honest, it cannot be overlooked that some men have shown moral delinquencies when temptation approached them through their purses.

Another thing I would avoid is contact between my herd and everything that emanated from another herd; as, for example, I would feed no product returned from a public creamery, at least not until it had been exposed to some process fatal to tubercle and abortion bacilli.

So much for a healthy herd. A tuberculous herd I would try to clean, not by slaughtering every animal that reacted with tuberculin, but by separating the healthy from the tuberculous members of the herd, and gradually disposing of the tuberculous members as their places could be taken by their own healthy progeny and the offspring of the healthy members. Tuberculosis is truly a contact disease, and is transmitted from subject to subject only through direct and indirect contact, of a kind which can easily be comprehended and prevented by persons of average intelligence when its nature is defined to them. If results can be obtained as easily in general practice as I have obtained them in actual tests at small expense, the control and eradication of tuberculosis among cattle should make rapid strides.

And finally, in regard to a herd afflicted with abortion disease, I frankly admit that apart from the proper disposal of all afterbirth and aborted fetuses, the proper

douching of the uteruses of cows which have aborted or have failed to clean promptly after calving, and the free use of disinfectants in and about stables and general hygienic measures, I don't know what to advise.

"We are constantly hearing the cry 'the tuberculin test is not reliable.' Once in a while a mistake will be made and that seems to go farther with the objector than a thousand true tests. But we never hear the question, 'Is tuberculosis reliable?' Unfortunately it does its work with a certainty that dismisses all cavil and cross questioning. We assure all opposers of the tuberculin test that tuberculosis is entirely reliable."—"Hoard's Dairyman."

REPORT OF THE COMMITTEE ON METHODS OF APPOINTMENT OF DAIRY AND MILK INSPECTORS AND THEIR COMPENSATION

Ernest Kelly, *Chairman*, U. S. Dairy Division, Washington
Dr. William S. Gimper, Harrisburg
G. S. Hine, Manhattan, Kan.

Mr. Chairman and Gentlemen: Your committee has compiled the data which seemed necessary for this report, and has perhaps somewhat exceeded its authority, in that it has embodied in this report a number of recommendations which may be somewhat beyond the sphere of authority of this committee. However, it seemed to this committee that the subject-matter was of such importance to this Association and the facts brought out by the data are so striking that the committee could not leave the subject without making a few recommendations.

Your committee has to report that the Department of Agriculture has sent out several hundred circular letters to State and city authorities for the purpose of securing data concerning methods of appointment and compensation of dairy and milk inspectors. These data have been placed at the disposal of this committee, and tabulations which have been made from them serve as a basis for this report. Unfortunately, the late hour at which these circular letters were sent out prevented a canvass of all towns, but letters were sent to all cities in the United States and to all State Departments having charge of inspection work. Answers were received from 31 States and from 102 cities. The total population of the cities reporting was 26,720,000.

Instead of separating the cities and States, they will be compared in this report, so that an idea may be gained as to relative conditions in the two branches of the service.

ATTENTION PAID TO INSPECTION

	No. inspectors	Per cent of total	Only part-time inspectors	Per cent of total	Only full-time inspectors	Per cent of total	Both full- and part-time inspectors	Per cent of total
States	9	29.0	6	19.4	10	32.2	6	19.4
Cities	5	4.9	27	26.5	37	36.3	33	32.3

From this table it can be seen that the cities reporting are paying considerably more attention to inspection than are the States, as only about 5 per cent of the cities lack inspection, while 29 per cent of the States reporting were remiss along this line.

NUMBER OF INSPECTORS AND TIME SPENT

	Full-time men	Per cent of total	Part-time men	Per cent of total	Largest no. of full-time men	Largest no. of part-time men	Av. no. of part-time men	Av. no. of full-time men	Av. time spent by part-time men
States	74	59.2	51	40.8	10	12	2.32	3.36	30 %
Cities	266	72.9	99	27.1	35	5	1.00	2.74	34.6%

In connection with this table it will be noticed that the cities employ a larger percentage of full-time inspectors than do the States. In fact, two-fifths of the State inspectors are men who devote only part of their time to dairy and milk inspection, while only one-fourth of the city men are part-time men. The part-time city man also spends a larger proportion of his time on inspection than does his brother in the State service. In compiling the figures for this table it was interesting to note that apparently the smallest amount of inspection, aside from no inspection at all, was done in a certain city where the total inspection force consisted of one part-time man, who receives $15 a month for his work along dairy lines.

SALARIES

	Highest salary	Lowest salary	Av. salary
States	$1,800	$1,000	$1,352.16
Cities	2,100	720	1,208.00

While the States pay a slightly higher average salary, the maximum paid does not reach the high mark attainable in at least one city for similar work. This is explainable by the fact that some of the larger cities have chief inspectors, who have a number of men under them and their responsibility is necessarily greater. It is interesting to note that the lowest salary, $720 per annum, is paid in one of the larger cities, where six men are employed at this pittance.

CIVIL SERVICE

	Civil service	Per cent of total	No civil service	Per cent of total	Men under civil service	Per cent of total	Men not under civil service	Per cent of total
States	7½	34.1	14½	65.9	43	34.7	81	65.3
Cities	53	54.6	44	45.4	243	66.6	122	33.4

It is apparent from this table that the cities are considerably ahead of the States in the application of civil service requirements to dairy and milk inspection. Another noticeable feature is that it is the larger cities which are leading along this line. This is shown by the fact that while only 54.6 per cent of the cities require civil service appointment, over 66 per cent of the inspectors are under such rules.

The explanation of the fact that a fraction of a State is shown is that one State reported that part of the inspectors were under civil service and the rest were not.

APPOINTING AGENCIES

In all States where civil service is not in force, inspectors are appointed by the Dairy and Food Commissioners or by the Commissioners of Agriculture, except in two States where seven inspectors are appointed by the State Board of Health and one State in which the three inspectors are appointed by the Regents of Education.

Appointments in cities having no civil service are made as follows:

Appointing agency	No. of cities	No. of inspectors
Board of Health	14	32
Mayor or Commissioners	14	26
City Council	6	12
Health Officer	6	41
Board of Control	1	1
Commissioner of Public Safety	1	6
Chief Inspector	1	2
State agencies	1	2

It is unnecessary to point out to this Association the fact that many of the appointing agencies are scarcely fitted by training or knowledge of the subject to select dairy and milk inspectors.

LENGTH OF SERVICE

	Maximum	Minimum	Average
States	20 years	Just appointed	4 yr. 9 mo. 12 days
Cities	28 years	Just appointed	5 yr. 3 mo.

This table needs no comment, but it is interesting to note that the average city inspector has served 6 months longer than the average State inspector.

SPECIAL EDUCATION

	Graduate veterinarians	Per cent of total	Agr. col. graduates	Per cent of total	Attended but did not graduate	Per cent of total	No special education	Per cent of total
States	22	17.6	30	24.0	17	13.6	56	44.8
Cities	71	19.4	38	10.3	22	6.0	235	64.3

Here the States lead the cities by quite a margin, and the only inference that can be drawn is that the State inspector is more often selected for his special qualifications than is the city inspector. Such a conclusion would seem to point out that civil service does not accomplish the results that selective appointment does; but your committee is strongly of the opinion that the fault does not lie with civil service as a system, but with the manner in which the civil service requirements have been drawn up.

It is interesting to note that the States employ a larger percentage of agricultural college graduates than of veterinarians, while the reverse is true of the cities.

A number of other inspectors are graduates of academic and scientific colleges, but they were not classed as having any special educational training.

EXPERIENCE AND TRAINING (*aside from education*)

The statistics of the State inspectors are as follows:

Experience	No.	Per cent of total
"Practical"	25	20
Dairy business	25	20
General	9	7.2
Medical	1	.8
One year previous inspection	3	2.4
None, or none given	62	49.6

The city inspectors stated a much wider field of experience, and it may prove interesting to show the data as offered to the committee:

Experience	No.	Per cent of total
Veterinary practice	5	1.4
"Practical"	45	12.3
Previous inspection work	5	1.4
Medical	6	1.6
Stock and slaughter house	7	1.9
"Passed examination"	3	.8
"Books"	1	.3
Dairy business	60	16.4
Employed by experiment station	1	.3
Taught by other inspectors	41	11.2
Druggists and chemists	2	.6
"Common sense"	1	.3
None, or none given	188	51.5

Grouping the various qualifications roughly into very general divisions we have:

	General dairy experience	Stock and veterinary	Medical	Formerly inspectors	Taught by others	Drugs or chemistry	None or none given
States.	47.2%		.8%	2.4%			49.6%
Cities	29.0%	3.3%	1.6%	1.4%	11.2%	.6%	52.9%

It is apparent to anyone that your committee has been extremely liberal in allowing some of the groups to stand under the heading of "experience." Furthermore, it was evident to your committee that the terms "practical" and "dairy business" were used rather loosely and in some cases conveyed rather more credit than was perhaps intended or warranted; but taking the figures at their face value, it can

be accepted as true that over half of the dairy and milk inspectors in the cities and States reporting went into their important positions without the benefit of any training or experience.

Before coming to its recommendations, your committee would like to express its attitude in this matter. We know from personal contact and observation that the majority of our dairy and milk inspectors are earnest, conscientious and sincere; but we further realize that there is room for improvement in the personnel of inspection departments as well as in the conditions under which they are appointed and carry on their work. We must consider this subject along broad lines, not allowing the personal element to obscure issues which are so vitally important to our Association and, through it, to dairy inspection generally. Poorly trained and inefficient inspectors not only cause injury to a legitimate industry, but cast discredit on our own profession, thereby arousing unnecessary antagonism and increasing the difficulties of our work.

Your committee recognizes the fact that many communities offer neither sufficient salary nor adequate protection from removal without cause to attract specially trained dairy inspectors. It is hoped that this Association can exert its influence to remedy the defects which now exist, and to this end we submit the following recommendations:

1. Cities and States should strive to employ only men who can devote their entire time to dairy and milk inspection.

2. No dairy or milk inspectors should be employed who derive any private income from the persons with whom they deal in their inspection work.

3. Salaries should be paid to dairy and milk inspectors commensurate with the training and experience necessary for properly performing the work.

4. Dairy and milk inspectors should be protected by civil service laws against removal except for cause.

5. Civil service requirements should recognize the fact that special education and training are not only desirable but necessary in a candidate for appointment.

6. Dairy and milk inspectors should be agricultural college graduates or should have at least attended such an institution, or institutions of similar rank, long enough to have acquired a working knowledge of dairy sanitation, bacteriology and chemistry.

7. It is very desirable that inspectors should have had practical experience in at least one branch of the dairy business, so that they are familiar with trade practices and the problems with which they will be constantly confronted.

DISCUSSION

DR. BROWN: I am sorry that I didn't hear Mr. Kelly's paper, but I have just spoken to him and he tells me that possibly the experience of New York City, which has been very recent, would be of interest to the Association.

Shortly after I went to work in New York I found that the Civil Service provided certain qualifications for milk inspectors, included in which and made a direct part of which were the peculiar qualifications tending to bring out the young men who had graduated from the agricultural colleges. The result was most happy. We are now using their list, which contained some hundred names, and we get all our men in city employ in New York City, at least all men of the specialized groups, from the civil service lists. For instance, out of ten of the men on this list, eight of them were graduates of agricultural colleges and the other two men had had other courses and considerable experience. We are working some three or four of these men now, and

they are nice, fine, clean-cut youngsters who know their job, and on whom we believe we can absolutely depend to give us what we want. I expect that we shall in the course of the next year or two develop some exceptionally valuable material from a list of this sort.

Mr. Kelly tells me that the general trend of his committee's recommendations is that civil service be used exclusively in making such appointments—or almost exclusively. I thought it would be of interest to know just what the result had been in the civil service pushed to perhaps its logical conclusion.

It has been also suggested to me that the committee send a copy of this report, at least of its recommendations, to the various civil service commissions of the States and cities that maintain such control. I am quite sure from my own experience with civil service that they will be very grateful for any light they can get on the subject; they are not experts in every line with which they have to deal and they need all the information they can get.

DR. STATES: I would like to ask Mr. Kelly—I may have missed it—but it seems to me there are no recommendations in this report for the employment of veterinarians as milk inspectors.

MR. KELLY: We say in our recommendations that dairy and milk inspectors should be agricultural college graduates, or should have at least attended such an institution, or institutions of similar rank, long enough to have acquired a working knowledge of dairy sanitation, bacteriology and chemistry.

DR. BROWN: That just relates to what I said by saying that the men we got were graduates of agricultural colleges; it is just in line with that.

A MEMBER: The question was raised regarding the employment of veterinarians as dairy and milk inspectors. I

would like to know if the committee regards graduates of medical schools eligible as dairy and milk inspectors.

MR. KELLY: If they received the proper instruction, while they were there, in dairy sanitation, bacteriology, and chemistry.

"Such an inspector is not a bacteriologist, chemist, veterinarian, physician, dairyman, or farmer, but a man trained for a place which is very responsible and essential to nearly every community. Much of the mischief of present conditions doubtless comes from the above specialists who look at the problem of milk inspection from a single viewpoint."—Charles E. Marshall.

UNITED STATES PUBLIC HEALTH SERVICE AND ITS INTEREST IN A BETTER MILK SUPPLY

A. F. Stevenson, U. S. Public Health Service

The present-day problem of city milk supply is, above all else, a social, economic and sanitary problem having its origin in the conditions of modern community life. Of the magnitude of this problem, the annual gathering of this international organization of milk inspectors is sufficient evidence; to its complexity and many-sidedness, your annual volume of contributed papers bears eloquent testimony.

Although to most of us of this generation it may seem as if there had always been a milk problem, it is nevertheless true that in times past, when the cities were smaller and the people were more directly dependent upon agricultural pursuits, the problem of milk supply, like that of water supply, sewage disposal, and other social or community problems, had not arisen. The household maintained its own milk supply, or purchased from some very nearby source. The production of milk had not then become a business, and the process was conducted in a rather haphazard way. Our grandfathers certainly knew little of modern sanitary methods of milk production, nor did their health or well-being suffer thereby, a fact which the opponents of modern methods do not fail to emphasize. They do fail, however, to note the changed conditions. The simplicity of the whole process was its greatest safeguard, and because of the small likelihood of infection by the few handlers of the milk, and because of the comparative freshness of the product used by the consumer, a dirty milk was not necessarily a dangerous milk. With the

growth of cities, and the crowding of the source of supply farther and farther away from the consumer, it became unprofitable for the individual producing a few quarts of milk to market it personally. This led to the organization of companies for collection and distribution.

Individual inspection of the supply of the consumer was made impossible, and, as might be imagined, the quality of the milk very rapidly deteriorated. Milk production became entirely a matter of business and, unfortunately, the code of ethics in force was of a very low order.

With increasing concentration of urban population the mere furnishing of an adequate supply became a serious agricultural and administrative problem. On the part of the agriculturist, methods of increasing the yield per cow became of extreme importance. Extensive studies were made and the results immediately put into use, for every new practical idea evolved meant an increase in profit to the producer.

On the part of the distributer there were problems of collection and transportation over increasing distances, and of economical handling and distribution throughout the year to an ever-growing circle of consumers, now wholly dependent upon him for an almost indispensable food. He, too, must look for a profitable return upon a large and increasing investment.

Thus the two distinct aspects of the problem, the agricultural and the administrative, were developed side by side. Each was independent of and at times antagonistic to the other, but both were vital to the business itself and to the interests of the consumer.

With the growth of the sciences of bacteriology and epidemiology there was revealed a third aspect of the milk problem, the vital interest of the consumer in a clean and safe milk. It was found that disease could be transmitted by milk and that in the development of the city supply

the natural protection of the rural conditions had been sacrificed. The city child of today may drink the milk of a thousand farms, with its thousand-fold danger of initial infection multiplied still many times by long hours of transportation and by a multiplicity of handling, in earlier days unknown. This new phase of the subject was not at first regarded with favor by those financially interested. Sanitary measures were called for which did not increase profits.

Official inspection and control became necessary, and there followed a clash of interests as well as of honest opinions—a clash which was not at all times reduced to its minimum terms by official tactfulness or legislative wisdom. On the whole, however, it has now come to be recognized that public health interests are paramount and there is but little lingering opposition to the generally accepted official requirements and sanitary specifications for a clean and safe milk supply. The public health aspect of the problem, therefore, takes its place along with the others, and although of paramount interest to the consumer, must adjust itself to the actual conditions and limitations imposed by the agricultural and the business or administrative aspects in any satisfactory and final solution of the milk problem. While mutually overlapping and at times mutually antagonistic, these three aspects of the problem must be dealt with along separate and distinct lines and by officials or others expert in those lines, between which there is in general little in common. Business interests may safely be left in the hands of the business men and organizations, in satisfactory knowledge of the fact that the laws of business will successfully eliminate the incapable and the ignorant and protect those competent to conduct important business enterprises. The agricultural aspect has received and will continue to receive the most detailed scrutiny and study of agricultural associations and official bodies. Here, too, it

may be assumed that efficient farm management, with due respect to such important items as the relation of dairying to farming in general, the breeding of stock, feeding and housing, mechanical equipment, and the sale of the product, has, or will have, resulted. The interest of public health officials is primarily with the public health aspect, with which they and they alone are, or should be, competent to deal.

The requirements necessary for the practical production of a clean, sanitary milk supply are much simpler than is generally supposed. In brief, they consist of the following: a healthy cow, dry-handed milking, an interested milker, a hooded milking pail, boiled or otherwise sterilized containers, efficient refrigeration and proper pasteurization. These seven things are absolutely essential, and the omission of any one under ordinary conditions is absolutely ruinous to the production of a high-grade product.

The first two, a healthy cow and dry-handed milking, are so obvious that a mere mention of them is sufficient. Milk from an unhealthy cow, or milk that has come in contact with the hands of the ordinary milker is not clean, and the danger of producing disease therefrom is so well known that it needs no discussion.

Too little attention, however, is generally given to the mental attitude of the milker. With him rests the success or failure of the whole process. If he is interested in carrying out the simple rules prescribed, a clean product results. If he is antagonistic, a complete failure is assured. Every inspector no doubt has his own methods of inducing the milkers to comply with his rules. A dairyman may always be induced to follow directions if the compensation which he receives for his time and product be made dependent somewhat on the degree of care he has taken in its production. From the public health side a high-scoring dairyman is more important than a high-scoring dairy.

The fourth requisite, the hooded milking pail, is of great importance. If it were possible to absolutely sterilize the cow, the milker and the air of the barn, the hood on the pail would be unnecessary. This unfortunately is not possible, and precautions of some kind have to be taken to guard against chance infection from these three sources. The commissions supervising the production of certified milk have attempted to produce ideal conditions by suggesting such measures as the covering up of the milker with a sterile white suit and cap, the grooming and washing of the cow and the construction of very expensive, perfectly ventilated cow palaces. Even with this equipment a hooded pail is recommended, and we now realize that it is the covered pail rather than the fancy equipment which is instrumental in producing the clean product. As far as the quality of the milk itself is concerned, this expensive equipment is unnecessary. The amount of dust which normally falls into the milk in an ordinary barn from an ordinarily clean cow being milked in the usual way by an interested milker is almost wholly intercepted by a properly constructed hood on the milk pail. The dirt actually gaining access is not in itself sufficient to remove the milk from the certified or inspected class.

The fifth necessary feature in the production of a clean milk, boiled or otherwise sterilized containers, is of the utmost importance. The ordinary method of washing milk utensils with soda or soap powder removes dried milk and other gross matter, but does not cause a killing of the bacteria adhering to the surface. These may be most easily destroyed by steam or boiling water. This fact is generally recognized, but its execution is often faulty. A puff of steam or a quick rinse with a small amount of hot water is not sufficient to sterilize a cold pail or can. If steam is used it should be applied till a drop of water quickly dries from the outside of the can. If hot water alone is avail-

able for sterilization, approximately the temperature and time combinations suitable for pasteurization should be insisted on.

Efficient refrigeration is generally conceded to be very important in the production of a sanitary milk. A low temperature very effectively stops the multiplication of bacteria which may have previously gained access. The temperature range between a point of practically no multiplication of organisms and one of relatively rapid multiplication is very small, and in inspection work the safest procedure is to simply credit the milk with proper or improper cooling. Establishment of grades of improper cooling belittles the importance of this step. The equipment necessary for cooling milk at the dairy or elsewhere is very simple. A tub made of wood or other suitable material supplied with running water at a temperature of 45° F. or less, or filled with ice water, is all that is necessary. The more rapid mechanical coolers necessitate a clean atmosphere in which to operate, are difficult to sterilize and furnish one more chance for the contamination of the product. Agitation of milk during cooling or the ventilation of cans of clean milk at that time is unnecessary. These procedures may add their portion to the contamination and in no way improve the quality of the product.

The last step, pasteurization, is by all means the most important in the production of a sanitary milk. It is absolutely necessary that we have milk, and this milk must be made safe for consumption. With our present authority the first six steps stated above cannot always be enforced and the final product is not necessarily free from accidental or thoughtless contamination of a dangerous sort. As a means of rendering this chance contamination harmless, pasteurization should be enforced.

It is very evident that many of the steps commonly recommended for clean milk production are not included in the

points just discussed. For instance, nothing is said about the removal of manure from the barn, the ventilation and amount of air space in the stable, the construction of the floors and the design of the milk house. These are not essential to clean milk production except in so far as they affect the health of the cow. They therefore are eliminated from the public-health aspect and become problems for the agriculturist. Also straining is not mentioned. When a piece of solid matter falls into the milk and is churned around during the process of milking, the majority of the bacteria are washed from it and it becomes harmless. As an esthetic measure it should be removed, of course, before the milk is bottled, but straining by the dairyman should be forbidden. Contamination through dirty strainer cloths or from the hands of the milker during the attachment of the cloths to the can is a far greater sanitary danger than that arising from the soaking of a reasonable amount of gross particles which may enter.

The idea of quick cooling is also omitted from these essentials. Bacteria do not multiply in milk at once after milking even if no refrigeration takes place. The method of cooling mentioned above is rapid enough to insure a final temperature of 50° in less than two hours.

The choosing of the essentials just described is not idle theory. They have been tried on large-scale production in several localities with decided success. Bacterial counts were obtained from ordinary barns which rivaled those from the finest certified dairies. Slight trouble was found in introducing these ideas at times, but once tried they were never given up.

In order to check the various processes and to determine where contamination is occurring the help of a laboratory is most essential. It is the duty of this laboratory to make analyses of the milk and interpret their sanitary significance. Large numbers of bacteria are indicative generally of filth

or age, both conditions being very favorable to contamination and subsequent multiplication of disease-producing organisms. The chances of contracting disease from such a milk are so much greater than from one where filth and age are eliminated that the sale of such milk is prohibited. The enemies of the total-count method of grading milk point as a classic example to the analysis of buttermilk. The choosing of this example shows ignorance of the subject. Milk and buttermilk are not in any way comparable commodities. In the one case a minimum number of bacteria is sought, while in the other the consumer is paying for a practically pure culture of a certain kind of organism. Our present methods of analysis and grading of milk are very valuable in a practical way, but they are not direct enough to stand very severe criticism. One of the most important problems to be studied is the relation between simple tests, for they must be simple to be useful, and the sanitary condition of the milk.

DISCUSSION

DR. STATES: I would like to ask the author of the paper if he really thinks that milk freshly drawn from the cow and put in a ten-gallon can of water at a temperature of 45° will be perfectly cooled without agitation after two hours?

MR. STEVENSON: I didn't state that as a theory at all. I know three shipping stations where practically their entire amount of milk is cooled in that manner in two hours. The bacteria did not multiply in any way. Analyses were made practically every day, and the statement that the milk cools in two hours is one that is wholly inside of safety; probably they won't multiply in three hours—we know they won't in two hours, and we know in a can of ordinary milk, not cream, placed in a tub of water and left over night the bacteria will not have increased the next morning.

QUESTION. Do you advocate the total elimination of the strainer cloth?

ANSWER. Yes.

QUESTION. And if straining is necessary to be done, have it done by the dealer?

ANSWER. Yes; done by the dealer or the creamery.

DR. THOMPSON (Iowa): I don't believe that it is hardly proper to put a ten-gallon can of milk in water to cool without stirring it. The fact that you didn't stir the milk, while it might not affect the bacterial content, I am satisfied would affect the flavor of the milk. My experience teaches me when you put that ten-gallon can in water the outside of the can will cool quickly but the center does not cool, and if you don't stir it up you will not get as good-flavored milk.

DR. H. A. HARDING (Illinois): There is nothing very doubtful about this idea, inasmuch as the largest milk company in the United States has been requiring its patrons to put milk directly into the can without stirring and cooling it in this manner for ten years, anyway, so it has been proved beyond any shadow of doubt that it works.

DR. STATES: The proposition of putting a quart of milk in a bottle and packing it in ice is an entirely different proposition from putting it in a ten-gallon can in a tub of water of a temperature of 45°. There is no comparison whatever, to my way of thinking.

MR. STEVENSON: I would like to ask why?

DR. STATES: Because it cools so much quicker.

"Experience is the great test of truth and is perpetually contradicting the theories of men."

THE STERILIZATION OF DAIRY UTENSILS ON THE FARM AND A DEMONSTRATION OF A NEW STEAM STERILIZER

GEORGE B. TAYLOR, *Market Milk Specialist,* U. S. Dept. of Agriculture

In order to illustrate the subject on which I will speak, I selected two cans, washed at the same time and both washed the same way, but one was sterilized with this apparatus and the other was not. I would like to have you please take a look at those two cans and note the absence or presence of moisture and odors.

(Five minutes' intermission.)

MR. TAYLOR, continuing. In the production of clean milk several factors enter in. Among those that we regard as of most importance are the sterilization of utensils and the cooling of milk and keeping it cold until it reaches the consumer. In the sterilization of utensils we succeed in keeping down the initial bacterial count; in the cooling of the milk and keeping it cold we insure a comparatively low count at the time of delivery.

In discussing the sterilization of utensils, I shall take the average condition as found on the small dairy farm which delivers milk or cream to a receiving station or ships it to the city. The utensils of most importance here are the pail, the separator parts and the milk can. The milk pail is comparatively unimportant from a sanitary standpoint. It is light, easy to handle and easy to wash; probably the housewife herself takes care of that. Unfortunately, however, after she rinses it she sometimes uses

a cloth more or less unclean and recontaminates the pail in an attempt to get it dry.

The problem of cleaning the separator is much more difficult. The trouble begins with the average agent, who in selling his separator claims it doesn't need to be washed more than once a day. I was told by the Food Commissioner of one State that he knew of an agent for a separator that went through his part of the country declaring his separator needed to be washed only once a week.

The proper cleaning of the shipping can is another great problem. Here we have a division of responsibility. The average milk dealer thinks if he doesn't wash the shipping cans the farmer himself will have to do it. In my opinion the milk dealer should not only wash the can, but he should rinse it, sterilize it, dry it and send it back to the farmer as clean as if it had never been used at all.

Milk Plant Letter 28, issued in July by the Dairy Division, being one of a series of letters sent out to milk plants, gave seven ways of treating the can. Of these seven ways the first, of course, was returning the milk can to the farmer without being washed, and the last way was proper washing and sterilization. Of these seven ways at least five were unsatisfactory.

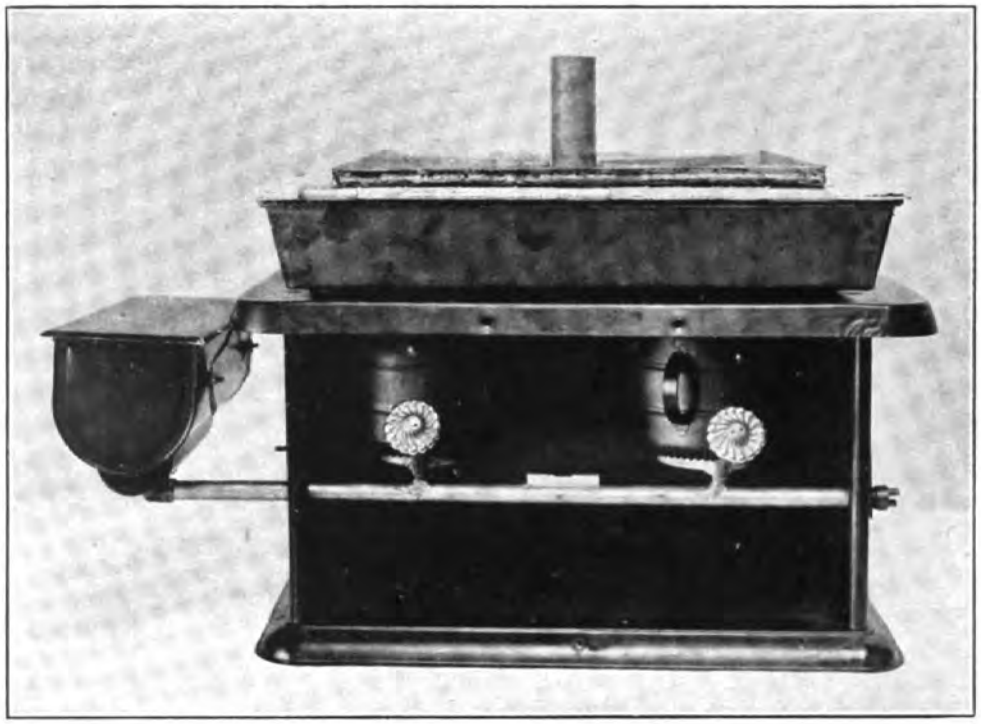
The milk can is heavy, unwieldy, hard to clean and hard to handle. Removing the bacteria by washing is practically a physical manipulation, as very few persons can comfortably keep their hands in water above 120 degrees Fahrenheit. This temperature will not kill many bacteria. The lack of proper cleaning means that there is left in the average can a certain amount of organic matter which decomposes, giving rise to large numbers of bacteria and musty, disagreeable and often foul odors.

I wish to say just a few words regarding bacteria. The figures I give are averages and these averages even are only relative because there is no way of telling how many bacteria there may be in a milk pail or milk can. Milk

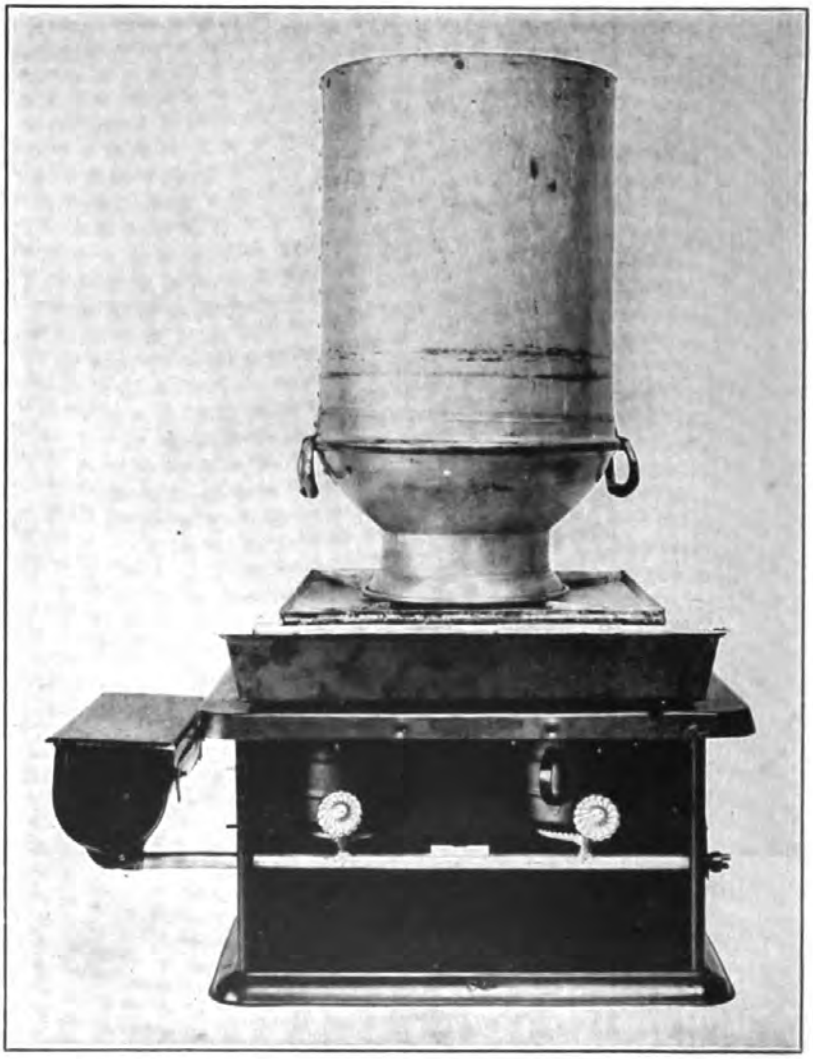
pails washed and rinsed with cold and hot water, properly rinsed and set aside for ten hours—that is, until the next milking period—were rinsed with sterile water. This rinsing removed 5,240,000 bacteria. Cans were washed with hot water and a brush and properly rinsed. At the end of an hour rinsing with sterile water removed 4,600,000 bacteria; after ten hours, cans washed under the same conditions, one rinsing of sterile water removed 1,400,000,000 bacteria. At the end of twenty-four hours, cans treated the same way, there were removed 2,680,000,000 bacteria. Now these figures are only relative to show the great increase of bacteria on cans left standing. For instance, we have got as low as 300,000 bacteria on a freshly-washed can with only one rinsing, and we have got as high as 3,000,000,000 bacteria on a freshly-washed can at a city milk plant with one rinsing. One rinsing with sterile water removes only a small percentage of the bacteria in the can; for instance, one can was rinsed with four consecutive rinsings of sterile water: the first rinsing removed 624,000,000, the last 72,000,000.

This proves that washing is not enough for milk utensils. Cans washed in the same way were treated with live steam, with the result that one rinsing of the can after standing twenty-four hours with sterile water removed only 4,000 bacteria per can. This is an absolutely negligible quantity.

Now for the practical application of steam: Steam has been used as a sterilizing agent for a long time, but when we come down to our dairy farms you don't find it except in our largest and best farms. We saw one beautiful sterilizer today, but the average farmer can't afford that, and the small farmer, the man who furnishes 90 per cent of the milk supply, hasn't the money to invest in costly sterilizing apparatus. On that account there was seen the necessity of devising some sort of simple, cheap and efficient apparatus, which could be used on the average farm.



STEAM STERILIZER DESIGNED IN THE DAIRY DIVISION OF THE U. S. DEPARTMENT OF AGRICULTURE



STEAM STERILIZER SHOWING METHOD OF STERILIZING CAN

In the Dairy Division last spring there was devised a sterilizer which we think covers these three points—simplicity, cheapness and efficiency.

The sterilizer I have here today consists of a heater, in this instance a two-burner kerosene stove, which insures a heat which will give a temperature to the issuing steam of from 210° to 211° F. It consists of a pan for holding the water, which in this instance is an ordinary baking pan, standard size, 14″ x 20″, with an insulated galvanized iron cover which consists of a shallow box filled with paper with the top soldered on. Through the center of this top is a spout 4½″ long and 1½″ in diameter. Pails and cans are simply inverted over this spout after the steam temperature reaches from 208° to 210° F., and left there for five minutes. The covers, separator parts and strainer cloths are put into this box with the cover on and left for five minutes.

As to the cost of the apparatus, we are trying to get it down as cheaply as possible. We think the apparatus here costs under $10.00; we hope we can get it very much cheaper. Kerosene to run the apparatus costs about one cent an hour. After the operation is started, the time taken is simply putting on and taking off the utensils. As to the efficiency of this form of apparatus, it is as efficient as any other form of sterilizing when the steam is not under pressure.

I have here a couple of charts, the first showing the flavor and bacteria results.

Ten gallons of a very good grade of milk were divided into two parts; five gallons of that milk were passed through a separator which had not been washed but through which water had been run to take out the extra milk. This milk running through the separator was run into a can which had been properly washed but not sterilized. The other five gallons were run through a separator which had been washed and the parts sterilized and run into a can which

had been washed and sterilized twenty-four hours before. In one hour the bacteria in the unsterilized can were 1,880,000, the flavor score was 16, acidity 19.6; in the other can, one hour, bacteria 24,000, flavor score 22, acidity 19.4. At the end of six hours the acidity was taken in both and showed no difference. In twenty-four hours the milk in the first can showed bacteria about 320,000,000, flavor score 10, and practically sour; in twenty-four hours the milk in the sterilized can showed 1,500,000 bacteria, still with a flavor score of 21, and acidity practically the same. In thirty hours the milk in the unsterilized can contained 1,580,000,000, with zero flavor score and with high acidity, and the other had run only ten million and a half, was still marketable from a flavor standpoint with acidity fairly low. In forty-eight hours the first sample was simply putrid. This was held at a temperature of about 60 degrees.

CHART 1

Sterilization of Milk Utensils

Time.	Separator and can washed, not sterilized, fresh milk passed through separator into can. Temperature, 60° F.			Separator and can washed and sterilized, fresh milk passed through separator into can. Temperature, 60° F.		
Hours.	Bacteria per c. c.	Flavor score	Acidity as lactic acid Gm. per 100 c. c.	Bacteria per c. c.	Flavor score	Acidity as lactic acid Gm. per 100 c. c.
1	1,880,000	16	0.196	24,000	22	0.194
6	.....	..	0.198	.....	..	0.192
24	320,000,000	10	0.334	1,500,000	21	0.185
30	1,580,000,000	0	0.529	10,500,000	19	0.203
48	Spoiled	Putrid		.....	..	0.247

This other chart represents, in a practical way, the work on one farm. This farm was about forty miles from a large city; it was one of the dirtiest places I ever saw, and the work was done in the midst of the harvest season when the farm hands weren't interested in milking and

didn't even wash their hands before milking after spending the day in the dry harvest fields. All conditions were equal in these two series of samples except in one instance the milk was shipped to the city in a sterilized can and the other in an unsterilized can. The bacterial count—sterilized can, 191,000, unsterilized can, 206,000—shows that the milk was dirty right at the start. At the farm during a period of fifty minutes, after cooling to 54° F., sterilized can, 310,000; unsterilized can, 817,000. At the receiving station 80 minutes after milking, average bacteria, sterilized can 574,000; unsterilized can 1,930,000. At the railroad station, 3½ hours after milking, average temperature 64° F., sterilized can 701,000; unsterilized can, 2,262,000. This farm had been shipping milk into the city all summer with counts varying from two to twelve million bacteria per c. c. Nothing was done regarding the methods in this test, and all the conditions were equal except that one shipping can was sterilized and the other was unsterilized.

CHART 2

Morning Milk—Average of Five Days

Note: Bad conditions; dirty methods; all conditions equal, except sterile and unsterile cans.	Bacteria per cubic centimeter	
	Sterile can	Unsterile can
1. Fresh at farm, temperature 95° F. Samples taken just after mixing and placing into one sterile and one unsterile can	191,000	206,000
2. At farm after cooling to 54° F. during a period of fifty minutes	310,000	817,000
3. At receiving station, eighty minutes after milking, average temperature 58° F.	574,000	1,930,000
4. At city railroad station, three and one-half hours after milking, average temperature 64° F.	701,000	2,262,000

If I have said enough to get you interested in this proposition and to get you to make up one of them to try out yourself and to demonstrate before the small dairy farmers of your community, I shall certainly be satisfied.

DISCUSSION

DR. KOONCE. I would like to ask the speaker, is not there an apparatus on the same order furnished by some of the dairy and supply houses, run by wood and coal with a galvanized pan like that over a cast-iron base, holding from fifty to a hundred gallons of water, and sterilizing three or four cans at a time?

ANSWER. I have never heard of it.

DR. KOONCE. I am using about fifteen in my town. You can put in four to six cases of bottles at one time. Just hold the case over the water for five or six minutes, with the water boiling underneath the cases in a galvanized tank very much like that.

ANSWER. It would cost a little more than this, I should think.

DR. KOONCE. It costs about $12.00 for fifty-gallon capacity.

MR. TAYLOR. And it does efficient work?

DR. KOONCE. The same steaming process. They are on the market now and quite a few of them are in use in some cities.

"Insanitary conditions exist largely because they are not known to be such. Actual demonstrations of their harmfulness, together with definite recommendations for their correction, remain one of the most gratifying and successful methods for instituting reforms."

THE RELIABILITY AND SIGNIFICANCE OF THE BACTERIOLOGICAL ANALYSIS OF MILK

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No factor connected with the laboratory study of milk has given rise to as much difference of opinion as its bacteriological analysis. The National Milk Commission of Standards is on record as declaring it to be the most significant of all factors connected with the analysis of milk. On the other hand, there are some who deny both its reliability and its significance. I have been asked to speak upon these two phases of bacteriological milk analysis.

RELIABILITY

There is no doubt that there has been in the past a good deal of variation in the analyses of milk, and when tests have been made upon duplicate samples, very anomalous results of the analyses have not infrequently appeared. You have all heard of instances where duplicate samples of the same lot of milk have been sent to different laboratories, with amusingly variant results in the report. By placing special emphasis upon such variations, the whole subject of bacteriological examination of milk has been discredited. That widely discrepant results have sometimes been obtained under such circumstances no one familiar with the facts would for a moment pretend to deny. That they vitiate the value of bacteriological analysis of milk by no means follows, as I shall endeavor to show. The fact that errors and mistakes are made in a chemical laboratory in the analysis of foods does not lead us to conclude that chemical analysis is therefore unreliable. Nor should simi-

lar discrepancies in bacteriological results lead us to such a conclusion.

Let us grant at the outset that variations of considerable moment have occurred in the bacteriological analysis of milk and let us ask to what factors these are due. For our purpose these may be classed under three heads.

1. *Errors.* Actual mistakes in laboratory technique occur in all laboratories, whether they refer to bacteriological or chemical analyses, or any other kind of laboratory work. It does not concern us here to ask to what these errors are due, and all that we need to say about them is that by the increase of skill on the part of laboratory men these errors can be readily eliminated; in all good routine laboratories they are practically eliminated at the present day so that they do not count in the general result.

2. *Different Methods.* Bacteriology is one of the newer sciences, and the methods of laboratory work have been undergoing more or less modification. There are a variety of methods adopted in different laboratories, some of which are wholly inadequate to conditions, while others are fairly satisfactory. In past years various routine laboratories, without much conference with each other, adopted methods of their own, which varied in many details. It would take too much time to explain how the different methods used give somewhat widely different results when examining the same sample of milk. These differences in methods, however, have now pretty largely disappeared, at least in all reliable laboratories. A series of Standard Methods have been adopted by bacteriologists, and these Standard Methods are used in practically all laboratories where milk bacteriological analyses are made. These Standard Methods are the result of many years of study, and they have resulted in very largely unifying the analyses from different laboratories, and, at all events, in getting rid of the variations that are due to this particular factor.

3. *Milk Not a True Solution.* Bacteria are not dissolved in the milk, but merely floating around in it, as solid, discrete particles, which must be, in some way, individually counted. The problem is, therefore, a very different one from analyzing a solution such as chemists commonly handle. Moreover, the bacteria in milk are so numerous that it is impossible to count the numbers in any large amount of the milk, and therefore an extremely small sample of the milk has to be taken for examination. It is perfectly evident that a series of small samples taken from the same bottle of milk would not contain identically the same number of bacteria under any conditions, and that some variations in identical samples would be absolutely inevitable. This is made further more emphatic by the fact that the bacteria have a tendency to clump themselves together in little groups. By the method of bacteriological analysis usually adopted, the plate method, the milk sample is distributed in solid culture medium, and the final counting, which is made after two days, is a counting of the number of colonies that grow on the plate. The assumption was made at first that each of these colonies came from a single bacterium, and therefore the number of colonies would indicate the number of bacteria in the milk. We now know, however, that in many cases a colony is the result of the growth of a group of bacteria rather than a single one, and that the final total number represents therefore the number of individual bacteria groups. Now it is evident that the clinging of bacteria together would never be exactly uniform through a whole bottle of milk, and hence two samples from the same bottle might show considerable variation, because in one sample there was a greater tendency to grouping than in the other, and hence the former would normally contain a different final count. From this fact two conclusions must be drawn. The first is that the plate count will always be an underestimate, the milk always con-

taining more bacteria than the plate will contain colonies. The second is that no bacteriological analysis of milk that is based upon plating can be absolutely accurate, and inasmuch as this is the case there will inevitably be some variations between duplicate samples of the same bottle of milk.

Of these three general sources of variations the first two may be almost wholly removed. Moreover, it is possible to say today that they have been largely removed, and in all good laboratories where routine work in bacteriological analysis is carried on the two sources of variation mentioned first, namely, errors and variations in methods, have been practically excluded. The third source of variation remains, and is unavoidable. The question for us to consider, therefore, is how great an error, or how great a variation in the analysis of milk made under proper circumstances is introduced by the conditions that are beyond control.

In order to determine the answer to this question a very extensive series of tests has been made during the last three years in a considerable number of laboratories. It was, I suppose, due to the fact that I was the referee in some of these extended series of tests that I have been called upon to speak to you upon this particular subject. One series of tests involved some twenty thousand analyses, in which five different laboratories were working in cooperation with each other. Duplicate samples of the same bottle of milk were sent to each of these laboratories under identical conditions. In some cases eighty samples of the same bottle of milk were shipped to the laboratories under different labels, in such a way that the laboratories supposed they were analyzing different lots of milk. Numerous methods of guarding these tests, which cannot be explained here, were made, but the total result of them all was such as to put us in a position where we can state with a pretty fair degree of accuracy how wide a variation may be ex-

pected when reliable laboratories make a bacteriological analysis of identical samples of milk. We can today speak with knowledge as to the results that will be obtained in a reliable laboratory by Standard Methods. Briefly those results may be explained as follows:

By Standard Methods used in routine laboratories by the ordinary assistants employed in such laboratories, we may expect in the analysis of identical samples of milk a variation of twenty-five to thirty per cent with an occasional variation wider than this. Where especial care is taken by experts a much closer result is obtained. But the ordinary routine laboratory will obtain in its duplicate results variations of not more than thirty per cent.

Thirty per cent may seem to be a very large variation, and at first thought it may perhaps appear to be large enough to discredit the whole analysis. We certainly should not think very much of a chemical analysis that varied as much as thirty per cent. But when we come to consider the actual facts, and the nature of the problem we are trying to solve, it will appear at once that a variation of thirty per cent is so small as to be really negligible. We are dealing here with factors totally different from those that are aimed at in chemical analysis. We are not aiming at getting percentages of composition, but at getting actual numbers. And when we consider the enormous range in numbers of bacteria that are found in different samples of milk, it will appear evident that variations even larger than thirty per cent have no real significance in the result. This can be made more intelligible by taking three actual cases representing the types of milk that are actually found, such as were actually tested in these series above mentioned. As an actual fact, the bacteria in milk range from a few thousands to many millions per cubic centimeter. Assume that a laboratory, or a series of laboratories, were to analyze three samples of milk, one of which contained 5,000,

one 500,000 and one 50,000,000 bacteria per cubic centimeter. Assuming a range of variation even wider than that mentioned above as that which is to be expected, we might expect in the three cases results ranging as follows:

Lowest	40,000,000	400,000	4,000
	50,000,000	500,000	5,000
Highest	60,000,000	600,000	6,000

From these figures it will be seen that the different laboratories would all agree exactly as to where each sample of milk should be placed. They would not agree as to the exact number but without a single error all laboratories would agree in placing one sample among the type of milk with bacteria in the high millions, the third one among the type of extremely good milk with bacteria in very small numbers and a third one intermediate between the two. It would make no especial difference in the classification of the milk whether it should contain 4,000 or 6,000, or whether 40,000,000 or 60,000,000; so that the variations which actually occur in the laboratory analysis would have no effect at all in classifying or characterizing any sample of milk. Of course there might be some border-line cases which one laboratory would throw at one side of a border line and the other at another side. But this is true of every type of analysis and in actual experience in the bacteriological analysis of milk it is a factor of no significance. Practically in all of the numerous samples of milk submitted to the different laboratories for analysis in this series of tests mentioned, there was hardly a case where there would have been any difference as to the place where each sample of milk should be classified. In other words, bacteriological analysis of milk would place milk samples in their proper grade, probably without a single error, unless it may be in an occasional border-line case that could be

just as fairly placed on one as on the other side of a dividing line.

It would be interesting to go more extensively into the results obtained in these experiments, and to explain them further. But for the purpose that we have tonight it is not wise to spend any more time upon this subject. The general conclusion that has been reached, and in this conclusion I may say that all bacteriologists are agreed, even those who are the most inclined to doubt the strict accuracy of bacteriological examination, is as follows: Bacteriological analyses of milk are reliable enough to place all samples of milk in their proper grades and if several samples are taken and analyzed and the results averaged no mistakes will be made by which a milk is wrongly classified. This statement may be absolutely relied upon, even while we recognize that the variation in the analyses is as high as twenty-five or thirty per cent, and hence that the results when expressed in exact figures cannot be taken as strictly accurate. In other words, there is no difference between a milk reported as having 4,000 and one as having 5,000 per c.c., but there is a great difference between milk reported as having 5,000 and milk reported as having 500,000 or 5,000,000.

If we admit that for all practical purposes bacteriological analyses of milk are reliable enough to accurately classify a series of samples of milk the wider question remains as to what is the significance of such analysis after we have obtained it. This is an extremely broad subject a complete consideration of which would take more than the time allotted to it this evening. I think, however, the essential facts bearing on the subject may be briefly outlined, and I can do this best and most concisely if I present the facts as a series of theses which I will number consecu-

tively, in order to make their connections a little more clear.

1. Milk is one of the best of foods, and one of the cheapest, but at the same time the most easily spoiled and the most dangerous. It is hardly necessary to argue these points. Everyone knows of the value of milk as a food, and in these days there is no one who has not heard of the hundreds of epidemics of typhoid fever, septic sore throat, scarlet fever, or diphtheria, that are distributed by milk, or the numerous cases of intestinal troubles so caused, and of the occasional instances of tuberculosis which children acquire from the drinking of milk from tuberculous cattle. The ease with which milk is spoiled is known by every housewife who has anything to do with the handling of milk as well as by all dairymen.

2. The sources of the bacteria present in the milk may be roughly classed as three: *Dirt, diseased or inflamed udders,* and *multiplication.* It is true that a small number of bacteria get into the milk in its passage from the milk glands to the exterior through the milk ducts. But these are very few in number, commonly, if the cow's udder is a healthy one, not more than a few hundred or at most a few thousand per cubic centimeter. If, however, the udders are diseased, or if there are inflamed areas in the udder due to any of a large number of causes, the numbers of bacteria that may get into the milk from this source may increase until they are so numerous as to count many thousand per cubic centimeter in the milk even when directly drawn from the udders, without any subsequent external contamination. I do not think it is necessary to emphasize the fact that bacteria from such a source are at least a menace to the health of those who are consuming the milk, especially young children whose power of resistance against disease is less than it is in adults. Apart from diseased udders, however, the great source of milk bacteria is to be regarded

as filth of all kinds. Under this head are included not only manure and other forms of filth that get into the milk directly during the milking, also, but old, partially decomposed milk, which is not infrequently left in the milk pails and milk cans ever after an ordinary washing. We have learned in recent years that this is the largest source of the external contamination of milk with bacteria and that a large part of the excessively high counts are due to some form of filth or dirt in the milking utensils. A third source, which I have spoken of under the head of multiplication, means simply that whatever bacteria may get into the milk at the time of milking or immediately afterwards find milk an excellent medium for their growth, feed and multiply rapidly, and at warm temperatures in the course of a very few hours may become prodigiously numerous. From this it follows that milk which was originally produced in cleanly condition may after a number of hours contain enormous numbers of bacteria. While there are other factors that control the number of bacteria present in milk, we must bear in mind in our discussion that the primary ones are those indicated: diseased udders, filth and multiplication.

3. The bacteria present in milk may be the cause of much mischief. In the first place by their growth they inevitably cause the decomposition of milk. The first indication of such decomposition is usually souring, which is the decomposition of the milk sugar. In addition to this, however, there are many other far more injurious types of milk decomposition which are brought about by the growth of bacteria, which would not be familiar by name to most people. These other forms of decomposition affect the destruction of proteids in the milk, and the fat, and result in decomposition products of more or less injurious nature. Some of them are certainly very deleterious to the drinker of the milk, producing forms of ptomaine

poisoning which occur occasionally from milk drinking and still more frequently from the eating of ice cream. In other words, the bacteria, if they are allowed to grow in the milk so decompose it as to spoil it as milk, having something the same effect upon it that decay has upon fruit. Second, the bacteria present in milk may cause various types of illness. Aside from those produced by direct poisoning that have just been mentioned the agency of milk in distributing the specific germs of various diseases is too well known today to require further mention. The extent to which these deleterious changes occur in milk will depend largely upon the kinds of bacteria that are present as well as upon their numbers and the rapidity of their growth. But speaking in general we may state that the larger the number of bacteria present in the milk, the greater is the indication that the milk has undergone decomposition since the time it was drawn from the cow.

4. In purchasing milk for consumption as food, the public has a right to demand three things. First, that the milk should not be *unsafe;* second, that it should not be *dirty;* third, that it should not be *stale.*

Safety. No one, of course, for an instant questions the right of the public to demand that the milk be safe and free from specific disease germs; it is a proposition so self-evident as to require no discussion.

Cleanness. Quite independent of safety, cleanness in itself has its value. Clean food will always bring a higher price in the market than food that is dirty or filthy. Merchants in all other food products thoroughly understand this, and take the greatest pains that the food which they offer to the market shall appear clean, knowing very well that this is a direct asset. Health authorities have in the last few years instituted many rules and regulations concerning the sale of foods, primarily for the purpose of keeping them clean, and hence attractive and wholesome.

Now when we buy ordinary food in market we can easily see whether it has become filthy or not. This, however, is not true of milk, for the nature of the product is such that even though a large amount of filth may be in it, it is entirely concealed by the opaque character of the milk. It is certainly possible to put a large amount of manure or urine in a quart of milk and not have it show at all to the eye. Hence the person purchasing the milk has no ordinary means of protecting himself against filth and dirt. I think, however, that we shall all agree that if it is possible he has a right to demand that the regulation of the milk industry shall be such that he is protected against purchasing filthy milk to put upon his table or to feed to his children.

Staleness. By the term staleness in this discussion I refer to milk which has become old enough to begin to be decomposed. Such milk, in a measure, is to be compared to fruit which is beginning to show signs of decay. The decay in fruit is readily seen if we simply make an examination of it. The corresponding decay of milk we cannot see by the naked eye, and unless the milk has become sour we have usually no means, either by taste or smell, to recognize the appearance of this character. Staleness in milk, like staleness in fruit, is not simply a matter of time, but of temperature as well, and also one of cleanness. Dirty fruit is liable to decay much quicker than fruit that is kept clean, as our Italian fruit dealers have thoroughly demonstrated to the public. Moreover, if kept cold, fruit will keep from spoiling for a much longer time than if allowed to become warm. The question of staleness of milk, therefore, is a factor of its original contamination with decomposing organisms, together with the time and temperature at which the milk has been kept, occurring more quickly at high temperatures and with large numbers of bacteria than at low temperatures and low numbers of bacteria. Now decayed fruit may not be injurious to the person that

eats it; but surely you and I do not wish to be forced to purchase decayed fruit. In the same way, quite apart from the question of safety, the public in purchasing milk and paying for it at a good price has a right to demand that it be protected against purchasing stale milk which is undergoing or just ready to undergo decomposition.

5. Clean fresh milk from healthy cows will contain few bacteria. This proposition lies at the basis of all our conceptions as to the significance of bacteria in milk. It is true that small numbers of bacteria will get into the milk during the milking, even from healthy cows kept in good condition. But this number will be extremely small, and if such milk is produced under cleanly conditions and placed in cleanly milking utensils, the number of bacteria will be commonly below five thousand, occasionally possibly running a little above this, frequently even below it. This proposition has been demonstrated over and over again, but it needs to be emphasized over and over, because it is not thoroughly understood or appreciated, or indeed more than half believed. If the numbers of bacteria in milk are high there is always a reason for it and a reason that lies somewhere along the lines of the sources of bacteria I have already mentioned. The milk coming from the udder of a healthy cow will contain only a few hundred, or at most a few thousand bacteria per cubic centimeter; rarely as high as ten thousand. And if this milk is properly received in clean sterile cans and properly handled by cleanly methods, the number of bacteria in such milk will be extremely low, so low that bacteriological analyses would always class it as the very best and highest quality of milk. A good milker, who understands the nature and sources of bacteria will have practically no difficulty in getting milk with a bacterial content of less than ten thousand in practically any dairy which is kept in cleanly condition.

6. From all of this it follows that the bacteria content of market milk is a measure of its cleanliness, freshness, and safety, or in general of its wholesomeness. Stated in other terms, we may say that milk with a high bacterial count is either dirty, or from diseased udders, or is stale.

It would certainly be a very desirable thing if it were possible from a bacteriological examination of milk to determine whether the high numbers of bacteria that may be present are due to filthy conditions on the farm, to unhealthy udders of the cow, or to the milk being old or kept warm. Unfortunately bacteriological analysis at the present time is not adequate to determine these facts. Sometimes the high numbers are due to filth. Sometimes they are due to age. Sometimes they are due to too high temperature. Sometimes they are undoubtedly due to milk drawn from diseased udders. Which of these various factors is the cause of any particular case cannot yet be determined by laboratory methods, and therefore all that we can conclude from a high bacterial content is that the milk has suffered in either one or another of the above respects. Such milk must certainly be called either unclean or stale.

7. The number of bacteria present in milk must not alone be taken as a measure of its safety. Even though the number in any sample of milk might be extremely low, it may chance to contain specific disease germs and be unsafe, and on the other hand a sample of milk may have bacteria in enormous numbers, and still be wholesome because the species of bacteria are in no sense injurious. It is for this reason that the so-called "buttermilk" that contains bacteria frequently in hundreds of millions per cubic centimeter is a perfectly wholesome drink, for though the bacteria are very numerous they are of a harmless and even healthful type. Therefore such milk is perfectly wholesome. Such buttermilk indicates a condition of *controlled* bacteria content, where the types of bacteria are

known to be harmless and wholesome. But when we consider the market milk we have a different problem. In market milk the type of bacteria is not controlled, and there may be many species both wholesome and harmful in the bacteria of such milk. In market milk a high number of bacteria means inevitably a sign of carelessness, and carelessness means danger. High numbers in such milk means that the milk has either been produced under filthy conditions, placed in dirty utensils, or has been kept warm, or has been kept too long, so that it has already begun to undergo decomposition of doubtful character. High numbers of bacteria in such cases, therefore, indicate carelessness—and carelessness means danger. The bacterial count is like the red flag of quarantine. The quarantine notice that our health officer places on our house when we have a case of diphtheria is not in itself dangerous, but it is a warning that danger is at hand. So here, high numbers of bacteria are not necessarily dangerous, but they are an indication of carlessness and therefore a sign of warning. As such they should be used.

From this fact we see the justification of what seems to be anomaly, that there may be properly different bacterial standards of milk in different cities, and all consistent with each other. At first there seems to be no justification in New York allowing 1,000,000 bacteria per cubic centimeter in milk to be sold, whereas Richmond allows only 80,000 per cubic centimeter. Surely milk with a hundred thousand bacteria in Richmond can hardly be regarded as more dangerous than in New York. But this criticism of a variable standard rests upon a misapprehension of the meaning of the standard. Richmond has learned that a proper amount of care given to the production of milk in its dairies, which are close by the city, makes it possible to produce milk and deliver it in the city with a bacterial count of below eighty thousand. They

therefore regard a count above that as indicative of carelessness in the handling of the product which must not be allowed. New York, however, which is so far from its dairies and where the milk has to be transported for many hours, frequently for two days on the train, has also learned from experience that an amount of care in the handling of the milk which is efficient in Richmond to produce a milk of eighty thousand bacteria per cubic centimeter will for New York produce milk of a count much over this. Hence a standard of a million in New York City might involve just the same amount of care in handling the milk as a standard of eighty thousand would in Richmond. In both cases the bacterial standard is used as a measure of carefulness in handling, and this is regarded as an indication of safety. In both cases the bacteria are an indication of the method of handling the milk, and are not looked upon in either case as an indication of specific danger from the bacteria themselves. If we look upon the numbers of bacteria as a measure of the carefulness in the handling of the milk, many of the apparent anomalies will be clearly explained. If a city near the dairy that produces its milk wishes by a bacterial standard to bring about carefulness in the handling of the milk, it must demand a lower bacterial count than need be demanded by a city like New York, where the distance is so great. Or, stated in other terms, care and cleanliness in the dairy and in transportation of milk sufficient for New York City to produce a milk with a number of bacteria less than a million would in the City of Richmond produce milk with a number of bacteria less than eighty thousand. Hence it is perfectly legitimate and intelligible that the two cities should have a different standard, each meaning the same thing in its application.

I think that no one would hesitate to follow me in the statement that any milk which is produced under filthy

conditions, which is old enough to have become partially decomposed, or even for decomposition to have set in, must be looked upon as unwholesome, even though there can be no proof that it contains specific disease germs. It is impossible by laboratory methods for health officers to discover in regard to any particular sample whether it contains wholly harmless or harmful bacteria. For these reasons, and because high numbers always means carelessness somewhere, the health official is justified in putting in the class of unwholesome milk all such as have high bacterial counts, not because every such sample is necessarily harmful, but because it is of a type that may be harmful because of carelessness in its production.

If we can admit the truth of the fundamental principles already indicated, we may then proceed to consider a few of the particular points that have to be considered in their application.

8. Samples of milk produced under apparently identical conditions sometimes show wide isolated variations from the average. It has been the experience of all who have had anything to do with bacteriological analyses that in a given source of supply, while the number of bacteria may run on day after day and week after week with fair regularity, being very much the same week in and week out, there will occur once in a while some peculiar exception. Upon one or two days, for reasons which are not obvious, the numbers may run up very high. Of course there is actually a reason for every one of these indicated variations. It is manifestly unfair to a person who is producing uniformly milk of a low bacterial count to condemn his source of supply because of an individual, isolated sample that chances to be high in bacteria. These irregularities are so well known to exist that bacteriologists are insistent that milk should not be graded upon isolated samples, and that isolated bacteriological analyses should

not be given to the public. The public is sure to misinterpret them, and the only fair way, either to the public or to the dealer, is to use bacteriological analyses, if we use them, simply as the results of averages. An average of at least five analyses is needed to give the proper data for bacteriological comment. Nor is an average in these cases always a proper thing to be published. If, for example, a dairy should consistently produce milk with bacteria less than twenty thousand, and upon one day should run up to five hundred thousand or a million, which is a perfect possibility, though not likely, if this should be averaged in with four analyses of twenty thousand, it would bring the total average up far beyond that which the dairy deserves. In other words, it is necessary to interpret bacteriological analysis with a considerable degree of wisdom. Individual analyses at all events are considerably misleading and unfair.

9. Milk may be produced under perfectly ideal conditions so far as concerns the dairy, the milk utensils, and all connected with the production, and yet if kept too long the numbers of bacteria will be extremely high. *Vice versa,* a dairyman may produce milk under filthy conditions, and yet by immediately icing it and keeping it extremely cold keep the numbers down to an extremely low point. These two facts again must be taken into consideration in interpreting bacteriological analyses.

10. After we have recognized all of these facts, we come back to the conclusion that if a milk supply is persistently high in bacterial count it means carelessness and danger, whereas if a milk supply has a persistently low count it means care and safety. Milk with high bacterial count *may* be perfectly safe, and milk with low bacterial count *may* be a source of danger, but taken in the long run, as a method of indicating the character of market milk, the amount of care taken in its handling is an indication of

the safety and wholesomeness of the milk, and high bacterial counts persistently kept up mean carelessness in handling or distribution.

11. It will follow from the facts already indicated that a bacterial count is not a satisfactory method of characterizing an individual sample of milk. No one can definitely say that an individual sample of milk which has a large number of bacteria in it is in itself dangerous, inasmuch as it is perfectly possible that these bacteria are of a harmless or perhaps even a healthful type. Nor on the other hand is it possible for anyone to state that a given sample of milk is perfectly safe because the number of bacteria in it is extremely low, for it is possible that these may contain certain specific dangerous disease germs. But while a bacterial analysis is not a satisfactory method of characterizing individual samples, it is a perfectly satisfactory method of characterizing a source of supply. If milk from one source of supply continues to be persistently high in bacterial count, it means that that source of supply is open to suspicion, and that the milk which it handles has either been produced under careless or filthy conditions, or has been kept long enough or warm enough to become old and stale, and partly decomposed. If on the other hand any source of supply continues to produce persistently milk with a low bacterial count, it is perfectly proper on the basis of such a count to classify this as a wholesome supply, because the low count indicates not only careful conditions in the handling but that the milk must be comparatively fresh and have been kept cool.

12. A bacteriological analysis of milk furnishes, therefore, a satisfactory basis for the grading of milk, and thus dignifies the milk industry. The milk industry has suffered more than those connected with it fully realize by the fact that in general milk is sold under one price, with no distinctions as to grade. I have heard dairymen strenu-

ously argue that the plan of one price for milk should be maintained by every possible means, and everything done to prevent the changing of prices. This doubtless they do from the intent of protecting themselves from the cutting of prices by some who are willing to produce milk cheaply and sell it cheaply. Unfortunately the result of it has been to bring all grades of milk down almost to the level of the lowest. In no other industry can it be said that the poorer grades bring the same price in the market as the higher grades. Under these conditions there is no stimulus to produce a higher grade of milk. The better class of dairymen who may be intelligent and conscientious have no stimulus placed upon them to produce a milk of a better grade than their neighbors, since they receive no more from it than their careless, slovenly competitor. Everyone knows that the result of such a condition of things is to reduce the quality to that of the lowest. This is to a considerable extent the cause of a large part of the trouble which the dairymen and milk dealers have experienced. If it were possible for milk to be sold according to its quality, there would be a very decided improvement in the conditions of things in the milk industry everywhere. The difficulty has been in devising any method by which the milk can be graded in such a way that the public can know that it is getting what it pays for. Experience of the last two years has shown emphatically that even in the larger cities the public is willing to pay a little extra for the kind they *know* is of a better quality. The dealer is willing to pay the producer a little extra price for producing such milk and the producer is perfectly willing to take the extra care for production of such a grade of milk if he can be guaranteed an extra price for it. The grading system of milk offers a way out of the present cut-throat system by which the industry is organized. When the time comes that I can

go into market and I can buy a bottle of milk with a certain label on it that guarantees to me that that milk has been produced in a cleanly, safe condition, I shall be willing to pay an extra price for such milk, and this extra price will have its effect all along the line from the purchaser to the producer in the country. Producer, dealer, and consumer will be all equally benefited.

Now a grading of milk must be based upon the character of the milk, and the character of the milk involves two quite distinct factors. One of these is its chemical composition, which gives an indication of its food value. This can be easily handled by chemical analyses, which are simply made and applied. The other factor is the sanitary character of the milk, by which is meant in general its cleanness, its freshness, its freedom from disease germs, and its unwholesomeness, using this term in the broad sense. The sanitary nature of the milk may be determined in part by a proper inspection and control of the premises on which the milk is produced, and the methods by which it is handled and distributed. But while these are large factors in the sanitary nature of the milk, they are not the whole factors. Much experience has shown that an ignorant, slovenly dairyman may produce unsanitary milk even under sanitary conditions. Something is needed at the market end to enable us to determine the actual condition in which the milk reaches the market. The only factor that has been suggested for this purpose is the bacteriological analysis. While such an analysis has its limitations and does not tell everything that might be desired, it does give us a fair indication of the care that has surrounded the production of any sample of milk. By a combination of dairy inspection and the laboratory examination of the number of bacteria in milk which reaches the market, we can with fair accuracy divide milk into proper grades according to its sanitary character. Without a bac-

teriological analysis a grading of milk according to its sanitary nature is impossible. With it it seems possible to so grade the various types of market milk that it can be sold upon its merits, and the milk business can thus be put upon a dignified plane that it has never before occupied.

I may briefly sum up what I have tried to give you in this talk by the following statement: *A bacteriological analysis of milk cannot be relied upon to give actual numbers of bacteria, but only approximate numbers. Variations of some considerable moment are sure to be found, even with the best laboratory technique. But these variations are of no significance when they come to be applied to the problem in hand. Considering the wide range of bacteriological content of milk, the bacteriological analyses as made in the routine laboratories are reliable enough to divide the milk accurately into proper grades, so accurately that different laboratories would not differ in the grade in which they would place their different samples.*

The bacteriological analysis of milk is not to be taken as indicating in itself either a condition of safety or a condition of danger, but only as a warning. Good, clean, fresh milk will have a low bacterial count, and a high bacterial count means dirt, age, disease, or temperature. A high bacterial count is therefore a danger signal, and justifies the health officer in putting a source of supply with a persistently high bacterial count among the class of unwholesome milk.

Bacteriological analysis offers the only means of grading milk according to its sanitary character.

A grading system applied to the milk industry is the great desideratum for the improvement of the industry in the future from the standpoint of the producer, the dealer, and the consumer.

DISCUSSION

CHAIRMAN. I feel like apologizing to Dr. Conn in behalf of the Association for being obliged to speak with a bowling alley on his right and a "boiler shop" overhead, but he certainly has weathered the storm in a most commendable manner, and we have enjoyed the paper. If there are any questions I know he will be glad to answer them.

MR. LYTHGOE. I would like to ask Dr. Conn if he has ever given any thought to examining bacteria by the logarithmic rather than by the numerical method?

DR. CONN. The National Commission on Milk Standards have wrestled over that for hours and hours, but no one was ever known to accept any of these methods except his own. We have tried logarithms, parabolic curves and everything else and have finally concluded we have nothing better at the present time than to write the results in numbers, and then say that in grading samples of milk four out of five samples must come within a certain point.

A MEMBER. What percentage of bacteria can be killed by proper pasteurization?

DR. CONN. You have a number of points in that question. In the first place what do you mean by "proper pasteurization"? Second, what kind of milk? In other words, you can't answer that question specifically. There are certain types of milk in which proper pasteurization will kill 99%, and in other kinds of milk that happen to be filled with other kinds of bacteria with spores in them it will not kill that number; and then some persons would mean one thing and some another by "proper pasteurization," so it is really impossible to answer your question categorically. The purpose of pasteurization, in my opinion, is not primarily to reduce the number of bacteria so much as to render the milk safe from all disease germs. The exact percentage I don't think anyone would venture

to state because the result would be quite different with different samples; but it would always be a pretty high percentage when done properly.

A MEMBER. What temperature and what time would you consider the best for pasteurization?

DR. CONN. The question of pasteurization has undergone a great many changes in the last thirty or forty years, and we people in America have come to a conclusion as to pasteurization that is quite different from that in Europe. Over in Europe they started pasteurization at about 180° and kept that temperature for about ten minutes. There are disadvantages in that, and some of the objections to pasteurized milk have arisen from this high temperature. It is claimed such milk is not quite as digestible as raw milk. I will not discuss that question, but we in America have taken a different ground. We have experimented until we have found a temperature which will kill the disease germs, the lowest temperature that is safe, and in this country we believe in general that a temperature of 145° for a half-hour is the ideal. You can use a little lower temperature, you can use a temperature of 140°, but this is not quite as safe. A temperature of 145° maintained for a half-hour is what we call our American ideal method of pasteurization. That temperature kills disease germs provided you maintain that temperature for a half-hour and does not produce the chemical changes produced by a high temperature, and the milk is therefore in a better condition.

You know perhaps that there has been a claim made that young children fed upon pasteurized milk exclusively sometimes suffer from some form of scurvy or some other type of malnutrition. I am not in a position to say positively whether this is true or not, but *this* is true: that such disorders can be absolutely prevented by the simple means of a little orange juice in the milk. This is a fact that has

been found true only within the last year or so, but it has been proved that all of those possible troubles that may be produced by pasteurized milk are absolutely avoided, even in a young child that is taking nothing but milk, by the use of a little orange juice or a little potato juice—not squeezed out of the potato, but the water the potato is boiled in. There are certain constituents present in the orange and potato which replace anything that may possibly be lacking in pasteurized milk.

A MEMBER. I was much interested in the temperature and I asked the question for the reason that we have a pasteurizing plant—the only one in our city—and they have a self-recording thermometer. I watch it very closely, and 142° is their standard. They were notified by the State Board of Health that unless it was raised to 149° they couldn't sell in the State as pasteurized milk. We sent out at once sixty-five letters, and if I am not mistaken you got one of them. We sent them to the various leading universities. We found 142° to be about the center of the group, although they ran all the way from 140° to 145°; no one recommended 150°, and most of them warned us about going too high.

DR. CONN. I am not responsible for your Health Board. They are certainly mistaken in that case. I don't know their rules, but 145° is as high as should be used, and 140° is all right if used properly.

QUESTION. What is the effect of clarifying on the bacterial count, does it increase or decrease it?

DR. CONN. That depends a little bit on what you mean. Clarification does not increase the bacteria, of course, but clarification does sometimes break up these little clumps so that you sometimes get two clusters instead of one. Hence milk that is clarified sometimes shows a higher count than before, not because there are more bacteria in it, but because clarifying shakes up and separates the groups. Some-

times you get a reduction. A great many bacteria are thrown out by clarification, but you sometimes get a higher count for the reason I have indicated.

QUESTION. Will clarification improve a bad milk or simply decrease the bacterial count?

ANSWER. It is likely to increase the *count,* but I think it would also improve a bad milk to get all the dirt out of it you can.

*"The beneficent applications of biological science * * * take effect in the field of human affections and family experiences, make life less anxious and more enjoyable for multitudes of human beings, mitigate or abolish ancient agonies and dreads of the race, and promise for it a happier future."—Charles W. Eliot.*

SOME ASPECTS OF MILK INSPECTION

DR. CHARLES E. MARSHALL, *Microbiologist,* Massachusetts Agricultural Experiment Station

Milk inspection came into existence not because of the spontaneous desire of one group to exercise control over another, but because of an actual need or demand to safeguard humanity. With the attempt on the part of the State or municipalities to organize the forces necessary to make milk supplies actually safe, ignorance and ineffectiveness have, in some instances, crept into a laudable undertaking to such an extent that the real purpose of inspection is apparently forgotten and injustice results.

To condemn milk inspection, however, is to condemn what we all approve in some form and we all enjoy the protection such control gives. The farmer advocates safeguarding against poor or unclean seed and misbranded fertilizers, the doctor against adulterated drugs and the business man against unscrupulous banking transactions. A very long list, in fact, of protective legislation created both for special classes and for all alike has been enacted. Milk inspection is only one of many protective agencies and must be regarded in accord with general policies. Its peculiar importance is doubtless attributable to the very common consumption of milk and milk products, together with the grave dangers which milk may contain at times, and which may be conveniently subdivided as follows:

1. The diseases of the cow eliminated in the milk.
2. The transmission of diseases in milk as a vehicle.
3. Poisons generated in milk or in the cow and secreted in the milk.
4. The dangers in the decomposition of milk.
5. The possibility of harmful and harmless adulterations of milk.

These are important factors embodied in the purpose of milk inspection, and the significance of each may be established in a limited space, for only a few well-known facts have to be brought to mind.

The cow may be the source of tuberculosis. This has been discussed so thoroughly and its possibilities are so well known that further consideration at this time would be superfluous. Other diseases, as anthrax and Malta fever, fall in this same category.

That milk may act as a vehicle of transmission is so well established in such diseases as typhoid fever that it cannot be gainsaid. However, it should not be taken for granted that every epidemic disease finds its way through milk. Epidemic histories of scarlet fever at times, and in some instances diphtheria, seem to affirm the presence in milk of the organisms causing them. Septic sore throat, infantile paralysis and diseases of this class are too often attributed to milk, although such a practice, it is true, helps to exonerate or advertise the individual making it and serves to cover his inability to discover the real source of an epidemic. In such cases, it is well to remember that the frailties of man find it difficult to get away from traditions, superstitions, and the tendency to furnish explanations in absolute ignorance and darkness, especially when a newspaper reporter is there to help him into a rosy publicity.

That human milk may be toxic is known to the intelligent mother, for she is constantly on her guard against eating certain foods. Exhaustion, fright and other emotions may react on the normality of her babe, who may respond to the slightest alteration of its food. If this is true, it would not be strange if a cow were subject to similar physiological functionings, although they may not be exactly the same. Such seems to be the case. Cows'

milk, too, is open to the attack of micro-organisms actually capable of producing poisons in milk.

Decomposition of milk is usually preceded by the development of lactic-acid-forming micro-organisms, aided by the presence of the natural sugar in milk. However, at times organisms are present which are able to institute decomposition processes which are seriously injurious to the human body; accordingly the public is alert to such decomposition if it can recognize any change and refuses to use the milk.

Adulterations are not as uncommon as they should be. Water is difficult to detect and in some hands easily masked. Of course, it is harmless, but it does reveal the presence of a criminal mind to deal with. The introduction of formaldehyde to preserve and some patent compounds to sterilize again suggest dangers. The latter is especially significant inasmuch as it leads to carelessness and reprehensible practices. Water and steam, washing powder or something to "cut" the fat are the legitimate weapons of a well-organized dairy and a mentally clean dairyman.

This very casual review of what is involved in the *purpose* of milk inspection is given to prepare the way for the treatment of certain human aspects which should find their basis in the purpose rather than in foreign interests; but before passing on to the consideration of these human agencies, let us stop for a short treatment of the physical means by which control is secured, such as tests, score cards, laboratory determinations and other technical means.

Too often these tools are used to cloak the real significance of milk inspection when they should be used as instruments only in the hands of the inspector. A test may be useful to the inspector but useless to the public, for the inspector may know or find out exactly what it

means while to the public it means nothing or is in a sense valueless. Too many tests for the inspector are scarcely possible, but the public simply wants to know the rating of the milk. It follows that the inspector necessarily should utilize all the tests available to establish his ratings.

The *practice of milk inspections,* weighed in the balance of its efficiency which is based on the human factors, now engages our intimate attention. Herein lies the essence of the case which may be considered apart from the adroit influences which many times control the situation.

Usually a milk inspector, assuming that he is properly trained, should enter the service through civil service examination and then develop his work in accord with the best standards. If he cannot do this and is hampered or influenced by local politics or a set of men who will meddle with his work in any way whatever other than in a wholesome control, then it may truthfully be said that adroit influences have defeated the real purpose of milk inspection. Do these influences exist? Too often, I fear.

The honorable and progressive milk producer or manufacturer welcomes the inspector into his dairy or factory, for he is as anxious as the inspector to produce the best quality commensurate with the price he is receiving. He welcomes the inspector for he feels he is within the legal limits and the inspector may contribute something which will be helpful to him. Such, in brief, are the relations which should obtain. The inspector should be of a type and have the training that will enable him through tactful suggestion to keep the producer alert and progressive. This is possible, for the inspector with good training and in touch with so many dairies ought to be well prepared to assist and encourage good practices.

Some of the qualifications for an inspector are as follows:

1. He should have a thorough scientific and practical knowledge of cattle, including anatomy, physiology, pathology, feeding, breeding and managing.

2. He should have a thorough scientific and practical knowledge of milk production and handling, including all the operations involved.

3. He should have a thorough training in dairy and pathogenic microbiology, with especial attention to the detection and transmission of specific dairy and pathogenic micro-organisms.

4. He should have a thorough knowledge of abnormalities of milk arising from physiological activities.

5. He should possess a thorough knowledge of dairy chemistry.

6. This presupposes, of course, a certain amount of prerequisite study.

Such training, it will be seen at once, puts a man in position to act as master of his vocation, provided, of course, he has the innate ability of the usual man and power to handle men.

Such a man is not a bacteriologist, chemist, veterinarian, physician, dairyman or farmer, but a man trained for a place which is very responsible and essential to nearly every community. Much of the mischief of present conditions doubtless comes from the above specialists who look at the problem of milk inspection from a single viewpoint.

The success of milk inspection, it is readily understood from the foregoing, is dependent not only upon the actual purpose, but also upon the man who inspects, who is master of his own profession and conditions, almost regardless of laws and institutions. The inspector should be a man of broad sympathies, of wide training; who realizes that producer and consumer are equally interested; who

understands that the welfare of both is conserved by each; who appreciates the major and minor difficulties of the situation; who abhors injustice and one-sided authority; and one who has a keen business sense. No group of men of a single profession or training can properly or without prejudice control a situation so much involved, or can a single man trained in a profession or field removed from milk inspection or the milk question turn to it and deal with it wholesomely or fairly.

Those who have followed milk inspection over a number of years and have acquired their knowledge through actual experience and actual study of the situation as it exists and from all sides, have become more and more convinced that milk inspection is not solely a matter of policing, nor of production, nor consumption, nor laboratory technique, nor medical dictation, nor score card marks, but the essence of all these reduced to good practices.

The education, direction and control required should, in most part, be extended by the inspector, who "rounds up" all the interests concerned, from producer to consumer.

The necessity for "Boards of Control" is recognized as a "governor" to the required inspecting mechanism. Initiative and performance do not find their origin in them, but rather in the inspector.

It may be said that boards controlling milk inspection should be truly representative. They should not be all producers or consumers, not all medical men or laboratory men, not all business men or other professional men, but really representative by a sprinkling of each. They should be men not influenced or prejudiced by ulterior purposes. Through such a channel of justice and fairness the turbulent elements of milk production and consumption may hope to pass to peaceful administration.

It seems possible that there should be a centralized representative board which can conserve the requirements of all parties concerned and mete out justice; which can under-

stand sympathetically the function and role of producer and consumer alike; and which can harmonize misunderstandings likely to arise between these two groups. Such a board should, of course, be made up of the most judicial men from the various fields previously named and possess discretionary power over all local milk inspectors.

"The milk inspector must be a man of broad vision and sympathies, seeing at all times the problems and welfare of the producer, the dealer and the consumer."—Prof. W. A. Stocking.

THE SYSTEM OF RECORDING AND TABULATING THE ANALYSES OF SAMPLES OF MILK COLLECTED BY THE MASSACHUSETTS STATE DEPARTMENT OF HEALTH

HERMANN C. LYTHGOE, *Director,* Division of Food and Drugs

Milk inspection has been carried on for thirty-four years by the State of Massachusetts through the State Department of Health, and its predecessors, the State Board of Health, and the State Board of Health, Lunacy and Charity. The system under which the work is carried out and the results tabulated has been largely a matter of growth and was not the result of an innovation. This system, while it is by no means perfect, may be of sufficient value that its publication would not be undesirable.

Shortly after the food inspection work was begun in 1882, it was deemed desirable that the samples submitted by the collector to the analyist should not be marked in any manner whereby the analyist could ascertain the identity of the person from whom it was taken. A system of serial numbers was therefore devised by the late Samuel W. Abbott, Health Officer of the State Board of Health, Lunacy and Charity, and subsequently Secretary of the State Board of Health. This system, originally designed for three collectors, was so ingenious that it has been capable of extension as the department has grown. It is as follows:

One inspector uses consecutive numbers, another uses odd numbers between one and 9,999, with a letter after the number, and upon reaching the highest number, begins again with number one followed by the next letter of the

alphabet. Another inspector in a similar manner uses even numbers from two to 9,998, with a letter after the number. Two more inspectors use numbers between 10,000 and 20,000, two more use those between 20,000 and 30,000. Examples of these numbers are as follows:

1-2-3-4....ad infinitum.
1A-3A-5A to 9,999A 1B-3B-5B, etc.
2R-4R-6R-8R to 9,998R 2S-4S-6S, etc.
10,002C-10,004C-10,006C to 19,998C 10,002D-10,004D, etc.
10,001E-10,003E to 19,999E 10,001F-10,003F, etc.
20,001H-20,003H-20,005H to 29,999H 20,001J-20,003J, etc.

Under this system each inspector's numbers are distinct from those of the others and he can collect 130,000 samples before it is necessary to again begin the series. Furthermore, the character of the number becomes so intimately associated with the inspector using it that the analyst can at once know who collected the sample by a glance at the number. The rules of the then State Board of Health required that the inspectors' records and the laboratory records be kept separate, therefore, each inspector kept a description of his samples posted numerically in a book provided for that purpose and each analyst kept a record of his analyses by number in a note book. Subsequently, the laboratory analyses were recorded on cards filed according to the character of the sample, which in some measure simplified the work. An attempt was made to index the analyses, which was not very successful owing to the rules of the board, but after the board was reorganized and a food and drug division was created by the Commissioner of Health in the new State Department of Health, the work was developed to its present condition.

The inspector brings his samples, for example, 16 samples of milk, into the laboratory and delivers them to the

analyst, who at once begins the analyses. The inspector then makes out a sheet stating the sample numbers, the name and address of the persons from whom the samples were taken, the date and place of collection and whether the sample came from a team, from a producer suspected of adulterating the milk, or from a store. If from the latter, the name of the dealer who furnished the milk to the store is stated. If from a suspected producer, the name of the customer is stated. He also states whether the person produces all, part, or none of the milk taken. This sheet is then left with the clerk in charge of the food and drug records.

The cards upon which the analyses are recorded are ruled in a special manner and previously numbered consecutively. The analyst takes the top card, upon which he records the sample numbers in the left hand column. In the next column is recorded the number of the platinum dish in which a five-gram portion of the sample is weighed and in another column the number of the Babcock fat bottle in which the milk is measured for the fat determination. After the solids and fat determinations are made and the samples are found satisfactory, the analyst gives the card to the clerk, but if some are bad, he may wish to know the history of the sample and, therefore, he gets the inspector's sheet and studies it. If, for example, two samples are obtained from one man who produces all his milk, and one appears to be watered, it is desirable to apply the tests for added water to both samples. If all the samples appear to be watered and were obtained from one man, it is not necessary to subject more than two or three samples to the final tests.

After the clerk receives the analyst's report, she copies the results of the analyses upon a separate sheet and also upon the same sheet copies certain of the data from the inspector's sheet and numbers both sheets the same as the analyst's card is numbered and for the first time the com-

plete data is recorded together. These sheets are bound in numerical order as per the cards of the analyst and give the complete record filed by sample numbers. A geographical index is next prepared by removing the appropriate card from the file and placing thereon the number of samples above and below the standard, the total samples, the total solids in the lowest sample, the number of skimmed and watered samples, the date, the card number, and the inspector's initials. An alphabetical index of the dealers is next prepared upon cards of three colors, white for retail and wholesale dealers, blue for stores, and pink for suspected producers. The department desires for statistical purposes the variation in the composition of the milk sold throughout the State and the figures for this compilation are computed as soon as each collection of milk is examined. The clerk in charge of the food and drug records adds up the solids, fat and solids-not-fat on each of the analysts' cards and transfers this to a sheet together with the number of samples above and below standard, the total samples, the number of skimmed and watered samples, the sum of the solids, fat and solids-not-fat of the adulterated samples and the number of samples with total solids above 15% and for each per cent to 8% and the number below 8%. At the close of the month these sheets are added and the monthly report upon milk statistics is soon calculated.

The results obtained by this method of computation for the year ending November 30, 1915, are given in the following tables:

SUMMARY OF MILK STATISTICS BY MONTHS

Month	Number above standard	Number below standard	Total samples collected	Skimmed samples marked	Skimmed samples not marked	Watered samples	Per cent of skimmed samples not marked	Per cent of watered samples	Per cent of total samples below standard
1914									
December	256	62	318	3	1	21	0.31	0.66	19.5
1915									
January	207	57	264	..	4	3	1.52	1.14	21.6
February	475	115	590	5	6	12	1.02	2.03	19.5
March	502	152	654	3	12	33	1.83	5.05	23.2
April	498	218	716	6	8	5	1.12	0.70	30.4
May	676	207	883	1	9	25	1.02	2.83	23.4
June	553	174	727	6	4	8	0.55	1.10	23.9
July	448	264	712	2	11	63	1.55	8.85	37.1
August	336	141	477	4	9	21	1.89	4.40	29.6
September	346	152	498	4	3	19	0.60	3.82	30.5
October	509	96	605	1	6	4	0.99	0.66	15.9
November	580	95	675	9	1	23	0.15	3.41	14.1
Totals	5386	1733	7119	44	74	237	1.04	3.33	24.3

QUALITY OF MILK BY MONTHS

NUMBER OF SAMPLES WITH SOLIDS VARYING BETWEEN

Months	15% and Above	14 and 15%	13 and 14%	12.15 and 13%	11 and 12.15%	10 and 11%	9 and 10%	8 and 9%	7.66 and 8%	Totals
1914										
December	3	17	73	161	57	5	2	..	..	318
1915										
January	7	8	65	127	53	2	2	..	..	264
February	3	22	126	323	99	6	9	2	..	590
March	9	23	143	325	126	19	9	..	..	654
April	3	20	125	345	206	13	4	..	..	716
May	6	13	154	502	193	14	1	..	..	883
June	6	14	128	401	165	8	4	..	1	727
July	5	18	119	306	214	33	11	5	1	712
August	5	17	108	204	125	14	3	1	..	477
September	5	17	87	234	132	18	4	1	..	498
October	3	22	160	323	91	2	4	..	..	605
November	12	26	202	335	81	12	7	..	..	675
Totals	67	217	1490	3586	1542	146	60	9	2	7119

QUALITY OF AVERAGE MILK BY MONTHS

Month	Average of all samples: Number	Solids Per cent	Fat per cent	Solids not fat per cent	Average of all samples not declared skimmed or watered: Number	Solids per cent	Fat per cent	Solids not fat per cent
1914								
December	318	12.63	3.73	8.90	293	12.75	3.77	8.98
1915								
January	264	12.68	3.76	8.92	257	12.73	3.80	8.93
February	590	12.57	3.76	8.81	567	12.67	3.80	8.87
March	654	12.60	3.76	8.84	606	12.73	3.82	8.91
April	716	12.46	3.69	8.77	697	12.51	3.74	8.77
May	883	12.52	3.78	8.74	848	12.69	3.85	8.84
June	727	12.50	3.74	8.76	710	12.56	3.78	8.78
July	712	12.31	3.72	8.59	636	12.55	3.80	8.75
August	477	12.55	3.84	8.71	443	12.68	3.93	8.75
September	498	12.45	3.76	8.69	472	12.56	3.83	8.73
October	605	12.69	3.75	8.94	594	12.74	3.78	8.96
November	675	12.79	3.80	8.99	642	12.91	3.87	9.04
Totals	7119	12.55	3.76	8.79	6,765	12.68	3.82	8.86

The dealer against whom it is proposed to make a prosecution is then sent a letter containing the results of the analysis of the sample and a request for an explanation within five days. Three copies of this letter are made. One goes to the inspector, one to the analyst, who attaches it to the card upon which his analysis is recorded, and the third goes into a file known as the "daily reminder" at a date five days later than the date of the letter. At the close of the five days, this copy is placed on the desk of the director of the division and if no reason to the contrary has developed in the meantime, the inspector who took the sample is told to prosecute. At the close of the prosecution, the inspector reports the result upon a special form to the clerk in charge of the files.

Warning notices are sent upon special forms, the figures being written in by the analyst. These forms are in books and the carbon copies are, therefore, not sorted.

This system is now being extended by placing upon the cards filed by names of dealers, the action taken upon the case of each sample found below the standard or adulterated.

A set of the forms used is given below. The analyses given are purely hypothetical and the initials used as names of dealers have no meaning. The copies of the geographical index, summary of milk statistics for February, 1916, and monthly report of July 1, 1916, are true copies of the Department's records:

COPY OF ORIGINAL RECORD OF ANALYSIS

Sample number	Dish number		Total solids per cent	Fat bottle	Fat per cent	Solids not fat per cent	Protein	Cu. Ref.	S. S. Ash.	
1397R	12	6506	13.06	A	4.06	9.00				
1399R	13	6485	12.97	B	4.00	8.97				
1401R	14	5880	11.76	C	3.50	8.26	3.20	36.5	.745	
1403R	15	6954	13.91	D	4.70	9.31				
1405R	16	6340	12.68	E	4.10	8.58				
1407R	17	6345	12.69	F	4.10	8.59				
1409R	18	5500	11.00	G	1.80	9.20	3.32	Skimmed not marked		
1411R	19	5300	10.60	H	1.60	9.00	3.28	Skimmed not marked		
1413R	20	7000	14.00	J	4.90	9.10				
1415R	21	6700	13.40	K	4.50	8.90				
1417R	Sk. 22	4800	9.60	L	0.10	9.50		Marked skimmed		
1419R	23	6250	12.50	M	3.70	8.80				
1421R	24	6255	12.51	N	3.70	8.81				
1423R	25	5000	10.00	P	3.10	6.90		33.1	.624	Watered
1425R	26	5514	11.03	R	4.00	7.03		34.6	.630	Watered
1427R	27	5942	11.88	S	4.20	7.68		35.3	.676	Watered
1429R	28	4731	9.46	T	2.80	6.66		31.0	.525	Watered
1431R	29	5340	10.68	V	3.20	7.68		35.2	.635	Watered
1433R	30	6200	12.40	W	4.40	8.00		35.8	.685	Watered
1435R	31	6250	12.50	X	4.50	8.00		35.7	.679	Watered

1401R 50.4—14.5 — 35.9 — 3.20%
1409R 50.4—13.2 — 37.2 — 3.32%
1411R 50.4—13.7 — 36.7 — 3.28%

1401R—A—.1862 — 0.745
1423R—B—.1560 — 0.624
1425R—C—.1575 — 0.630
1427R—D—.1690 — 0.676

1429R—E—0.1312 — 0.525
1431R—F—0.1587 — 0.635
1433R—G—0.1712 — 0.685
1435R—H—0.1697 — 0.679

13—7—20
1 Skimmed above standard,
2 Skimmed not marked,
7 Watered.

C. A. R.

COPY OF INSPECTOR'S RECORD

Massachusetts State Department of Health

Milk Report

Boston, June 31, 1916.

Number	Name and address	Date and place of collection	Taken from team, store, suspected producer, or producer given 20-day notice	Produces all, no, or past milk marked Sk?	If from store state name of dealer supplying milk, size of and amount in container. If from suspected producer state name of customer
1397R	A.B.	Concord	Dealer	part	8 qt. can
1399R	A.B.	"	"	"	1 pt. can
1401R	C.D.	"	"	buys	can
1403R	C.D.	"	"	raises	1 qt. jar
1405R	E.F.	"	Store	buys A.B.	1 qt.
1407R	E.F.	"	"	buys A.B.	1 pt.
1409R	A.C.	"	"	buys C.D.	part of can
1411R	A.D.	Sk. "	Dealer	all	pt. bottle
1413R	A.D.	"	"	"	qt. bottle
1415R	A.D.	"	"	"	can
1417R	E.G.	"	"	none	can
1419R	E.G.	"	"	"	qt. bottle
1421R	E.G.	"	"	"	pt. bottle
1423R	H.N.	"	S.P.	all	8 qt. can
1425R 1427R 1429R 1431R 1433R 1435R			Sells to L.V., Somerville		

M. L. F.
Inspector.

THE COMMONWEALTH OF MASSACHUSETTS—STATE DEPARTMENT OF HEALTH

Milk Analysis

Date, June 31, 1916.
Card number, 476.

Number of Sample R.	Total Solids	Fat	Solids not fat	Proteins	Copper Serum Refract'n	Sour Serum Refract'n	Sour serum ash	F.M.	Name and address	Taken from team store, dealer or suspected producer	Produces all, no, or part milk
1397	13.06	4.06	9.00								
1399	12.97	4.00	8.97						A.B., Concord	Dealer	part buys
1401	11.76	3.50	8.26	3.20	36.5						
1403	13.91	4.70	9.31						C.D., Concord	Dealer	raises
1405	12.68	4.10	8.58								
1407	12.69	4.10	8.59						E.F., Concord	Store	buys A.B.
1409	11.00	1.80	9.20	3.32	Skimmed not marked				A.C., Concord	Store	buys C.D.
1411	10.60	1.60	9.00	3.28	Skimmed not marked						
1413	14.00	4.90	9.10								
1415	13.40	4.50	8.90						A.D., Concord	Dealer	all
1417	19.60	0.10	9.50		Marked Skimmed						
1419	12.50	3.70	8.80								
1421	12.51	3.70	8.81						E.G., Concord	Dealer	none
1423	10.00	3.10	6.90		33.1		.624	Watered			
1425	11.03	4.00	7.03		34.6		.630	Watered			
1427	11.88	4.20	7.68		35.3		.676	Watered			
1429	9.46	2.80	6.66		31.0		.525	Watered			
1431	10.68	3.20	7.68		35.2		.635	Watered			
1433	12.40	4.40	8.00		35.8		.685	Watered			Sells to
1435	12.50	4.50	8.00		35.7		.679	Watered	H.N., Concord	S.P.	all L.V., Somerville
	248.63	70.96	177.67								
	13	7	20								

7 Watered.
2 Skimmed not marked.
1 Skimmed above.

Concord—Suspected Producers (in part).

H. & R.

COPY OF CARD FROM ALPHABETICAL FILE

Milk From Suspected Producer

Name: H. N. Date: June 31, 1916.
Place of collection: Concord. Address: Concord

Number	Total solids	Fat	Proteins	Solids not fat	Refraction of copper serum	Ash of sour serum	
1423R	10.00	3.10		6.90	33.1	.624	Watered
1425R	11.03	4.00		7.03	34.6	.630	Watered
1427R	11.88	4.20		7.68	35.3	.676	Watered
1429R	9.46	2.80		6.66	31.0	.525	Watered
1431R	10.68	3.20		7.68	35.2	.635	Watered
1433R	12.40	4.40		8.00	35.8	.635	Watered
1435R	12.50	4.50		8.00	35.7	.679	Watered R.

COPY OF GEOGRAPHICAL INDEX

City or Town.....

Above standard	Below standard	Total	Lowest solids	Skimmed marked	Skimmed not marked	Watered	Foreign substance	Inspector	Date	Card number
12	4	16	11.60	..	1	..	..	MPC	Jan. 3	41
12	4	16	10.74	..	..	1	..	DEM	Mar. 3	68
11	7	18	11.10	..	..	1	..	DEM	Apr. 12	116
8	8	16	11.40	..	..	..	..	JSK	Apr. 12	117
12	5	17	10.64	..	..	1	..	JSK	Apr. 21	137
14	4	18	11.40	..	..	..	..	DEM	Apr. 21	138
3	3	6	11.68	..	..	..	..	DEM	May 2	158
11	5	16	11.86	..	..	..	..	DEM	May 18	187
12	4	16	11.36	..	4	..	..	DEM	June 9	221
10	8	18	11.58	..	..	..	..	DEM	June 20	239
15	3	18	10.92	..	2	..	..	JSK	June 20	240
17	1	18	12.06	..	..	..	..	DEM	June 23	254
4	7	11	11.80	..	..	..	..	DEM	July 14	293
11	7	18	11.34	..	..	..	..	DEM	July 24	311
9	12	21	11.18	..	..	..	..	MCP	Aug. 29	392
9	11	20	10.56	..	..	5	..	DEM	Aug. 29	394

SUMMARY OF MILK STATISTICS

FEBRUARY, 1916

Card number	Skimmed milk: Above standard	Below standard	Total samples	Above	Below	Not marked	Watered	Sums: Solids	Fat	Solids not fat	Sk. and watered: Solids	Fat	Solids not fat	Solids per cent: 15	14	13	12.15	11	10	9	8	Below 8
53	6	10	16	..	..	..	..	194.74	57.20	137.54	....	....	....	..	..	1	5	10	..	..	..	..
54	15	1	16	..	..	..	..	204.20	56.70	147.50	....	....	....	..	..	7	8	1	..	..	..	..
55	12	13	25	..	..	1	..	303.98	81.35	222.63	11.04	2.40	8.64	..	..	3	9	13	..	..	..	..
56	1	5	6	..	..	..	4	65.56	18.85	46.71	41.76	12.25	29.51	..	..	..	1	2	2	1	..	..
57	6	2	8	..	..	..	..	106.46	33.45	73.01	....	....	....	..	2	3	1	2	..	..	..	..
58	15	1	16	..	..	..	..	198.76	56.50	142.26	....	....	....	..	..	..	15	1	..	..	..	..
59	7	0	7	..	..	..	..	88.90	26.60	62.30	....	....	....	..	..	1	6	..	..	..	..	..
60	5	1	6	..	..	..	..	76.72	23.10	53.62	....	....	....	..	..	2	3	1	..	..	..	..
61	14	2	16	..	..	..	..	201.20	58.00	143.20	....	....	....	..	..	..	14	2	..	..	..	..
62	16	0	16	..	..	..	..	201.64	59.60	142.04	....	....	....	..	..	1	15	..	..	..	..	..
63	15	1	16	..	..	..	..	202.54	58.45	144.09	....	....	....	..	..	3	12	1	..	..	..	..
64	16	0	16	..	..	..	..	204.18	57.55	146.63	....	....	....	..	..	5	11	..	..	..	..	..
Totals	128	36	164	..	..	1	4	2048.88	587.35	1461.53	52.80	14.65	38.15	..	2	26	100	33	2	1	..	..
Average of all samples			5					12.49	3.58	8.91												
								52.80	14.65	38.15												
			159					1996.08	572.70	1423.38												
Average of samples not skimmed or watered								12.57	3.62	8.95												

THE COMMONWEALTH OF MASSACHUSETTS—
STATE DEPARTMENT OF HEALTH
DIVISION OF FOOD AND DRUGS
Room 501, State House, Boston, Mass.

Boston, July 32, 1916.

C. D.
Concord, Mass.

Dear Sir:

You are hereby informed that there has been obtained from you a sample of milk below the legal standard. You will be prosecuted for the sale of this milk if, after a reasonable interval of time, a second sample is found not to conform to the requirements of the law. This department is willing to co-operate with you if you so desire for the purpose of enabling you to sell milk above the legal standard.

Legal Standard	Total Solids	Fat
	12.15%	3.35%
Number		
1401R	11.76	3.50
1403R	13.91	4.70

Yours very truly
Director of Division

ALLAN J. MCLAUGHLIN, M.D.
Commissioner of Health

MASSACHUSETTS
STATE DEPARTMENT OF HEALTH
BOSTON

July 7, 1916.

H. N.
Concord, Mass.

Dear Sir:

You are hereby informed that the milk recently obtained from you has been examined, with the results stated below.

Any statements made within 5 days in person or in writing in explanation of the condition of the milk will be duly considered by the State Department of Health. If, as the result of the explanation, it becomes necessary to obtain more samples, any information given to the person from whom the samples are to be taken will defeat the purpose of an inspection.

MILK COLLECTED *June 31, 1916*

No. of Sample	*Total Solids*	*Fat*	*Remarks*
1423R	10.00	3.10	Watered
1425R	11.03	4.00	"
1427R	11.88	4.20	"
1429R	9.46	2.80	"
1431R	10.68	3.20	"
1433R	12.40	4.40	"
1435R	12.50	4.50	"

Yours very truly
C. A. R.
Assistant Analyst

CAR/CEM

THE COMMONWEALTH OF MASSACHUSETTS
STATE DEPARTMENT OF HEALTH

Date of Trial *August 32, 1916*

Names and Address of Defendant
H. N.

Court *Xth. Middlesex District* Before Judge *U. V.*
Character and No. of Sample *1423R* *Milk*
Analysis of Sample
Total Solids 10.00 — Fat 3.10 — Watered
C. A. R.
Analyst

Copy of Complaint. Did have in his possession one-half pint of milk to which water had been added with intent

then and there unlawfully to sell the same within this Commonwealth.

Verdict, Guilty. Fined $50.00.

Appealed, No.

Other Witnesses *M. L. F.*
L. V. Inspector

(These reports to be rendered immediately upon completion of case in the lower court.)

THE COMMONWEALTH OF MASSACHUSETTS
Allan J. McLaughlin, M.D.
Commissioner of Health

DIVISION OF FOOD AND DRUGS
Hermann C. Lythgoe
Director

STATE DEPARTMENT OF HEALTH
BOSTON

July 1, 1916.

To the State Department of Health:

I have the honor to present the following report of analysis of Milk during the past month.

Number above the Standard	795
Number below the Standard	161
TOTAL	956
Number having more than 15% of total solids	11
Number having between 14 and 15% total solids	28
Number having between 13 and 14% total solids	173
Number having between 12.15 and 13% total solids	517
Number having between 11 and 12.15% total solids	124
Number having between 10 and 11% total solids	10
Number having between 9 and 10% total solids	4
Number having less than 8% total solids	1
Number of samples Skimmed Milk above the Standard	2

Number of Samples Skimmed Milk below the Standard	—
Number of samples Skimmed Milk not marked	18
Number of samples Watered Milk	9

Respectfully submitted

CEM *Director, Division Food and Drugs*

DISCUSSION

QUESTION. What is the policy of your Department in taking these samples? Do you go out when you feel like it or is there some systematic scheme carried on?

ANSWER. I have a map of the State in the laboratory, and I have that map marked with pins of four colors. Our fiscal year begins in December and the inspectors are given their work, a series of cities and towns to cover. As soon as an inspector hands his sheet in as to where he has called, my clerk takes a pin and sticks it in that town on the map. At the end of the week I look over the map and pick out some more towns to be visited and give the inspectors a new route. We have four men doing this work all the time and I use other men when the rush comes that requires a lot of extra work. At the close of three months a pin of another color goes on that map and by watching the map with the pins stuck in there you can tell pretty well how a section is doing. I aim to cover most of the cities twice a year and the cities and towns of large population four times a year, and also have the inspectors get milk from nearly all the milk dealers, so in the city of Newton one man would go there for three days of inspection, the same with Lynn, Cambridge, Somerville and the larger cities, whereas in the small places a man would go only once in three months and in the very small places only once a year. We go down to Nantucket and Barnstable only once a year in the summer time and we take in the summer resorts only once a year. Some places we only touch in the winter time. The western

part of Massachusetts we take in the fall. I have found by experience that the milk generally runs all right in Berkshire County except during the months of September and October, and during that time it is liable to run poor. I find the milk in Gloucester always good in the winter and poor in the summer, so I leave it alone in the winter. It's a question of supply and demand. I found this year Gloucester was behaving itself beautifully.

The follow-up cases depend on what the men find. If the men find any bad cases official letters are sent out and the cases are followed up. Where an inspector is satisfied a man is being imposed upon he goes out and takes it up with the producer. Where the milk is sold in bottles in stores we don't hold the store man responsible; if sold in cans we hold the store responsible. Milk in restaurants, skimmed, we hold the restaurants responsible.

MR. KELLY. Are you required by law to give a sealed sample? What do you think of the advantages and disadvantages of this system?

ANSWER. I never worried about the disadvantages of this system. We have to take the law as it is and follow it up. The law says if a man calls for it he can have it; the law also says you can't prosecute a man for the sale of low standard milk unless you have given him a sealed sample, so it is customary for an inspector to ask a man if he wants it. You can prosecute a man for the sale of adulterated milk without a sealed sample. There are lots of very fine points on the sealed sample law. The law says "at the time of taking" if a man asks for a sample the inspector shall give it to him. We had an inspector—that was years ago—who was a pretty slick article on court cases. In one case where a man claimed that he asked for a sample and didn't get it, it developed during the case that the man walked out to the wagon and said, "I want a sample." "I'll give you one," said the milkman. "I'll take it," said the inspector and picked out

the sample he wanted. He argued to the judge that that wasn't "taking," it was voluntary delivery, and the judge fell for it and convicted the man. But as a general rule if a man says he asked for a sealed sample his word will generally go. I personally believe that a man is entitled to a sealed sample and ought to get it at the time of taking.

QUESTION. If you take a sample and pay for the sample are you compelled to give a sealed sample for the asking?

ANSWER. I don't think you are if you pay for the sample. I think it is your own property if you pay for it.

QUESTION. Do you prosecute for hygienic transgressions or just merely for tampering with the chemical nature of the milk?

ANSWER. All we have authority to do is to enforce the law. Hygienic conditions are covered by the local Board of Health regulations. We have eighty-eight cities and towns where we make examinations of milk and in those eighty-eight cities and towns they manage to get between 800 and 900 different regulations. That is no joke.

QUESTION. Can you prosecute for the violation of the rules and regulations?

ANSWER. No, we can't, but the local Board of Health can.

QUESTION. That is, for violations of local ordinances, not State law?

ANSWER. The local authorities can prosecute for it but we have no authority to carry on that work, we are only empowered to enforce the State laws. Each city and town is a law unto itself as far as regulations are concerned as to the sanitary conditions, and that is enforced entirely by local authorities.

"He that will not be counseled will not be helped."

EXPERIENCES AND OBSERVATIONS IN THE WORK

DR. O. P. THOMPSON, *State Dairy Inspector*
Waterloo, Iowa

The title of my paper is "Experiences and Observations in the Work," but at a very early age a certain incident occurred that convinced me that sometimes relating one's experiences may be very embarrassing.

When I was a young boy out in Iowa they used to have what they called revival meetings during the winter season. They didn't have picture shows then, or anything of that kind, so everyone went to meeting. I remember there was a certain Deacon Gould, who was mighty in prayer—that is, in the amount of noise he made—and who was very vociferous in his responses to the remarks made by other people, and very positive in his likes and dislikes. You know, at those meetings they usually have what they call an "experience meeting" following, and a certain Mr. Smith got up and in a feeble voice gave his testimony and wound up by saying, "I hope you will all pray for me," and this Deacon Gould said, "He needs it, he needs it, he needs it!" Another fellow got up and gave his testimony, and wound up by saying, "I hope I will meet you all in Heaven," and Deacon Gould says, "I doubt it, I doubt it, I doubt it!" Now, then, I might have the same embarrassing experience in telling my own experiences.

I have had some experiences with milk contests. I live out in Iowa and we have a dairy show out there, second possibly to this, not very far behind it, however, and we have had milk contests out there. Up to the present year we have been in the habit of having a fellow boil his cow and sterilize his hands, and all that kind of thing, and

submit a sample of milk. Well, they didn't submit very many samples, and the milk test didn't amount to very much, although we have had as high as thirty-five and forty entries. This year in Iowa I sent to the inspectors of eighteen different cities refrigerator milk cases, and had them send samples of milk as offered and sold on the street, had them send these samples in to the laboratory, and we scored them, using the Government score card. I think that meant something, but the other thing didn't mean anything at all. This kind of a test showed what kind of milk a dairy was selling, and I will say to you that when the people came in to the exhibit we had these refrigerator milk cases where people could get right up close to them, not three or four feet away, and everyone could see and understand. We always had someone there to tell them all about the proposition: we had the average score of the milk posted, the name of the city, and we also had the score card posted with each individual sample, and if a man came in from a certain town and wanted to know what kind of milk they had there, we just gave him the score cards and let him read them over.

Now, Dr. Conn last night suggested he didn't think it was fair to take just one sample of milk and publish the result of the analysis. I will say to you I think he is right ordinarily, but in these different cities we had been taking the milk right along, and we knew about how the milk ran, and these samples were about the usual run, so we felt justified in making it public—and we did. We had sixteen cities represented on those score cards, and anyone coming in was welcome to look them over. It was quite satisfactory to the dealers, with one exception. In the town where we had the show we had but one pasteurizing plant, and the average bacterial content of the milk was 4,480,000; and we had raw milks from the same town that had as few as 1,500 bacteria. You will readily understand that the fellow "pasteurizing" his milk and running his big

plant wasn't very well pleased with the show, didn't think it was a very good thing; but that was the way his milk ran and what he was selling, and we felt justified in telling the public. We had always "gum-shoed" on the publicity proposition, but we have gotten over that. Now in Des Moines, which is the largest city we have, we do this way. We notify the milkmen that we are going to publish the bacterial content of the milk, but we do not take only one count; we take five at least from each man, and then we publish the average bacterial content of those samples, and I will say to you that it has a very good effect on the milkmen and they came flocking into our office to find out how in the world to reduce the number of bacteria in their milk, and I had to go down the State three times myself to answer questions as to how to reduce the number of bacteria in milk. Milk standards are a necessary evil, that's the way I look at it—a necessary evil.

I am going to tell you the circumstances of my official visit to a city milk inspector seven years ago. I was sitting in the hotel, looking out of the window and wondering how and where in the world I would find this fellow; and while I was sitting there a fellow drew up on the street and he had a horse with a big abscess right between the front legs. Two or three fellows were standing across the street, one fellow with his pants in his boots and chewing a big wad of tobacco. The fellow says: "Hello, Buck, come over and look at this horse." The fellow reached in his pocket and took out a big jack-knife, opened it up and cut a big slit in the abscess. The pus ran down all over the horse's legs and feet; the old fellow wiped the knife on his boots and then on his pants; then he reached in his pocket, took out a plug of tobacco and cut off a piece. Well, pretty soon I went to the proprietor of the hotel, and I says: "Do you know Dr. Hooker?" (that wasn't his name), and he says: "Oh, yes; everybody knows him."

"Well," I says, "can you tell me where I can find him, where his office is?" "He hasn't any office, he's usually on the street somewhere." "Well, do you see him around anywhere?" He says: "Why, yes; that's him right across there," and I looked across and he was the very fellow, the milk inspector of that city. I might say to you that he ceased his operations as dairy and milk inspector from that time on.

Now, a law was passed in our State a few years ago, requiring all people giving the Babcock test for fat to secure licenses, and before securing those licenses they were obliged to pass a routine examination. I tried to give those examinations to ten or a dozen fellows in a town at once, and in one town I had about six bright young fellows, and I thought the answers would all be about the same, and I asked each one to read his answers as written. They were practically all agreed, except on the question, What amount of acid do you use in a nine-gram test? Some said half of 17.5, some said 8, some said 9, and one fellow said 17.5; practically all agreed except that one man who said 17.5. I said: "Here's a good chance for argument, what do you think about it?" They all knew this man who used 17.5 was wrong. Why? Because if he counts his milk that way and uses that amount of acid he will burn the milk all up. "Well," I said (we happened to be where there was a laboratory handy), "we'll try it." I had him take nine grams of cream and—well, you probably have surmised that that fellow who used 17.5 acid added an equal amount of water to the cream before making the test. These fellows were positive that fellow was wrong; that he couldn't test cream with that amount of acid. I tried to impress on them that just because a man don't do things the same way you do he don't necessarily do them wrong. Here is another instance along the same line. I was in a town

where one of our assistant commissioners lived, and we were taking up samples of the milk and cream in that town, and after we had them all collected he said: "Now, Thompson, I have some D. C. milk and cream bottles at home, and I believe we better get those so as to be sure we are right." So he got his D. C. bottles. We tested out these samples of milk and cream and they were all right, with one exception that tested 10.5. He says: "I am not surprised; that fellow furnishes my father, and he thought he was selling that kind of cream." I says: "Your father don't always guess right; what are you going to do about it—prosecute him for selling that kind of milk?" He says, "You seem to doubt whether I know how to test cream or not." "No, no; you know how, but I always make a duplicate test when I make an examination." He says: "All right, we can test it again." So he did, and when he got through I was washing up the bottles and things, and one tested 10.5 and the other 21. He says: "I made a mistake there; the only way I can figure it out is I balanced the bottles and then I put a nine-gram weight on this side and filled it with cream and then took up the nine-gram from here and I have eighteen on one side and nine on the other." I says: "Try it again," so he did; I watched him, and he got the same result—10.5 and 21. Now these two instances I am relating to you may seem simple, but it is the simple things we have to look out for. This fellow was a bright fellow, a splendid dairy commissioner and I was up against it up to that time. "Well," he said, "what's the trouble now?" and when we examined the bottles we found we had one nine-gram cream bottle and we should have doubled the reading. Now I tried to teach that fellow a lesson: when you know you are right, go to work and prove it before you file the information.

"When you know you are right, go to work and prove it before you file the information."—Thompson.

A METHOD USED IN DETECTING A MILK-BORNE TYPHOID EPIDEMIC

W. H. ROTHERY, *Milk Inspector,* Auburn, N. Y.

The method I will describe can be used not only for tracing a milk-borne typhoid epidemic, but also other diseases. Before going into details of the method I will try to give a short history of an epidemic.

In the month of October, 1914, on one of our milk-producing farms the son of the owner became ill with typhoid fever. The case was not reported to us at the time, as the law compelling the health officer of a town to report all such cases did not become operative until November of that year. This case was not known by us, but care evidently was taken and no cases at that time resulted from it. On July 14, 1915, the following year, a case of typhoid was reported in the city, and by August 8th we had eight cases. I had been on a vacation the last week in July and the first week in August, and this was the condition that I found on my return. We had no idea as to the source of infection and the first step was to find the source. We used the following method in chart form, looking out for fly transmission and the eating and drinking indulged in by the patient. The information when completed furnished a full history of each case.

First: the name of the patient, the sex, age, address, and occupation; when the first indisposition of the patient occurs, the date of the doctor's first visit, or the first visit to the doctor, which sometimes occurred. Working back from the date of the first indisposition we try to trace back the patient's movements for the thirty days previous

thirty days being regarded as a long enough period for any infection to develop.

Next, the doctor's name and the name of those who are nursing the patient are recorded.

Food problem is next investigated, then the water used; whether or not city water has been used; whether or not well water has been used; and whether or not other water has been used for the preceding thirty days, which includes mineral waters, so-called pure waters, or spring water.

The name of the party furnishing ice is also recorded, and whether the ice was used in the water for drinking purposes. We find and record the name of the dealer who furnishes the milk, ice cream, buttermilk, skim milk. We also find whether the patient used oysters or clams, and if so where obtained. We find also whether the person has attended any social gatherings where food was served.

We find if there is any privy on the premises, the disposition made of the excreta, whether flies have access to it, and whether it is disinfected, and the disinfectant used; whether a cesspool is used and what sewer system the premises drain into.

The conditions of the house inside and the surroundings are noted.

A place is left for the name of the informant, and a column for remarks.

We found that all of the cases of fever referred to had been buying milk of the same dealer. On August 9th I made an inspection of the fifteen farms from which this dealer produced his milk and found the father of the boy who had typhoid fever ten months earlier sick himself with fever, which two days later was declared to be typhoid fever. The sale of milk from that farm was at once prohibited, and the balance of the dealer's supply pasteurized. We had thirty-two cases of typhoid directly traceable to the

milk supplied from this farm. On September 20th the epidemic ended. Upon investigation and testing we found the water used on this farm polluted probably from carelessness during the first case, and that it had been communicated to the milk supply by the rinsing of the cans in cold water from the well.

About this time we had a case of para-typhoid on another dairy farm which ran three weeks or more before the farmer consulted a doctor. This man did the milking and handled the milk yet we did not have a single case resulting from it, as all his milk had been sent to a dealer who pasteurized his milk.

In conclusion I will say that if all supplies of milk were pasteurized we would not run the possibilities of contracting typhoid from cases in the producers' or dealers' families such as I have here described.

"The prevention of disease is the only practical procedure by which we may hope to establish and maintain a low death rate."

ORGANIZATION OF NEW YORK CITY MILK INSPECTION FORCE

JAMES J. CLARK, *Chief of Division of Milk Inspection,*
Bureau of Food and Drugs, Department of
Health, New York City

As it is widely known, the problem confronting the City of New York is the control of a milk supply of approximately 2,500,000 quarts daily, produced in six different States and two provinces in the Dominion of Canada, and from an area of 55,000 square miles. It is produced by 400,000 cows, handled at 400 creameries and 750 pasteurizing plants, transported over eleven different railroads, the longest haul being 450 miles, and on reaching New York City is received at sixteen different terminals, transported and delivered on 6,000 wagons and dispensed at 14,500 stores.

In the country from which we derive our milk, or what we term "the milk shed," twenty inspectors are assigned, under supervision of two supervising inspectors. While the right of cities to keep out deleterious foodstuffs has been upheld by the United States Supreme Court, we also under our permit system maintain that we are entitled to ascertain the conditions under which milk is produced before issuing a permit to the dealer who buys or brings that particular milk in the city. A refusal to permit inspection is followed by an immediate exclusion of the particular source and the dealer having his permits revoked.

The "country districts" are apportioned as equally as possible; the number of places to be inspected, the area, means of transportation, etc., are carefully considered. These inspectors cover the sources at every point, the

dairy farms, receiving and cooling stations known as creameries or country pasteurizing plants and up to the placing of the milk in the trains.

At the dairies, sanitary inspections are made. At the creameries and pasteurizing plants, in addition to sanitary inspections, bacteriological and chemical samples are obtained from the patrons or farmers as delivered by them. The burden of taking sediment tests is placed on the managers. Tests are conducted weekly and are subject to inspection by our inspectors at all times. High bacteria counts and excess of sediment result in exclusion. At the creameries, special attention is paid to the cooling of milk, also the sanitary conditions under which it is handled; at the pasteurizing plants, to the sanitary conditions and taking down of apparatus daily and to the accuracy of the temperature charts. I may state that the inspectors have found considerable faking of charts, this as a rule being done by not pasteurizing and marking sheets with pen by hand or by placing bulb of thermometer in vessel of water held at a pasteurizing temperature. As these charts are now our only index as to the proper pasteurizing of milk, and until some simple test has been invented to determine whether milk has or has not been pasteurized, very close attention is paid to this phase of pasteurization.

A system of communication by telegraph and long distance telephone is maintained between all portions of the milk shed and the office of the Chief of the Division in New York City, and all important reports and orders are submitted in this way.

Supervision work consists of continual observation by the supervising inspectors of the existing conditions and the results being obtained, and also the method used in making inspections and obtaining results as employed by the various inspectors.

The next step in the control is at the terminals. A squad of three men is detailed for this purpose. Special

attention is paid by them to receipts from Grade A sources, excluded sources, refrigeration, labeling and the returning of unclean containers to the country. As to the refrigeration, the temperature of milk when reaching city and the practice of leaving uniced milk on platforms for a considerable length of time before a dealer called for same is carefully noted. At times these inspectors also take samples for bacteriological and chemical examination.

In the City proper, there are three squads consisting of fifteen men, five men engaged in the inspection of our forty-five city pasteurizing plants and the obtaining of bacteriological samples of all raw and pasteurized milk, both city and country, sold in their respective districts. Six men are continually making lactometer tests of milk sold in their respective districts. Samples are only taken where these tests show milk to be undoubtedly adulterated or at least suspicious. These inspectors on a great many occasions have destroyed milk on lactometer tests, and in all of these instances the chemical analysis has shown their actions to be justified. In addition, these men are charged with the sanitary inspection of wholesale depots, other than pasteurizing plants, and the enforcement of rules regarding temperature of milk sold in these districts. The rules require that all milk sold in the city must be maintained at 50° F., but usually an allowance of 5° is granted, and invariably all milk found at a temperature of 55° or over is condemned and destroyed. They also submit a report known as a labeling report on every inspection. These label reports are carefully checked with records in office daily. In this way a close watch is kept as to whether dealers are labeling milk with the proper grades, in accordance with the permits issued to them.

City dairies, of which there are 105 in the City, having about 3,600 cows, are inspected by a force of four men. Most of these dairies produce Grade B pasteurized milk and very few Grade A raw milk. These inspectors enforce

the sanitary regulations and also take chemical and bacteriological samples from time to time. On account of the manner in which the dairies mentioned are conducted, continual observation being necesssary, they are a source of considerable trouble and annoyance.

The work of the City force is also supervised by two field supervisors who keep themselves continually in touch with every activity.

Complete up to date records of the inspections of various plants, both city and country, are kept on file in cabinets and are accessible at a moment's notice. Regulations are as a rule vigorously enforced. On second inspection of a dairy farm found to be insanitary, the product is immediately excluded. Where the sanitary conditions of a creamery or pasteurizing plant are found to be very objectionable, milk or cream handled or pasteurized at these plants is forbidden sale in New York City until further inspection shows that plant has been placed in a sanitary condition.

In practically all instances where samples obtained for chemical analysis show adulteration, criminal prosecution results. Where bacteria counts are found to be in excess of the required amount on the first sampling, operator is notified, and upon reinspection if excessive counts are again found, the supply is either degraded or excluded forthwith. Degrading usually consists of the lowering of the grade from A to B and from B to C. The inconvenience and financial loss resulting to the dealer when these actions are taken can be readily seen, especially when Grade B is reduced to C.

A dealer having a large bottle trade is practically unable to use this milk, as the rules provide that milk of this Grade shall be delivered in cans only. These actions usually produce immediate results.

The Chief of the Division is always in touch with the control being maintained. Daily reports of the inspec-

tors must be mailed before 8 P.M. on the day work is performed, and are usually on the desk of the Chief of Division at 9 A.M. of the following day. In addition to the files, large charts are provided which show every creamery, pasteurizing plant (both city and country), city dairy, Grade A and certified dairies, which are alphabetically arranged by districts so that at a glance he can inform himself as to when last inspection was made, when bacteriological or chemical samples, city or country, were obtained. He in this way can tell whether certain sources are over or under inspected, and also as to the character of work performed by the inspectors.

On October 1st, this year, the milk situation became a serious problem due to the disagreement between the dealers and the farmers, the farmer refusing to sign contract at prices offered by the dealers, and also demanding that the dealers pay the prices quoted by the Dairymen's League. In order to meet the situation, inspections were assigned to all terminals at which milk is received. These inspectors were instructed to inspect all milk being brought into the city, to see that it was properly labeled and that it otherwise conformed to the requirements of this Department. The dealers and also the representatives of the Dairymen's League were notified that there would be no let down in the enforcement of the regulations. Where applications were made to bring milk from new sources, the dealers were notified that such milk could only be brought in temporarily until after investigation. In order to expedite matters, the dealers were notified that all such milk must be brought into the city raw and then pasteurized under the Department supervision, and such milk could not be shipped into the city without the source being first inspected, unless the dealers could obtain a certificate from the city to which the milk had formerly been shipped that the milk was acceptable to said city. Upon such certificate being presented, the milk was permitted to be

brought into the city for pasteurizing under our supervision. Samples of milk were immediately taken for bacteriological examination and arrangements were made with the bacteriological laboratory to have information results in twenty-four hours, to be confirmed by complete results in forty-eight hours. In this way we were able to form an opinion as to the quality of milk in at least twenty-four hours. Where milk was brought into the city which was unlabeled and the dealer could not definitely establish the place of shipment by means of way bills, the milk was rejected.

A special watch was also kept of all sources which had at any time been excluded from the city on account of violating the regulations of the Department, the inspectors being provided with a list of all the approved sources. Approximately 30,000 quarts were rejected for the above reasons; and I am sorry to say that most if not all of this milk was diverted to nearby towns and cities. The new sources which the dealers in their endeavor to serve the trade were compelled to draw upon included supplies which formerly had been shipped to Philadelphia, Pittsburgh, Cleveland, Indianapolis, Chicago, Auburn, Montreal and Colebrook, N. H. To enable the Department to have knowledge of the actual amount of milk being brought into the city, the inspectors checked and tallied all the shipments. A special twenty-four hour detail was maintained at the Department in order to assist work of the inspectors.

DISCUSSION

QUESTION. I would like to ask Dr. Clark in regard to the grading of milk; suppose you find a plant where you want to grade the milk from B to C; how do you proceed?

ANSWER. We notify the dealer that receives the milk in the city to sell it as Grade C in cans only. That means practically excluding it.

QUESTION. Suppose a Grade A man goes to Grade B?

ANSWER. He has to use Grade B caps.

QUESTION. Do you give any notice to a pasteurizing plant?

ANSWER. We give verbal notice, if favorable conditions prevail; otherwise we give notice that we will not allow them to pasteurize until they have a reinspection.

QUESTION. How do you take care of their trade?

ANSWER. That isn't up to us.

QUESTION. Have you had such cases?

ANSWER. Yes.

QUESTION. Do you know how they take care of their trade?

ANSWER. They get milk from other dairies to help them out. I have seen their milk apparatus alive with maggots; if you think a dealer or an operator who maintains a plant in that condition is entitled to any consideration, I fail to see it; the only way we can get any results in New York City is by putting a "kick" into everything we do. It is such a big proposition we can't dilly-dally with anybody; we don't like to make arrests and we give a man as much leeway as we can. We do a lot of work by exclusion and degrading.

DR. ABBOTT. I want to ask Dr. Clark what becomes of this milk that is degraded to the extent that it cannot be sold in the city?

ANSWER. What becomes of it is of no interest to us so long as it is not sold in New York City. They usually sell to the nearby cities in the vicinity of New York.

QUESTION. Isn't that of interest to New York City?

ANSWER. We have an interest inasmuch as we would notify them; we have notified some cities and their action and interest has been so lukewarm that we simply ceased notifying them; and we can't say just where shipments are going, we know they may be going some place in

Jersey, but we have all we can do to handle everything coming into New York City.

QUESTION. I appreciate that all right, but the point is might not something be done to protect or help protect the people outside of New York City?

ANSWER. Well, our records may show that a certain place of shipment is maintained in an unsanitary condition; these authorities in other cities may not consider that our records or reports are final as regards that. That's the way they look at it.

QUESTION. That's just the point. Your regulations are different from others?

ANSWER. In some cases.

QUESTION. And you don't agree?

ANSWER. No.

QUESTION. And you don't permit the sale of that milk in your city, but still there is no system of protecting the public in general?

ANSWER. Not in other cities, no.

DR. ABBOTT. That reminds me, Mr. Chairman, if I may be permitted to make the reference. The members of this Association will remember that during one of the conventions of the Association a city health officer outlined his method of finding the origin of a diphtheria epidemic, and he showed that after the milk from a particular dairyman had been excluded from the supply of that city that the epidemic that had started in his own city immediately ceased. Now as proof of the fact that his diagnosis was correct and that this particular dairyman or dairy was the origin of the diphtheria, he told us that that dairyman shipped his supply over to another city and sold the supply there right along, and a diphtheria epidemic broke out in that neighboring city and brought down about 150 children, many of whom died. Now so far as the outside world was concerned he might just as well not have done anything at all with the milk from that dairy. He did

protect his son John and his wife, and me and my wife, but the other fellow, his neighbor, didn't get any protection and was stricken down with the disease. Now it has seemed to me that we might do something in an organized way to help each other. Just how it can be done or what can be done is a thing, of course, to be looked forward to, but I think every man here should feel the responsibility of putting something away from him that he wouldn't permit in his own territory and allowing it to go into somebody else's territory, and not cutting off the danger but simply transmitting it. I will suggest that as a thought to be considered by all of us as time goes on.

DR. HAGGERTY. Is all the milk in New York City supposed to be sold in bottles?

ANSWER. No, fifty per cent is sold in bottles.

QUESTION. If a man brings in his milk in a can, how does the consuming public know that it gets Grade B?

ANSWER. Each can has a label on it.

QUESTION. The public can't see that.

ANSWER. Well, Grade C milk can be sold only for manufacturing purposes.

QUESTION. What do you call "manufacturing purposes?"

ANSWER. Why, the manufacture of different foodstuffs. Only fifty per cent is sold in bottles; we have about 12,000 stores where they dip milk in New York City, and sell from 40 to 120 quarts per store.

QUESTION. Do you take your samples in duplicate?

ANSWER. Yes.

DR. MALONEY. I want to say I appreciated Dr. Clark's paper very much; it is very splendid to have a man in charge of the milk supply of a great city go into such detail as he has in describing it, and it, of course, is very interesting to us who have charge of the smaller cities; but some of the requirements of the smaller cities would be very inadequate for a large city. The thing that is particularly interesting to me is the method of inspection

and following up violations of regulations, and it seems to me it should be commended as bringing about the very best and quickest results in the enforcement and continuation of sanitary conditions. While I quite agree with Dr. Abbott that something should be done, I also quite agree with Dr. Clark that it is quite a problem for health officers and chiefs of milk divisions to properly care for their own cities. Very much has been said at this convention and previous conventions that something should be done to protect the general public, but no plan so far as I know has been definitely outlined, and I would like to call the attention of this Association to the many attempts of the State of Massachusetts to bring about just such a condition.

Somewhat replying to Dr. Brown, who spoke here Tuesday afternoon on milk analysis, in which he rather caustically took to task the milk inspectors and officers in charge of milk divisions for their lack of information and other things in not bringing that about. Now as a matter of fact in the State of Massachusetts for the last eight years there have been strenuous efforts along the very best lines on this subject to bring about a uniform law for cities and towns. Only last year Dr. McLaughlin held many meetings and a bill was drawn in an effort to make a uniform law covering the sale of milk in Massachusetts, and absolutely failed of passage because of the variety of interests both in commercial and legislative channels. It has been an utter impossibility to bring about a uniform law in a small State like Massachusetts. Every town and every city feel equally competent to deal with this great problem. Everyone of us feel that it is a State problem, and until it becomes that, and we have a uniform State law to take care of what Dr. Abbott would like to have taken care of, we can't do any better than take care of our own city as best we can.

A MEMBER. May I explain briefly how that matter is taken care of in Connecticut? The health officers of the

those analyses are made at Dr. Conn's laboratory the various towns send in samples to the State bacteriological laboratory at Middletown, from the retail dealers. When analyses are sent to the health officers, the milk inspector of the town, to the dairy and food commissioner and to the county health officer. When the dairy and food commissioner gets the analysis from Dr. Conn, and from the analysis of the sample of milk that dairy is deemed unsafe, the State inspector is sent to that dairy and when conditions are found unsatisfactory that dairy is quarantined. It would not make any difference whether that milk was to be sent to Pennsylvania, or Springfield, or New York City, it could not be legally sold, and if it was sold, the inspector would have instructions to go to that dairy and if he found a violation of the quarantine, he prosecutes in the local court. I have never in my experience known of a case where we did not receive a conviction in the local courts.

DR. ABBOTT. I want to make an observation here, that after studying cooperation as much as almost anyone in this country, I don't believe cooperation is a thing to be brought about by legislative enactment. I don't think legislative enactment is necessary at all to develop a cooperation that will be effective in keeping infection from being transmitted to any city in any State after it has been once driven out of any particular city. Cooperation is a thing that comes voluntarily, it comes by the wish and desire of people engaged in any great undertaking largely, and it is a thing that cannot be developed except on the highest basis of trust among the people who are supposed to carry on the cooperation. When I was traveling through the United States visiting all the State officials a year or so ago, I asked one State official who was interested in this question what sort of a plan of cooperation had been established in his State between the State department and the local city departments engaged in the same business

that he was engaged in. In one State I was met with this answer: the man said, "Nothing, absolutely nothing, we don't need any." Now, of course, as long as a State commissioner feels that way about it he won't get any and there won't be any whatever, but if we desire that our neighbors be protected it seems to me it would be a simple matter for any city department to report to the State department that a diphtheria epidemic has broken out in my city caused by this particular dairy, and that State department official, who has authority to operate everywhere and who has a plan of cooperation with the different city departments, can take hold of the situation and see that the citizens of the State are protected.

MR. ROTHERY. I would like to ask Dr. Abbott if during his investigation he took up the New York State plan? If not, I will explain. Immediately upon the discovery of any communicable disease by the health officer on a farm producing dairy products, he immediately notifies the State Department of Health. The State Department of Health notifies the health officer of the city where the milk is being delivered and from that time forth the milk is under the supervision of the health officer, and no milk or dairy products, such as buttermilk or cheese, can be sent away from that farm. The plan eliminates all chance of that farmer's turning around and sending it into another city or State. That law has been in effect for the past two years.

DR. MALONEY. I would like to ask Dr. Abbott just how he proposes to protect the public health against a diphtheria or typhoid epidemic in case there is a refusal of cooperation between adjoining towns or cities?

DR. ABBOTT. Of course, if a man who is interested will not cooperate with you, why I don't think there is any way you can make him cooperate with you even by force of statute if you had such a thing. Cooperation must be a voluntary thing; I don't know how to make a man

do it if he doesn't want to; I wish to goodness I did know sometimes.

DR. MALONEY. I want to say in that connection that I think our State laws are of some value and have some force in the protection of public life.

DR. ABBOTT. I don't want to be misunderstood about this uniform law or regulations matter. I am just as strongly for uniformity in these laws as anybody can be, but I am also just as strong for a minimum number of laws and regulations compatible with safety and protection of the public health. But I say we cannot wait for statutes to be enacted before we begin cooperating with our neighbors for the protection of public health in general.

MR. ———. I think that there is one way that the uniformity of the whole thing can be extended, and that is by a universal pasteurization law; then I don't believe there would be any epidemics of any kind or nature. I believe it is the duty of the State departments to appoint capable inspectors. The local health officer is generally a resident family physician; he is a physician, not an inspector; and there is a great deal in the scope of inspection that I don't believe the local physicians are in touch with. Instead of local physicians, whose action generally consists in quarantine, there should be State inspectors that are capable and efficient enough to know what to do. I think there should be cooperation between cities. When a milk is excluded by one city it is often immediately accepted by another city merely as a sort of slap-back at the bigger city, and we find in our experience where we exclude it in the larger cities, the smaller cities don't hesitate to take it in. They don't ask why it is excluded, they just take it in. We have an instance in New York now where we have excluded the supply and another city has taken it in and they have a typhoid epidemic on their hands at the present time. They have never offered any kind of cooperation with New York. In fact, stuff we have excluded

absolutely on account of sanitary conditions has been accepted by these other cities and States as a desirable supply. There is only one way I think you can fight epidemics, and that is to have perfect pasteurization. Our typhoid epidemics have occurred every fall, but we have kept our hands pretty clean in the last two or three years on account of maintaining perfect pasteurization.

"In our industrial, social, civic and religious democracy everything waits on education. No real progress and no lasting improvement in any line of life is possible except through the better education of the people."

THE CONSUMPTION OF MILK IN THE UNITED STATES

L. B. Cook, Dairy Division, U. S. Department of Agriculture

Two years ago the Dairy Division, U. S. Department of Agriculture, sent questionnaires to the cities of the United States for the purpose of collecting information in regard to each city's milk supply. From these replies I have deduced the following information in regard to the consumption of milk.

The reports from 319 cities gave the following information in regard to the daily per capita consumption of milk. (These geographic divisions are the same as those used by the Census Bureau, U. S. Department of Commerce.)

Number of cities reporting	Geographic Division	Daily consumption per capita
		PINT
59	New England	.7252
64	East North Central	.7193
27	West North Central	.7152
73	Middle Atlantic	.6961
29	Pacific	.5632
9	Mountain	.5088
33	South Atlantic	.4256
16	West South Central	.3952
9	East South Central	.3080
319	Average	.6504

These figures show that the greatest consumption is in the New England States and the lowest in the East South Central. The consumption is noted to be lower in the

Southern States, which is probably owing to high price, scarcity of supply, climatic conditions, and the high per cent of negro population.

In this connection it is interesting to note the following table, which gives the average price paid for milk by consumers in the various geographic divisions:

Number of cities reporting	Geographic Division	Average price per quart
		CENTS
44	South Atlantic	10.20
22	West South Central.	9.93
15	East South Central.	9.61
37	Pacific	9.39
15	Mountain	8.76
76	New England	8.50
37	West North Central.	8.23
104	Middle Atlantic	8.07
92	East North Central.	7.78
442	Average. . . .	8.59

These tables show that there is a general trend toward less consumption as the price rises.

The need of our educating the consumer to the value of milk as a food is obvious. The quantity of milk consumed in the United States should be increased, and I do not believe we are placing our goal too high if we aim at an average consumption of one pint per day for each person.

The work being done along this line by the National Dairy Council and many dealers is commendable work. It is surprising, however, how few people realize the true value of milk in comparison to other foods. At this time of high cost of living it is a fact that all should know. In order that the purchaser may obtain at the same rate

the same quantity of protein that a quart of milk contains, he should pay approximately 2.7 times as much for round steak or eggs as for milk, or about 1.4 times as much for milk to obtain the same number of calories.

If the consumption of milk is to be increased, we must first have on the market a clean, safe milk with a desirable flavor. Many cities have milk of this kind, but need to educate consumers to its value. Consumers must create the market, then distributors will be ready to supply the demands.

Many people feel that milk for children is a necessity but for adults a luxury, while as a matter of fact it is a cheap, wholesome food for all. Of course, milk is a diluted food, and only a certain quantity can be consumed; but it is doubtful whether many are consuming as much as they should when the average daily consumption in the United States is only a little more than one-half pint for each person, which means only an expenditure of a little over two cents.

We should always keep in mind, in connection with our work for the improvement of the quality of milk, that if it is clean and safe we should do nothing to decrease its consumption. I believe people oftentimes have been scared from using milk by our talk about its dangers. When we think of the large quantity of milk used daily in this country, we must admit that most of it, as now sold, is not dangerous. We all believe in "Safety First," so I am not belittling the work for a better grade of milk, but I do think we should work to increase the use of safe milk and do nothing to turn people from using it freely. Campaigns for clean, safe milk should go hand in hand with those for its increased use.

"Education is the greatest factor in putting the milk business where it belongs."—C. B. Lane.

"LICENSED TO KILL"

C. W. SIMPSON, *Dairy and Milk Inspector,* Vancouver, B.C.

By way of preamble let me state that my remarks refer entirely to the city and town milk vendor, and that by dairy and dairymen I mean the city bottling plant and the men responsible for it.

"Licensed to kill" is an unkind term that is often applied with a mistaken idea of humor to the medical profession; in fact it has been so worn that any original humor that may be left has been so sterilized by the heat of friction resulting from constant repetition as to leave us the bald statement of "Licensed to kill" applicable to anything and anybody.

Here in British Columbia we are insistent on British Columbian qualification. A doctor wishing to practise in this Province must pass the British Columbia examination for doctors; no matter what degrees he may hold, no matter if his name be world famous and he does not or will not satisfy the examiners, then if he wishes to continue in his profession he must try elsewhere. An engineer may have been chief engineer of a dreadnaught, George Stephenson come to life again, Parsons of turbine fame, yet if he wants to run a three-horsepower boiler to heat water he must pass his examination for the Province and take out his British Columbia certificate, otherwise there is trouble. Any druggist who wishes to dispense medicine must have his certificate for pharmacy from the British Columbia authorities. The same applies to lawyers, surveyors, dentists and many others and even to taxi drivers and bartenders; but what about the milk vendor? Is he licensed? No! Most emphatically, No! We license his premises, but not the man. To my mind it would be just

as reasonable to license the office of a doctor, and not the doctor; the office of a dentist, and not the dentist; the drug store, and not the druggist; the boiler, and not the boiler-man.

Licensed to kill! Who has more license to kill than the milkman? Thousands upon thousands of babies and millions of others, such as people of weak digestion, invalids, children of course, and even grown-ups are at the mercy of the milkman, and yet one hears and reads of inspectors, health authorities and others boasting of the laws governing the milk supply and of the high standard attained by the dairies, bottling plants, and so forth; but so far, in the course of my experience and reading, I have failed to come across any city that can boast that every milk vendor in that city is a practical, scientific and certified dairyman. How many people are killed by explosions of a little three-horsepower boiler? How many by dentists? How many by lawyers (if you do not include starvation after paying the lawyers' bills)? Yet a man builds a dairy (by dairy I mean a city bottling plant) according to the conditions embodied in the city, State, Provincial, Federal or Dominion Milk Laws, and then it is "Go ahead; you are licensed to kill," and not a thought given to the qualifications of the man, though here in Vancouver we have a blanket clause in the By-Law that would enable us to refuse a license to an undesirable person. Now this clause, to my mind, is purely a negative clause and of negative value, for while it would be enforced to the extent of refusing a man a license on account of a noxious disease, yet if one refused a man a license on the grounds of incompetency I venture to say that you would not be upheld in the law courts.

Who is the city milk vendor, and what has he been? Of course, I am not referring to big plants in big cities, though even they originally sprang from the same source.

As a rule this is more often the case: A man is out of a job, and as a last resort takes to driving a milk wagon for somebody else; perhaps he makes good money and manages to save enough to buy out a milk route, or maybe he is a man of some personality and does not wait to buy out a route, but boldly buys a horse and wagon and starts out on his own, trusting to his personality to canvass sufficient trade to pay expenses while working up a good business. Again he may have heard that there is good money to be made driving a milk wagon, and is shrewd enough to see the possibilities. Tell me, what do these men know about the proper handling or care of milk, or, what is worse, what do they care, as long as they can get the almighty dollar and avoid trouble with the Health Department? Another type of milk vendor is the man "who was brought up on a farm," with the "You can't tell *me* anything about milk: I've drunk milk all my life, and it has not killed me yet. Look at my father! He never troubled about these new-fangled notions and *he* never died—at least not from drinking milk." This man is a hard man to deal with.

Nowadays the policy of education of the milk vendor is the method advocated by the best authorities, and quite rightly, too; but I go further and say, "Educate him first" before he is allowed to be a milk vendor, and let him qualify for the great responsibility of handling milk and pass a satisfactory examination. In these days of agricultural colleges nearly all cheese- and butter-makers take a short course at one of these colleges. The man who has served an apprenticeship on the farm or in the dairy is the man who really benefits most by this education, and this again brings me back to where I digressed—why should a town or city that suddenly wakes up to the fact that babies are dying from dirty milk have to engage a milk inspector to teach the dairymen that they are mur-

clerers, while the dairymen, on their side, resent his interference because they have been handling milk for years and nobody has ever told them that anyone suffered any harm from drinking their milk?

Let the State or Province, Federal or Dominion authorities say, "No man shall act as a milk vendor in any town or city until he has passed an examination that proves him competent for his work." I should like to see every dairy and milk inspector work for at least six months as herdsman on an ordinary farm, and for six months in a city bottling plant, and when I say "work" I mean "earn his living" as a hand, and not to go as a gentleman pupil. An inspector who has been through the mill, and at the same time is a scientist, is the man who is respected by the dairyman. Man being but human and liable to err, the health authorities would then confine their efforts to checking up the milk supply; for with an up-to-the-standard owner, up-to-the-standard milk inspector, and up-to-the-standard laboratory, all working together amicably (for a trained man appreciates the efforts of a trained inspector), then the babies and invalids ought to have the best of milk, for there would be no occasion to tolerate any indifferent milk vendor.

"To cure is the voice of the past; to prevent is the demand of the future."

VALUE AND PAYMENT OF MILK

RUSSELL S. SMITH, *Market Milk Specialist,* U. S. Department of Agriculture, Washington, D. C.

Food, to fulfill its functions properly, must be enjoyed; and we all know that the enjoyment of food lies not alone in the taste and odor, but to a great extent in the eye and in the mental attitude of the person taking it.

A food that looks good, is clean and inviting, and gives the assurance of being at least free from gross dirt, will be much more beneficial than one lacking these qualifications.

It is universally recognized that appetite is an important element in the proper utilization of food, and eating is not merely a matter of introducing into the body a certain amount of substances capable of yielding tissue and energy.

From the earliest times milk has been considered as an easily digested food for children and invalids. Not only does milk cause a secretion of gastric juice in the stomach, but, as will be shown, a weaker gastric juice and a smaller amount of pancreatic juice are poured out on milk than on an equivalent amount of nitrogen contained in any other food. The work performed by these digestive glands is, therefore, less and the saving of energy in consequence is greater than when meat or bread, for example, is eaten.

Pawlow (translated by Thompson, England, 1902) has made an interesting calculation of the comparative work done by the stomach in digesting three articles of food.

He finds that the number of ferment units required for the digestion of corresponding nitrogen equivalents in the different kinds of foods is as follows:

Bread.....	1,600 units
Meat.....	430 units
Milk.....	340 units

This means that the protein in the form of bread requires five times more acid proteinace for its digestion than is poured out upon the same amount of protein in milk, and that the protein of meat requires a fourth more than its equivalent contained in milk.

It is known that vegetable proteins are much less easily digested than those of meat, and the proteins of meat less easily digested than those of milk.

The different kinds of proteins seem, therefore, to call forth the secretion of quantities of ferment which correspond with the differences in their digestibility.

In the intestine, the trypsin of the pancreatic juice in a slightly alkaline medium performs a somewhat similar function to the pepsin of the gastric juice, only here the process is continued further.

The following figures show that when equivalent quantities of protein are fed in the form of bread, meat and milk, the total quantity of ferment units poured out upon these foods in the intestine stands as:

Bread.....	1,978 units
Meat.....	1,502 units
Milk.....	1,005 units

In other words, vegetable protein demands from the pancreas as well as from the stomach the largest number of ferment units, while milk demands the least. The difference between the secretion of the stomach and the pan-

creas is, therefore, limited to the fact that the former pours out its ferment in a very concentrated form upon bread while the latter pours it out in a more dilute solution.

In quoting the foregoing figures I may have intruded upon the work of a nutrition expert or perchance upon the studies of a physiologist, but if the results are of value to those men of science, then surely they are worthy of our attention at this time.

We have been advocating for many years the use of milk as a food, and we have quoted and seen in print many tables of relative values with the object of bringing out the relative value of milk as compared with other foods. The familiar tables showing the value of a quart of milk and its equivalent in other articles of food and those showing the relative cost of the nutritive elements are of great value in furthering the use of milk as a food. We are in need of still more relative value tables so as to bring out to the consuming public the true value of milk. It must be remembered that while foods may have the same relative composition as milk as regards the actual chemical composition, the actual available nutriment secured by the bodily consumption of that food may be vastly different. The net energy secured by chemical analysis of other foods compared with actual nutritive value of the milk when ingested by the stomach is greatly in favor of milk.

The absorption by the human system of the energy containing constituents of milk is remarkably constant. This is shown in the following table made from Rubner's experiments,* which show the physiological utilization of the total calories of milk.

*Rubner: "Energiegesetze," 1902, p. 418

	Per cent of calories absorbed
Human milk	91.6 : 94
Diluted cows' milk	90.7
Diluted cows' milk and milk sugar	92.2
Same given to stunted infant	87.1
Cows' milk given to an adult	89.8

While we are quoting the results of these experiments, with the object in mind of extending to some greater degree the present knowledge of the value of milk as a food, we must not overlook the following important facts, namely:

In the nutrition of the young the milk of one species is specifically adapted to the growth of the offspring of that particular species.

The relatively large proteid content of cows' milk may not be useful for the child because it may clot in a heavy mass in the child's stomach. Even though this be digested it may be relatively much above the requirement of the organism, and its specific dynamic action increases the amount of heat produced. To support this the following may be quoted from Rubner, expressing the relative calorific value of the different constituents.

Percentage composition of calories in cows' milk and human milk:	Cows'	Human
Proteid	21.3	7.4
Fat	49.8	43.9
Milk sugar	28.9	48.7

Here, then, there are tremendous differences of composition which force the conclusion that cows' milk is not to be substituted, without modification, for human milk. In our anxiety to further the use of milk and dairy products in general, it may be well to add a word of caution to those dependent upon cows' milk for the rearing of their young. Such word of caution may in some instances be badly

needed and might result in more good to the industry than the advocating plan.

Much agitation over the price paid for milk at the farm and in the cities has been noticed during the past few years. It is becoming a problem that must eventually be confronted and this body should be in a position to give counsel to the factions involved. Whether a farmer can sell his product to a creamery, a condensary, or to the city dealer, must necessarily depend upon the relative net profits of each market, and it is only natural to expect that he will take the most profitable course. Here, then, we find a producer of a most valuable food product seeking the most profitable market for the same, and even if that profit does not prove to be ample, he is forced to sell because of the perishable nature of his product.

The basis of payment when selling milk or cream to a creamery or condensary is usually the butter-fat content. It is fat which costs the farmer the most to produce, and it is frequently the basis for determining the value of dairy animals. Breeders strive to secure a high-producing herd by using a sire whose ancestors have a history of a certain amount of butter-fat production. The advanced registry requirements of different breeds demand a certain number of pounds of butter-fat to be produced in a given time before the animals can be registered.

It would appear, then, that since butter-fat in milk is a desirable factor, when the milk is sold from the farm a payment should be received for this factor in accordance with the current market price.

If actual food value cannot be computed in dollars and cents to the satisfaction of all concerned, then it might be well to consider the value of the several factors which make up the composition of the product.

A creamery will pay the producer for the butter-fat content of his product—some may also pay him for his

skim milk—but as yet he has not demanded that the consumer pay him likewise.

Some fair basis of payment should be set, and it is only fair that the farmer demand that it be at least the same as the creamery is willing to pay. Perhaps in so doing he may be able to run his dairy farm at a profit and keep up the fertility of his land, which the selling of whole milk, at a price regardless of its composition, has failed to do so many times.

Considering the butter-fat content alone as a fair basis of payment for market milk, the following figures are submitted, which show what a producer might reasonably expect to be paid for milk having a definite butter-fat test. Such a table will, of course, vary with different standards and prices of butter-fat, but, for example, I have taken a 3.25 per cent milk and assumed that it is the standard and that the current butter-fat price at the creamery is $.35 per pound. Assuming also that 7 cents a quart is now received for the 3.25 per cent milk from the consumer, we have:

Milk	Butter-fat	Reasonable price per quart	
1 qt.	3.25	$0.070	
1 qt.	3.50	.072	
1 qt.	3.75	.074	
1 qt.	4.00	.076	
1 qt.	4.25	.078	Difference of 1%
1 qt.	4.50	.080	fat = .008 per qt.
1 qt.	4.75	.082	
1 qt.	5.00	.084	
1 qt.	5.25	.086	Difference of 2% fat = .016 per qt.

These figures are for butter-fat content alone and are not concerned with other relative food values, cleanliness or

bacteria content of milk, for which an extra premium may well be asked and paid.

When only one quart is considered the difference of one per cent in the butter-fat content may seem insignificant, but when the business is extended to several hundred quarts or more and the butter-fat test is relatively high, these differences then become convincing.

From a food and health standpoint milk very rich in cream, or cream alone, regardless of its cleanliness and freedom from bacteria, is not the best, for in actual food value skim milk contains more food nutriment than cream.

Skim milk contains all the albumin, sugar, salts and other valuable parts of milk aside from the fat, but as yet we have not reached a basis of payment according to the actual value of these important constituents. It is hoped that the day is not far off when a definite system of payment of milk can be ascertained.

If milk could be sold at a price comparable with its actual food value and adaptability to infants and invalids, instead of being sold by the hundredweight or quart regardless of its composition, and even if sold from the farm and to the consumer on a basis of its fat content, there would be less controversy over prices.

A basis of payment of milk according to its butter-fat content, its solids and its purity as determined by its bacteria content would be just. This, along with its added value because of its ease of digestibility and its relative low cost when compared with the nutritive elements in other foods, would be an ideal basis.

In absence of such an ideal uniform basis, the present form of grading as adopted in some sections seems to give to the consumer a means of selecting that for which he is willing to pay. Some such system seems necessary in order that the consumer should know what he is receiving from the dealer and the dealer should in turn know

exactly what he is selling in order that he may guarantee his product and increase his business under such a guarantee.

I have endeavored in this short paper to bring to your attention some of the virtues of cows' milk other than those with which you are familiar. We are in need of more and more enlightenment and facts upon which to base our claim that milk and its products are nutritious and wholesome and worthy of the patronage of all to whose use they are adapted.

"The results of some lines of research may seem at times to be quite without practical bearing. But we should remember, when tempted to style any such work as useless, that a notion which is derided by one generation as impracticable, or, indeed, false, often becomes an every-day affair in the next generation."—Prof. J. L. Hills.

MILK INSPECTION FROM THE POINT OF VIEW OF THE BUREAU OF CHEMISTRY OF THE U. S. DEPARTMENT OF AGRICULTURE

DR. CARL L. ALSBERG, *Chief,* Bureau of Chemistry,
U. S. Department of Agriculture

Milk inspection, in my opinion, is about the most important work that has to be done in connection with the enforcement of our food and drug laws. I know of no work that is so important, economically and hygienically, so dignified, so valuable, as the work of milk inspection. If I were told that the Bureau of Chemistry had to cease working on all subjects but one, and were asked to select that one subject, I should not hesitate a moment in saying that the thing that I would choose is the milk question. I feel that anything that can be done to improve the milk supply of this country is the most valuable service that any man or any body of men can perform, and I think it is pretty generally coming to be recognized among food and drug officials that the time has passed when an inspector in all seriousness can waste time upon some of the technical violations that have been reported by inspectors in food and drug work in the past. We have gotten away very largely from that sort of thing, and have come to a point where we are confining our work to really serious matters. I am not saying that technical violations of the law should be wholly ignored, but when there are so many more serious matters you cannot waste effort upon technical violations until such time as all the serious conditions have been remedied. The most serious

matter that we have to deal with is the matter of milk inspection.

Now, last year when I had the privilege of saying a few words before this Association, I pointed out that when one has a statute like the Federal Food and Drugs Act to administer, it is very easy to do harm as well as good in its administration. I can illustrate that most easily by citing some work that was done in a State in the Middle West that shipped milk to a large city just across the State line. The Bureau made a number of prosecutions in that territory. The next year an inspector was sent through that neighborhood to learn whether the prosecutions had done any good. If our aim was to prevent objectionable milk from reaching the city through interstate channels, it was shown that we had succeeded because the farmers had gone out of the milk business. Now, as it happens, that particular city was getting about two-thirds of its milk supply from within its own State, and one-third of its supply from across the State line. The only good we did by our law enforcement was to give the people within the State a monopoly of the furnishing of dirty milk to the city, and to put out of the milk business a certain number of farmers who were neither better nor worse than those shipping milk to this city from within the State. So we in the Bureau of Chemistry were working against the aims of the Bureau of Animal Industry, which encourages dairying; we were putting the milk producers out of business.

It occurred to us that there must be a way out; and the way out has been found in cooperation with the Bureau of Animal Industry. We are now working together. Mr. Kelly is the man with whom we are working most of the time. Those of you who have cooperated with us in this way are thoroughly familiar with our methods. The plan is to take samples from the shippers on the railroad line shipping to certain towns and to examine the milk. Where

we find evidence of bad handling, evidence of filth, evidence of lack of refrigeration, evidence of delay in handling. Mr. Kelly's subordinates step in, go to the dairy, and try to show the producer where he is at fault and how he can mend his ways. Then, when he has been told what ought to be done and what he can do with his limited means, we leave him alone to do these things. We return a little while later—we usually come back two or three times—and keep after him. Finally, in the majority of cases, he does learn to produce a satisfactory grade of milk without having been prosecuted.

This procedure has worked out very satisfactorily in a good many localities. Of course, we can touch only the interstate commerce in milk. Where a city gets its milk both from within and without the State, we find that we do not always get the kind of cooperation from the State that leads to cleaning up the milk situation within that State. This is unfortunate, and it is pretty hard to know how to deal with such a situation. Perhaps some form of publicity is the most satisfactory way of dealing with it. There are some rather important towns in different parts of the United States where we have succeeded in improving the supply of milk shipped interstate but where the supply of milk that comes from within the State remains about as bad as it well can be.

What I particularly want to say to you tonight concerns the work that we have done in New England with the help and assistance of Mr. Kelly and his subordinates. I hope to show you what a limited number of shippers (limited because our force, our funds, and our time being limited, we can reach only a part of these shippers) have been able to do, what has been accomplished with them, just by simply getting after them and keeping after them until they actually did what was needed. I can illustrate

that best by the actual records I have, of which the following is typical.

Here we have a milk shipper who in July had milk that showed a million micro-organisms per c. c. In August his milk still had a million micro-organisms; in four or five different samples there were as many as nine million. He evidently didn't think we were in earnest when we visited him again in August and kept after him two or three times. Finally he began to think that maybe if he didn't do something he might get into trouble. So he did the things he was advised to do and got his counts down to from 20,000 to 60,000. He did not buy a thing or expend anything except some labor and some care. I have here about fifteen instances of exactly that sort, with counts running into the millions in June and July, when we made our first visit; they were still in the millions in August, after we made our second visit; but after a third visit, twenty-four hours later, they came down to 50,000, 30,000, 40,000, and one to 15,000.

Some of the milk delivered at the milk station, as far as bacterial count goes, was just as good as certified milk. The farmers did nothing except follow directions. It was not a case of inability to produce good milk, it was just simply a question of lack of care and lack of cooling. Most farmers do not cool as well as they can. If they have water that is 50° they don't cool down to 50°; if they have ice they don't cool down to 40°; they are careless and they have to be made to realize that the chief thing is to be neat and clean and to cool their product.

Now, of course, that is all an old story to you; you gentlemen know all about that as well as I do. My excuse for presenting these facts is just to point out some simple actual improvements that have been made by the farmers last summer here in New England because we stirred them up. It did not cost the farmers any investment; it was

SOME RESULTS OF REGULATORY INSPECTION ON THE BACTERIAL CONTENT O' MILK*

	Date	Count	Temp. at time of delivery F.	Date	Count	Temp. at time of delivery F.
Shipper A	7–14(a)	11,600,000	54.5°	8–14(a)†	3,700,000	56°
	7–14(b)	240,000	63.5°	8–14(b)†	79,000,000	56°
	7–15(a)	93,000,000	59°	8–14(c)†	2,275,000	56°
	7–15(b)	80,000	61°	8–15(a)	18,500,000	58°
				8–15(b)	172,000,000	60°
				8–16(a)	35,000	57°
				8–16(b)	315,000	56°
				8–16(c)	30,000	58°
Shipper B	7–14(a)	580,000	57°	8–15(a)	1,005,000	53°
	7–14(b)	450,000	57°	8–15(b)	205,000	53°
	7–15(a)	5,300,000	55.5°	8–16(a)	50,000	56°
	7–15(b)	560,000	57°	8–16(b)	165,000	55°
				8–17(a)	290,000	58°
				8–17(b)	115,000	58°
Shipper C	7–14(a)	750,000	56°	8–14(a)	86,500,000	46°
	7–14(b)	2,490,000	57°	8–14(b)	18,800,000	45°
	7–15(a)	21,000,000	57°	8–15(a)	245,000	43°
	7–15(b)	1,300,000	56°	8–15(b)	36,500,000	43°
				8–16(a)	50,000	38°
				8–16(b)	20,000	38°

Shipper D	7–14(a)	1,310,000	60°	8–14(a)	350,000	58°
	7–14(b)	1,000,000	61°	8–14(b)	40,000	61°
	7–15(a)	50,000	62°	8–15(a)	20,000	62°
	7–15(b)	3,900,000	63°	8–15(b)	40,000	60°
				8–16(a)	60,000	63°
				8–16(b)	20,000	68°
Shipper E	7–14(a)	1,670,000	62°	8–14(a)	9,400,000	58°
				8–14(b)	345,000	57°
	7–15(a)	550,000	61°	8–15(a)	835,000	62°
	7–15(b)	1,150,000	68°	8–15(b)		
				8–16(a)	Less than 20,000	64°
Shipper F	7–24(a)	1,480,000	63°	9–8(a)	325,000	61°
	7–24(b)	16,000,000	64°	9–8(b)	30,000	62°
	7–25(a)	360,000	59°	9–9(a)	110,000	60°
	7–25(b)	139,000,000	60°	9–9(b)	700,000	61°

*Prepared by Mr. W. C. Burnett, Junior Chemist, Bureau of Chemistry, in charge of the New England work
†(a) (b) (c) represents samples from respective cans.

just simply a question of being careful, using some common sense, and ordinary cleanliness. If it interests you here is the tabulated record which may be passed around.

I have another table of the same kind, which I won't pass around because it has the names of the milk shippers on it, and that might not be fair. There are only about a half-dozen here, anyway, but an interesting fact about the second table is that the big milk dealers did not do so well as the farmers; the big milk companies in New England were just about as bad when we got through with them as they were when we started. A number of them apparently made no effort to clean up, no effort to get their milk in good shape, no effort to improve conditions. Everything continued just about the same as before. Something, of course, will have to be done about that—just what, remains to be seen.

Now, there are one or two other situations we meet here in New England that may be of interest.

Aside from the fact that producers were not cooling as well as they could with the means at their disposal; aside from the fact that they weren't clean in their methods, and that when they were required to cool and exercise care the counts decreased considerably—aside from that, there was one very important source of trouble, and that was the returned milk cans. I am informed that in New England the milk companies are supposed to clean and sterilize the cans before they are returned. Well, those milk cans, as Mr. Kelly will tell you, in the vast majority of cases contained about a teacupful of dirty water swarming with micro-organisms, while many, through improper washing, contained a deposit of dried milk or cream. When the farmer pays a cent or a cent and a half to the milk company to have his cans cleaned and sterilized you can't blame him for not wanting to do it over again himself. Now, it is up to you gentlemen to see that the milk con-

tractors who charge for the cleaning of those cans sterilize them and return them to the producer in a proper condition. You gentlemen can see that they do it. About the worst trouble we had was the result of these so-called "sterilized" cans getting into the hands of the farmer, the farmer putting his milk into the can he believed, and in fact had been told frequently, was sterilized, but which actually contained a cupful of a concentrated culture of organisms. That is something for which there is a very simple remedy. You gentlemen can very easily remedy it and no doubt will remedy it now that it has been brought to your attention. I assume that you haven't been aware of it before.

Now, there is another matter in this connection that all of you have no doubt considered frequently, although I don't know that anybody has ever attempted to remedy it. The farmer unfortunately located may be inspected by five different inspectors. I know one locality in New York State where he may be inspected by six different inspectors, each with his own ideas. The poor farmer is in a pretty bad way if he has to please five or six different inspectors. Now, aside from the farmer's having to please so many different individuals, has it ever occurred to you what a great waste of time, energy and money is involved in inspecting the same dairy five or six times? Something ought to be done about that, and, of course, there are a number of ways and means that can be adopted. Cities could exchange inspection reports of dairies, or they could divide the territory and agree to inspect one section of their milk shed and turn the reports over to another city, exchanging reports in that way; or, there could be a general State inspection, which would not help very much when the inspectors came from across the line.

What I have always regarded as the most feasible means to eliminate this evil is for certain groups of States that

supply similar territories to get together and establish a clearing-house for inspection reports in that particular neighborhood. It would probably not take more than a thousand-dollar clerk, some stationery, a desk, and a typewriter to get all that information in shape so that any city Board of Health could find out whether any given dairy has even been inspected and what the inspection report was. In that way you would avoid duplicating the inspection with a corresponding saving of time on the part of the official and of annoyance to the farmer. The present system leads to a contempt for the milk inspector on the part of the farmer because no two milk inspectors seem to the farmer to say the same thing. What they say may be correct from the standpoint of an expert, but they naturally use different language and illustrate in different ways. The farmers, sometimes not being versed in the ways of sanitarians, are apt to think that one milk inspector wants something different from that required by another inspector. It brings the whole proposition into contempt; at least that has been my observation in going around the country and talking to producers, dairymen and milk inspectors. I may have formed a mistaken opinion, but I feel convinced that some such clearing-house should and could be arranged for each territory, and maintained so that any city could get an inspection report. If there was no such report available for a particular producer, steps could be taken to have the inspection made. An immense saving could be made and there would be an immense addition to the efficiency of the milk inspection service the country over.

I know that is true not merely of milk: it is true of all other products; it is true of foods and it is true of drugs. On account of our system of government, separate States and a National Government, we are all of us doing over

and over again what the other fellow does; and sometimes, in the case of national matters, it is duplicated perhaps twenty-five or thirty times. There are one or two nationally sold articles that I know positively have been analyzed in twenty-four different States. One of the things we need is some system, some clearing-house by which we can eliminate wasteful duplication. We all have more than we can do; we all have a quantity of things we ought to do and can't do because we are too busy. I think we have all passed the stage where the definition applies which I once heard a man give in the Association of American Dairy, Food and Drug Officials. Speaking of cooperation he said: "Cooperation is that manner of doing work whereby one man does the work and two share the credit." I think we have progressed beyond that stage of affairs and that we ought to be able to get together in some practical way.

I have cited the work we have done in New England because we happen to be here in New England. We have conducted similar work in the Upper Mississippi Valley, as Commissioners Newman and Barney well know. We enjoyed their cooperation in the work there. Consequently I am not picking on New England when I tell you the results we got here this summer, because there are other places in that general section of the country where we found conditions not all they should be. Now, it is quite evident that the kind of campaign we carried on here in New England will have to be repeated practically every year. We can reach only a few hundred shippers each year, and we have to come back to the same territory year after year until by campaigns of inspection and wielding of the big stick we have got the general run of dairymen turning out a clean, satisfactory product. I think it has come out of this work very definitely that you get a little

further with a campaign of both big stick and education than you do with education alone. You can reach a certain point by persuasion, education and demonstration, but in this kind of business—in which competition is very keen—you have to be ready to swing the big stick when necessary if you are to achieve results.

"The message of modern science to dairying is helpful and inspiring, though it often lays upon the individual a greater responsibility because of increased knowledge."

REMARKS BY MR. W. E. BARNEY

State Dairy and Food Commissioner of Iowa

I have been in the milk business since 1881, and I know something of the troubles of the milk producer. I have been a law-enforcing officer in Iowa for seven years, and I know something of the troubles that have come to me in trying to straighten out the milkman. Now, I want to say, from the standpoint of the producer, I believe they generally welcome all reasonable regulations, but I don't believe that they want too many regulations or want them so intricate that they don't understand them. I know why they want good regulations and reasonable regulations. They want them for the same reason that the seller of any food products desires good regulations—for the reason that it protects the honest man in the game just as well as it does the consumer.

I know something of the feeling of the man who has an inspector come to his place that knows but little or nothing about what the producer is trying to do, and we have had too many dairy inspectors of that kind. I remember when I was appointed Commissioner in Iowa I was up against a politician who wanted a milk inspector appointed. We have a law that fixes the appointment of the milk inspector on the State Commissioner in cities of ten thousand or more people, and we appoint, in connection with the Council, an inspector for all such cities. In Des Moines they had not had an inspector for some time. The Councilman that had this part of the work to look after consulted me, and, after having a good many talks, he said to me one day: "Mr. Barney, I know a man who would make a good milk inspector." I said: "Very well, who is he? Does he know anything about the milk work?

Has he ever lived on a dairy farm? Has he ever had anything to do with it?" He says: "No, he hasn't; but he owns a motorcycle, and I think it would be a good thing for him to ride around on and make his inspections." Now that was his only excuse for wanting this man appointed. I found by investigation that this man had been a good booster for him in his ward, had helped to secure the votes that elected him; but he had no other qualifications than the fact that he owned a motorcycle—and he was not appointed.

Now, just think of a farmer or a dairyman who knows something of his business coming in contact with that sort of a man! How would you feel if a man tried to tell you how to do your work that knew absolutely nothing about it and was without experience along that line? You wouldn't take kindly to it. Great mistakes have been made by putting out men not competent to do the work they are expected to do. A great many uninformed men still think there is nothing to this dairy and milk inspection. I want to say to you that the milk inspector must be a diplomat. He must be able to make a producer or dealer feel he is interested in his work, that he has something in common with him, that he can help show him how to make a little improvement here, a little money there, and show him how he can better the work he is doing and produce milk that will be cleaner and better. Just as soon as we get down to that basis we are going to get more cooperation from the milkman. I realize that there are a lot of men in the milk business that do not understand their work; that is the very reason why we should have milk inspectors that do understand it and who are competent to go out and explain this work to the producers and dealers.

In Iowa we have five hundred creameries, and we try to instruct our cream producers to wash the separator twice

a day. The separator salesmen in telling their story very generally said: "If you will buy my separator you will only have to wash it once a day; if you buy the other fellow's you will have to wash it more frequently than that." Now, there isn't a lady in Iowa that would think of serving her breakfast on dishes and then not washing them before she served the dinner, but it is quite common—or had been, rather, until we got busy on this proposition—to use the separator in the morning and then not wash it before using it at night, and it became a sort of habit to do it that way.

I sometimes tell a story to show what force of habit will do. We have a motorman there on the Des Moines line that ran out there day after day and week after week and month after month. He got off at the end of the line, and he got in the habit of saying to the passengers: "This is as far as I go, and this is where you get off." Now, last winter we had a pretty icy time through that country. He went down to Kansas City. Now, any of you who have been in Kansas City know it is very hilly country. He wanted to see something of the town, so he went out to look around, and got out on to one of the steep streets there, looking up at the high buildings, and all at once his foot slipped from under him and he slipped and began sliding down one of the steep hills. When he got part way down he came in contact with a fleshy lady and she sat down in his lap and they continued down the hill. When they got to the bottom, of course, they stopped, and he says: "Madam, this is as far as I go, and here's where you get off." Now, you know that was force of habit with him, and this proposition about being cleanly about the dairy is a matter of habit, too, and one that can be cultivated by keeping after these fellows and helping them to understand that it is right and decent and that it will pay them

to be clean in all their work; and that's the way we are trying to get results out in Iowa.

I was very much pleased with what Dr. Alsberg said tonight. I agree with him that education and then prosecution is the thing that will clean up the work and make our products better, and we all know there is no product that should be cleaner than milk.

"As long as human beings are fallible, so long will contaminating accidents be possible."—Dr. John S. Hitchcock.

REMARKS BY MR. JOHN B. NEWMAN

Assistant State Food and Dairy Commissioner of Illinois

When I was appointed to my present position, some of my friends in the department came to me and said: "Now, John, we don't want any foolishness." I knew what they meant. I have seen milk produced by rich men with fancy stables that wasn't clean; and I have seen clean, safe milk produced in stables that an ordinary and uneducated inspector would have condemned. That's what they meant. They wanted no foolishness.

Now, the ordinary physician is responsible for most of the intricate and foolish regulations. I have often said it isn't the things they don't know so much as the things they do know that are not so that are responsible for a lot of this trouble. They know too many things that aren't so, and that they can't prove. Now, I tell the dairymen out in our country that we want clean, safe milk. We want less regard for equipment; we want more consideration of the individual, the man; some say method, but I am perfectly willing to eliminate the method and the equipment and put it all up to the man.

Dr. Alsberg has indicated what can be done with a man when he became inclined in the right direction. I think Mr. Kelly had been out giving these people instructions, and up to the time they found they were in for trouble they paid no attention to it, but when they got wise to the fact that trouble was pending they got "Kelly-wise," and they had clean, safe milk. I have been in the field with

Mr. Kelly, and I tell you I am a great admirer of his sane methods. We had all of our inspectors out with Mr. Kelly for two weeks, and nothing has ever happened that did as much good in our State as those two weeks with Mr. Kelly. We wish we could have him every year.

Over in London there was a philanthropist and he had a hobby that every year he would have all the newsboys in London taken down to the ocean. He would have special trains there to take them down to the beach. After these little urchins had been there a couple of times, as soon as they caught sight of the ocean they would be ready to jump off the train and run for the ocean, and the last fellow off was a coward. One day as they were running for the beach, stripping off their clothes en route, one little fellow hollered to another: "My, Jimmy, your back's dirty!" and Jimmy says: "Well, I can't help it, 'cause I missed the train last year." This has been the case with some of our dairymen regarding cleanliness and care in milk production: they have slipped and "missed the train."

We have always had in our department considerable co-operation with the State Dairy Association and the Agricultural College, and with the Northern Illinois State Milk Producers' Association. They are pretty well organized and have some pretty bright fellows. They had their milk strike and got their price and they make pretty fair milk. Now, they realize they must popularize their product, and we have told them—and we will continue to tell them—that they must bear this in mind: that they must strive—and I think this is one of the things that you inspectors should bear in mind to tell producers you come in contact with—tell them they should make milk so sweet of flavor, so clean and safe, that they can and will challenge anyone, not only the consuming public but the critical observation

of competitors and the watchful eye of the law-enforcing officer, and they can do it and will do it if they will get "Kelly-wise."

"It is true that a good many dairymen do not understand why it is that conditions and methods that have been permitted for the past twenty-five years should suddenly be condemned—milk inspectors, therefore, should be careful to explain the new order of things and the importance of better sanitary conditions, and give the dairymen a fair chance to meet the new demands made upon them."

REMARKS BY MR. J. J. FARRELL

State Dairy and Food Commissioner of Minnesota

Mr. Chairman: I scarcely know what to say to these inspectors who are so busily engaged in looking up all the facts about milk that I have heard referred to since I have been here. I am of the opinion that we will never solve the problems and have an ideal condition in relation to dairy products until in the primary grades of the rural schools and in our city schools and high schools we are teaching the children regarding the composition of milk and how to produce clean milk, how to care for it, and how to use it. I think when we get to that we will have taught all the future housewives and all the future milkmen and the future dairy inspectors what milk is and what it means to us. We will also have eliminated most if not all of this trouble we have nowadays, and we will live in an age of full protection at least.

I am delighted to be here. I have enjoyed every minute of it. I have gone over the Mohawk Trail and through the Connecticut Valley and over to the proud city of Boston. I have taken in a great many things in Massachusetts. I wondered before I left home to come here if I would hear anything of these difficulties in a country so old, a couple of centuries old, where you might say the people have all learned to live; and yet here in Massachusetts I hear some of the same complaints and troubles in this old, enlightened settlement that we have way up in frontier, the home of Sitting Bull and some of the great Indian tribes. We have much the same trouble, but we don't make much fuss about it. We usually try to have law and order up there. We have a sanitary law under

which we get most offenders. It is true we have turned it into an educational feature largely, and we are very rarely troubled with the law, although we are told from time to time by some of the health boards and health officers that we are bad and we must improve.

I am very much pleased to see that you are taking a good common-sense way to remedy all these evils which appear like mountains from time to time and that the men in charge of this work are really thinking that just a few of the common essentials are all we need to be clean and to handle this splendid product in a cleanly manner. The product is never contaminated until it comes into the hands of man, and when we have taught the men to be clean themselves I can assure you the milk will cease to be harmful. I am more than pleased to be with such a body of men that are seeing these things as they are.

"It is obvious that hygienic conditions in the dairy, in transportation and in the sale and delivery of milk can be secured only by constant supervision."

REMARKS BY MR. H. E. BOWMAN

President Milk Inspectors' Association of Massachusetts

Ordinarily I should be rather sorry to be called on to address an after-dinner audience, because I realize you want to be entertained. But you have been amply entertained, and I am going to confine my remarks to just a word of appreciation in behalf of the Milk Inspectors' Association of Massachusetts. We deeply appreciate the honor of attending a joint convention with the International Association. Men of international reputation are its members and guests, and they have given their lives to the improvement of milk supplies. The Massachusetts organization was formed about sixteen years ago. My predecessor in office was elected as first president, which position I believe he held until his death. The members numbered at that time about a baker's dozen. The membership, however, has increased, new inspectors have been appointed, until now we have about fifty active members, all men who are making an honest effort to improve and make safe the milk supply of this Commonwealth.

I want to take this opportunity of expressing to the members of the International Association our gratitude for the courtesies extended, and if we have added one iota to the enjoyment of the members of the international body we are indeed repaid. It has been a privilege which we shall long remember and hope may be ours again. The kindly expressions regarding our efforts to entertain were highly gratifying and the friendships we have formed while attending to our duties as milk inspectors and as

members of this Association are among the most precious.

I want to say finally that we thank the members of this Association for making this wonderful meeting possible, and assure you that we shall all look forward to another year with great pleasure.

"Kindness is the golden chain by which society is bound together."

REMARKS BY SECRETARY WELD

Our toastmaster, Mr. Lombard, has deliberately violated an unwritten law of our Association in calling upon your Secretary for a speech. Your Secretary, perhaps for the first time, may also attempt to deliberately violate that law, for he does not feel that he can let this opportunity pass without expressing to President Bowman and to his associate members of the Massachusetts Milk Inspectors' Association the deep sense of appreciation which we of the International Association feel. We appreciate the cordial invitation which the Massachusetts Association extended for us to hold this, our fifth, annual convention in this State, and it was probably more largely because of that cordial invitation than for any other reason that our Executive Board finally decided to hold this convention here in Springfield at this time.

We most keenly appreciate the hearty, whole-souled co-operation of your officers and members in arranging the details and perfecting the arrangements for this convention. We greatly appreciate and thank you for the warm, hearty welcome that you extended to us, both as an organization and as individuals, and for the pleasing and generous entertainment which you have given us. The automobile trip about this very interesting city on Wednesday morning, and the trolley trip through the beautiful hills and valleys to Amherst on Thursday morning will be long and pleasantly remembered. We appreciate the delightful vocal selections and instrumental musical program provided for us and which we have so much enjoyed here tonight.

But over and above all else, and deeper down in our hearts than all else, do we appreciate the opportunity to meet you men of Massachusetts face to face and to be-

come better acquainted with your accomplishments. It is perhaps impossible to fully contemplate the immense amount of work and the importance of the work which we as an organization should accomplish. It is difficult to realize the tremendous responsibilities attached to the work in which we as individuals are engaged. But I do believe through such conventions as this, and with such cooperation as we have experienced here, a great deal more work can be accomplished and a great deal better work will be accomplished.

We are glad indeed to receive the information and the many practical suggestions of the gentlemen who have spoken to us during the convention. We are glad indeed that they have been able and willing to come here and to give us of that inspiration which from time to time is necessary for the most successful performance of our labors.

In closing permit me, in behalf of the International Association of Dairy and Milk Inspectors, to express again our gratitude and appreciation for the cordial hospitality, the delightful entertainment and hearty cooperation of the splendid gentlemen who have done so much real work to make this convention not only possible, but so enjoyable and so beneficial to all who are in any way making an effort toward the real betterment of milk supplies.