SIXTH ANNUAL REPORT

OF THE

International Association of Dairy and Milk Inspectors

INCLUDING PAPERS READ AT THE ANNUAL CONVENTION
IN WASHINGTON, D. C.,
OCTOBER 15-16-17, 1917

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

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"All attempts to urge men forward, even in the right path, beyond the measure of their light, are impracticable; augment their light, conciliate their affections, and they will follow of their own accord."

COMPILED BY

IVAN C. WELD, Secretary-Treasurer

1120 CONNECTICUT AVENUE

WASHINGTON, D. C.

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.

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

*Adopted October 29, 1915.

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.

In your correspondence with our advertisers, please do not fail to mention this publication

International Association of Dairy and Milk Inspectors

OFFICERS, 1917-1918

President, ALFRED W. LOMBARD .....Arlington, Mass.
First Vice-President, DR. JAMES O. JORDAN..Boston, Mass.
Second Vice-President, HOYES LLOYD...Toronto, Ontario
Third Vice-President, DR. C. L. ROADHOUSE...Davis, Cal.
Secretary-Treasurer, IVAN C. WELD....Washington, D. C.
Auditors—
SAMUEL G. SHARWELL .....Newark, N. J.
DR. HARRY E. STATES .....Detroit, Mich.

COMMITTEES

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

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

Ernest Kelly, *Chairman*
L. P. Brown
Geo. S. Hine
John B. Newman
Dr. C. L. Roadhouse

COST OF DAIRY AND MILK INSPECTION

Hoyes Lloyd, *Chairman*
Gustaf L. Berg
E. F. Burke
John J. Coughlin, Elizabeth, N. J.
John J. Coughlin, Lowell, Mass.
Thos. F. Flanagan

E. R. Gauhn
John F. Gibbons
Clarence W. Horton
Frank A. Jackson
Dr. Thos. E. Maloney
John H. Park
Benj. L. Purcell
Dr. W. T. Scarboro
Carl O. Seaman
Willard E. Ward

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

Dr. C. L. Roadhouse, *Chairman*
Dr. R. R. Ashworth
Dr. W. B. Billingsley
Dr. Thos. B. Carroll
Dr. M. E. Conard
Dr. C. W. Eddy
Dr. Wm. S. Gimper
Dr. W. A. Hornaday
Dr. Wm. V. Hughes
Dr. L. F. Koonce
Dr. Thos. E. Maloney
Dr. W. T. Scarboro
Dr. Clarence E. Smith
Dr. Harry E. States
Dr. F. P. Woolf
Dr. Hulbert Young

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

A. F. Stevenson, *Chairman*
Dr. Stanton H. Barrett
Hoyes Lloyd

Dr. R. F. Lockwood
H. N. Parker
Dr. Wm. H. Price
Dr. B. R. Wakeman

DAIRY FARM INSPECTION

J. A. Gamble, *Chairman*
A. D. Burke
Prof. H. A. Harding
Prof. C. B. Lane
W. H. Rothery
Dr. Clarence E. Smith
Dr. H. E. States

CITY MILK PLANT INSPECTION

A. N. Henderson, *Chairman*
John J. McGrath
Samuel G. Sharwell
W. H. Phipps
Fred J. Widmayer

LEGISLATION AFFECTING MILK AND MILK PRODUCTS

Prof. James O. Jordan, *Chairman*
L. P. Brown
Thos. A. Buckland
Hermann C. Lythgoe
Geo. B. Taylor

TRANSPORTATION AND MARKETING OF MILK AND MILK PRODUCTS

H. E. Bowman, *Chairman*
E. F. Burke
A. N. Henderson
Prof. C. B. Lane

Melvin F. Master
Fred J. Moore
Willard E. Ward
John W. Yates

METHODS OF APPOINTMENT OF DAIRY AND MILK INSPECTORS AND THEIR COMPENSATION

Ole Salthe, *Chairman*
Brooks Brown
E. Bourbeau
E. F. Burke
Thomas Holt
John J. McGrath
A. G. Shaw
M. J. Smisek

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

Dr. Geo. E. Bolling, *Chairman*
Dr. Leon Banov
Dr. Stanton H. Barrett
Dr. Wm. G. Bissell
L. B. Cook
Dr. Truman C. Terrell

ORGANIZATION OF MILK CONTROL

Dr. Wm. H. Price, *Chairman*
Prof. H. A. Harding
H. I. Huntington
Ole Salthe
Geo. B. Taylor
Dr. O. P. Thompson
Dr. Hulbert Young

RESOLUTIONS

Prof. James O. Jordan, *Chairman*
H. E. Bowman
Ernest Kelly
Dr. Harry E. States
Dr. O. P. Thompson

"Not only strike while the iron is hot, but make it hot by striking."

MEMBERS

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

Banov, Leon .....Asst. City Bacteriologist.....Charleston, S. C.
Barrett, Stanton H...City Bacteriologist.....Chattanooga, Tenn.
Berg, Gustaf L.....Inspector of Milk.....Worcester, Mass.
Billingsley, W. B....Veterinarian, State Dept. of Health of Maryland.....Baltimore, Md.
Bissell, Wm. G.....Chief, Bureau of Laboratories, Dept. of Health.....Buffalo, N. Y.
Bolling, George E....City Bacteriologist and Inspector of Milk.....Brockton, Mass.
Bourbeau, E. .....General Cheese Inspector.....St. Hyacinthe, Quebec, Canada.
Bowman, Herbert E..Inspector of Milk.....Somerville, Mass.
Brown, Brooks .....Dairy Inspector, Maine Dept. of Agriculture .....Augusta, Maine
Brown, Lucius P.....Director, Bureau of Food and Drugs, Dept. of Health.....New York, N. Y.
Buckland, Thos. A...City Chemist .....St. Louis, Mo.
Burke, A. D. .....Bacteriologist, U. S. Public Health Service .....Washington, D. C.
Burke, E. F. .....Chief, Bureau of Dairy Products, Division of Farms and Markets, State Dept. of Agriculture .....Albany, N. Y.

Carroll, Thos. B.....Milk Inspector, Dept. of HealthWilmington, N. C.
Chilson, C. H.....Formerly Chief Milk InspectorDetroit, Mich. now "somewhere in France"
*Conard, M. E. .....Supervisor of Field Work, Hires Condensed Milk Co...Philadelphia, Pa.
Cook, L. B.....Dairy Div., U. S. Dept. of Agriculture .....Grove City, Pa.
Coughlin, John J.....Dairy Inspector .....Elizabeth, N. J.
Coughlin, John J.....Asst. Milk Inspector.....Lowell, Mass.

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

Eddy, C. W.....Telling-Belle Vernon Co.....Cleveland, Ohio

Flanagan, Thos. F....Food and Milk Inspector.....Hartford, Conn.

Gamble, J. A.....Dairy Div., U. S. Dept. of Agriculture .....Washington, D. C.
Gauhn, Emmett R....Chief Milk Inspector.....Rochester, N. Y.
Gibbons, John F..... Farm Inspector .....New Haven, Conn.
Gimper, Wm. S..... Director of Milk Hygiene.....Harrisburg, Pa.

Haggerty, A. L..... Chief Food Inspector.....Augusta, Ga.
Harding, H. A..... Head, Dairy Dept., University of Illinois .....Urbana, Ill.
Henderson, A. N.....Formerly Chief Dairy Inspector .....Seattle, Wash.

*Admitted to membership November 9, 1917.

Hine, Geo. S..... State Dairy Commissioner....Manhattan, Kan.
Holt, Thomas ..... Deputy Dairy and Food Commissioner, State of Connecticut .....Hartford, Conn.
Hornaday, W. A.... City Dairy and Milk Inspector.Greensboro, N. C.
Horton, Clarence W..Milk Inspector .....Swampscott, Mass.
Hudson, Arthur .....Inspector of Milk.....Newton, Mass.
*Hughes, Wm. V.....Food Inspector .....Harrisburg, Pa.
Huntington, Homer Bacteriologist, U. S. Public Health Service .....Washington, D. C.
Huxtable, F. L.....City Milk and Food Inspector.Wichita, Kan.

Jackson, Frank A....Chairman, Board of Food and Drug Commissioners of Rhode Island .....Providence, R. I.
Jordan, James O.....Inspector of Milk.....Boston, Mass.

Kelly, Ernest .....Market Milk Specialist, U. S. Dept. of Agriculture.....Washington, D. C.
Kerr, A. H.....Milk and Dairy Inspector....Norfolk, Va.
Koonce, L. F.....Milk and Meat Inspector.....Raleigh, N. C.

Lane, C. B.....In charge Scientific Dept., Supplee Alderney Dairy.....Philadelphia, Pa.
Lockwood, Ralph F. .Milk Inspector and Health Officer .....Warwick, R. I.
Lombard, Alfred W..Dairy Bureau Agent.....Boston, Mass.
Lloyd, Hoyes .....Chemist in Charge Milk Control, Dept. of Public Health.Toronto, Canada
Lucas, Harry S.....Food Inspector, Health Dept...Washington, D. C.
Lythgoe, Hermann C.Director of Division of Food and Drugs, Mass. State Dept. of Health .....Boston, Mass

Maloney, Thos. E....Veterinarian, Board of Health.Fall River, Mass.
Master, Melvin F.....Inspector of Milk.....Lowell, Mass.
Mayotte, Rene G.....Chief of Milk and Dairy Farm Inspection Service .....Montreal, Quebec.
Moore, Fred J.....City Milk Inspector.....Detroit, Mich.
McGrath, John J.....Inspector of Milk.....Salem, Mass.

Newman, John B.....Asst. State Food and Dairy Commissioner of Illinois....Chicago, Ill.

*Park, John H.....City Food Inspector.....Harrisburg, Pa.
Parker, H. N.....Bacteriologist, *"Delineator"* Seventh Baby Campaign....New York, N. Y.
Phipps, W. H.....Chief Food and Dairy Inspector .....Kansas City, Mo.
Price, Wm. H.....U. S. Public Health Service...Washington, D. C.
Purcell, Benj. L.....Dairy and Food Commissioner of Virginia .....Richmond, Va.
Purrington, W. F....Inspector, State Board of Health of New Hampshire..Concord, N. H.

Rive, Henry .....Formerly Dairy Instructor ...Victoria, B. C., now "somewhere in France"

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*Admitted to membership November 9, 1917.

Roadhouse, C. L.....Professor of Dairy Industry, University of California....Davis, Cal.
Roshon, Harry B....Formerly Milk and Meat Inspector .....Reading, Pa., now in U. S. Army
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

Salthe, Cle .....Asst. Director of Bureau of Food and Drugs, Dept. of Health .....New York, N. Y.
Scarboro, W. T.....Meat and Milk Inspector.....Winston-Salem, N. C.
Seaman, Carl O.....Health Officer .....Manchester, N. H.
Sharwell, Samuel G..Chief Dairy and Food Inspector .....Newark, N. J.
Shaw, A. G.....Milk and Dairy Inspector.....Jacksonville, Fla.
Simpson, C. W.....Formerly Dairy and Milk Inspector .....Vancouver, B. C. now "somewhere in France"
Smisek, M. J.....Milk and Dairy Inspector.....St. Paul, Minn.
Smith, Russell S....Market Milk Specialist, Dairy Div. U. S. Dept. of Agriculture .....Washington, D. C.
States, H. E.....Veterinarian, Board of Health.Detroit, Mich.
Stevenson, Albert F..Sanitary Chemist, U. S. Public Health Service .....Washington, D. C.

Taylor, Geo. B.....Milk Specialist, Dairy Div., U. S. Dept. of Agriculture.....Washington, D. C.
*Terrell, Truman C..City Bacteriologist .....Ft. Worth, Texas
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 InspectorMobile, Ala.

Yates, J. W.....Milk and Pasteurizing Plant Inspector .....Kansas City, Mo.
Young, Hulbert .....Manager, Walker-Gordon Laboratory .....Baltimore, Md.

HONORARY MEMBERS

Evans, Wm. A.....Editor, Health Dept., *Chicago Tribune* .....Chicago, Ill.
Pearson, Raymond ..Assistant Secretary, U. S. Department of Agriculture....Washington, D. C.
Woodward, Wm. C...Health Officer, District of Columbia .....Washington, D. C.

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*Admitted to membership November 9, 1917

SIXTH ANNUAL CONVENTION

WASHINGTON, D. C.

MONDAY MORNING, OCTOBER 15, 1917

The Sixth Annual Convention of the International Association of Dairy and Milk Inspectors was called to order by President William H. Price, at the Raleigh Hotel, at 11 o'clock.

Mr. A. Leftwich Sinclair, President of the Washington Chamber of Commerce, on behalf of commercial Washington welcomed the Association, and Dr. William Fowler, Assistant Health Officer, extended a welcome in behalf of the government of the District of Columbia. President Price responded for the Association and expressed the pleasure of the officers and members in again meeting in Washington.

Mr. Ernest Kelly, in charge of Milk Investigations for the U. S. Department of Agriculture, addressed the Association on the subject of "The Influence of War Time Conditions on Dairy Inspection." After discussing Mr. Kelly's paper the convention adjourned, to meet at 2 o'clock.

MONDAY AFTERNOON

At 2.15 P.M. the convention was called to order by Dr. William H. Price. The Committee on Dairy Farm Inspection presented a report, which, in the absence of Chairman Gamble, was read by Prof. H. A. Harding, of the University of Illinois.

After discussion, Mr. H. E. Bowman presented a communication from the chairman of the Committee on City Milk Plant Inspection.

A paper on "Observations on the Washing of Milk Cans," contributed by Richard O. Webster, of the U. S.

Bureau of Chemistry, was read by Dr. Charles Thom, of the same Bureau. After discussion the convention adjourned to meet at 8 o'clock.

MONDAY EVENING

Vice-President Alfred W. Lombard called the convention to order at 8.15. The presidential address was delivered by Dr. William H. Price.

Mr. Albert F. Stevenson, of the U. S. Hygienic Laboratory, presented a report from the Committee on Diseases of Man—Their Relation to the Milk Supply and to the Public Health.

Dr. Geo. E. Bolling presented the report of the Committee on Methods of Bacterial Examination of Milk and its Products. Dr. James O. Jordan offered the following resolution, which after discussion was adopted by the Association:

Resolved, That this Association go on record as believing the changes adopted by the American Public Health Association in the matter of making media for milk plating by altering the acidity from 1½ to 1% and the use of meat extract in place of meat infusion is inadvisable, in that such changes give lower results than the older media, and that a change to the original method is desirable.

Mr. Hermann C. Lythgoe, Director, Division of Food and Drugs, Massachusetts State Department of Health, presented a paper on "The Serious Aspects of the Milk Situation in Massachusetts." After discussion the convention adjourned until Tuesday afternoon.

TUESDAY MORNING, OCTOBER 16TH

On Tuesday morning at 9.30, the members of the Association, as guests of the Washington Chamber of Com-

merce, Washington Board of Trade and the Washington Retail Merchants' Association were given an automobile ride, visiting many points of interest about the city.

TUESDAY AFTERNOON

Tuesday afternoon at 2 P.M. the convention reassembled and was called to order by Dr. William H. Price, who presided during the remainder of the convention.

Mr. Geo. B. Taylor, Milk Specialist of the U. S. Department of Agriculture, read a paper on "The Importance of Clean Utensils in Clean Milk Production."

Mr. Ernest Kelly, chairman, presented the report of the Committee on Rules and Regulations Necessary for Securing a Clean and Safe Milk Supply. The Association voted that the report of the committee be printed and distributed to the members of the Association, in order that it may be carefully studied by the members, who are urged to offer such suggestions and constructive criticisms as may be helpful.

Prof. James O. Jordan, chairman, reported for the Committee on Care of Milk in Transportation. After discussion the convention adjourned.

TUESDAY EVENING

Tuesday evening at 8 o'clock the convention reassembled. Dr. R. A. Pearson, Assistant Secretary, U. S. Department of Agriculture, addressed the convention on the subject of "Agriculture, Inspection and the War."

Dr. Joseph Neff, Narberth, Pa., read a paper on "Decrease in Milk Supply; Its Effect on Infant Mortality."

Dr. Wm. A. Evans, President of the American Public Health Association, gave an address on "The Effect of War on Milk."

Dr. Harvey W. Wiley, responding to a call from the chairman, spoke briefly on the importance of milk and of good methods in producing it.

The appreciation and thanks of the Association was expressed to the speakers of the evening by standing. The convention then adjourned.

WEDNESDAY MORNING, OCTOBER 17TH

On Wednesday morning at 11 o'clock the convention assembled in the auditorium of the U. S. Food Administration Building. President Price introduced Mr. Herbert C. Hoover, U. S. Food Administrator, who addressed the Association.

WEDNESDAY AFTERNOON

At 2 o'clock the convention reassembled at the Raleigh Hotel. Prof. H. A. Harding, of the University of Illinois, presented a paper on "A Possible Basis for the Grading of Milk."

Mr. Alfred W. Lombard, acting chairman of the Committee on Legislation and Legal Limits for the Control of Milk and Cream, read a brief report.

Dr. Harry States, chairman, presented a report of the Committee on Bovine Diseases—Their Relation to the Milk Supply and to the Public Health.

Mr. Benj. L. Purcell, State Dairy and Food Commissioner of Virginia, presented a paper on "An Exceptional Opportunity for Municipal Health Officers and Dairy Inspectors to Secure the Cordial Cooperation of the Producers and Distributers of Milk."

Mr. L. P. Brown, Director of Bureau of Food and Drugs, Department of Health, New York City, invited the members of the Association to meet with the Food and Drugs

Section of the American Public Health Association on the following day at 9 o'clock.

Mr. John J. Coughlin, of Elizabeth, N. J., read a paper on "Present Day Supervision of the Milk Supply."

Mr. Hoyes Lloyd, Chemist, Division of Laboratories, Department of Health, Toronto, Canada, presented paper on (a) "The Necessity for the Pasteurization of All Milk," and (b) "The Value of Human Milk Analysis."

Papers were also presented by Mr. Samuel G. Sharwell, Chief Dairy and Food Inspector, Newark, N. J., on "The Need of Some Identification Mark for Cows Reacting to the Tuberculin Test," and by Mr. Russell S. Smith, of the Dairy Division, U. S. Department of Agriculture, on "Calculation of the Nutritive Value of Milk from Routine Tests."

Following the afternoon session the business meeting of the Association was held. The report of the Secretary-Treasurer and the report of the auditors were presented and accepted by the Association.

Dr. R. A. Pearson, President of the Iowa State College and Assistant Secretary U. S. Department of Agriculture, was elected an honorary member.

The Association then proceeded with the election of officers for the ensuing year, and officers were elected as follows:

President, Alfred W. Lombard, Arlington, Mass.
First Vice-President, James O. Jordan, Boston Mass.
Second Vice-President, Hoyes Lloyd, Toronto, Ontario.
Third Vice-President, C. L. Roadhouse, Davis, Cal.
Secretary-Treasurer, Ivan C. Weld, Washington, D. C.
Auditors, Samuel G. Sharwell, Newark, N. J.;
Harry E. States, Detroit, Mich.

The Association voted that the report of the Committee on Care of Milk in Transportation be referred to the Executive Committee.

The Committee on Resolutions reported and the following resolutions were adopted:

1. *Resolved,* That the International Association of Dairy and Milk Inspectors offers the services and cooperation of its members to the United States Food Administrator for the conservation of infant life in the control and distribution of milk supplies.

2. *Resolved,* That the report of the Committee on Rules and Regulations necessary for securing a clean and safe milk supply be adopted as containing minimum requirements and recommendations for the production and handling of good milk.

3. *Resolved,* That the Secretary be instructed to express the thanks of the Association to all those who have contributed to the program of this convention: Mr. A. L. Sinclair, Dr. W. C. Fowler, Dr. R. A. Pearson, Dr. Joseph Neff, Dr. W. A. Evans, Dr. H. W. Wiley, Dr. E. C. Schroeder, Dr. George W. Brett, Dr. J. A. Kiernan, Dr. C. J. Hastings, and Dr. John R. Mohler.

4. *Resolved,* That the Secretary be instructed to express the thanks of the members of this Association to the trade bodies of Washington, D. C., for courtesies extended during this meeting.

5. *Resolved,* That this Association recommend proper pasteurization of all milk and cream including that to be used in the manufacture of ice cream and butter.

The Association voted to express to the retiring President, Dr. William H. Price, its thanks for the able manner in which he has presided at this convention and for the service he has given during the year.

The Association voted to express its thanks to the Secretary-Treasurer.

The business session then adjourned.

WEDNESDAY EVENING

The convention assembled for its final session at 8 o'clock. A paper, "Public Health Studies Concerning Cheese," contributed by Dr. E. C. Schroeder and Dr. George W. Brett, was read by Dr. Schroeder, Superintendent of the U. S. Bureau of Animal Industry Experiment Station at Bethesda, Md.

A paper, "The Eradication of Tuberculosis from Cattle and Swine," was presented and read by Dr. J. A. Kiernan, of the Bureau of Animal Industry, U. S. Department of Agriculture.

A paper, "Conservation of Live Stock by Controlling Animal Diseases," was presented and read by Dr. John R. Mohler, Assistant Chief, Bureau of Animal Industry, U. S. Department of Agriculture.

The convention finally adjourned.

"The work of science is to substitute facts for appearances, and demonstrations for impressions."

ADDRESS OF WELCOME

MR. A. L. SINCLAIR, *President*, Washington Chamber of Commerce

Mr. Chairman, and gentlemen of the International Association of Dairy and Milk Inspectors:

I am very glad indeed to be here. I am charged with a very simple, but a most pleasant duty on this occasion. I am here not to try to enlighten you on the milk question, but on behalf of the people of the District of Columbia to welcome you to the national capital, to express the hope entertained by all of us that your deliberations will be pleasant and profitable, and to wish for all of you when your sessions are over a safe and happy return to your homes.

It gives me great pleasure to discharge this duty, I assure you. I greet you most heartily, and hope that much good will result from your deliberations. We are glad that you have seen fit to hold your convention in Washington. Washington is the natural meeting place for all organizations such as yours, and it is destined to become the convention city of the world. The facilities afforded by Washington for conventions are unequaled. More and better newspaper correspondents are gathered here than in any other city in America. For delegates to conventions Washington possesses more attractions than any other city, and on account of the great war it is more attractive now than ever. We bid you thrice welcome to all that the city affords, and hope that you will return as often as possible.

"Welcome ever smiles
And Farewell goes out sighing."

ADDRESS OF WELCOME

DR. W. C. FOWLER, *Assistant Health Officer,* District of Columbia

About one hour ago Commissioner Brownlow telephoned me and said that he would be unable to be present to welcome you and asked me to represent him. I have not gotten over my fright just yet, but I am here, nevertheless.

The Commissioner asked me to say to you that he regrets exceedingly that he is unable to be present, and to tell you that his absence is due to the fact that today he has to submit the annual estimates for the fiscal year for the District of Columbia. He has been somewhat delayed on account of war conditions, and on that account he is unable to be here. He wished me in his name to welcome you and extend to you the hospitalities of this District.

The District of Columbia is exceedingly interested in the work that you are doing. We have had quite a number of controversies on the milk question. We are endeavoring to secure the purest and best milk that we possibly can. The Health Department is doing the best it can along this line. The inspectors are trying to see that milk is kept in the proper condition. We are endeavoring to keep the dairies in the proper condition, and our records at the Health Department are open for the inspection of you all, and we invite you to come there and see what is being done. I have been told by a member of the committee who is connected with the Chief Food Inspector's office that the inspectors will be available at any time to take any of you gentlemen who may desire to do so around to some of the dairies and dairy farms and let you see our method of doing this work and what we have to contend with.

I wish for you all a most successful meeting, and I am sure that the results of your labors will be shown in a better condition of the dairies throughout the United States.

"To say you are welcome were superfluous."

RESPONSE TO ADDRESSES OF WELCOME

DR. WILLIAM H. PRICE, *President*

Gentlemen, the International Association of Dairy and Milk Inspectors deeply appreciates your welcome to the city of Washington. It is not the first time we have met here, and so we are the better able to appreciate the advantages of Washington not only from a material standpoint, but also from that of hospitality, and the inspiration that is to be received here. The convention we held here two years ago was one of the most successful that we have ever held, and all of us on leaving looked forward to coming here again.

The International Association of Dairy and Milk Inspectors is concerned in a work that in the present crisis has come to be of national, or possibly international importance, rather than of purely local concern. In the great undertakings in which this Government is engaged, few factors can be of greater importance than the health of the people and the adequacy of their food supply. It is with these subjects that this Association is concerned, and therefore we feel particularly fortunate at this time to meet in this city, the center around which all things revolve, to compare our work with other works in which the Government is engaged, to receive first-hand expressions from leaders in the movement for the public health and the improvement of the food supply, to the end that each member on returning to his home may greatly extend his usefulness in promoting the public health and conserving the food supply.

On behalf of the International Association of Dairy and Milk Inspectors I thank you for your cordial welcome to the city.

"I do not know at first what it is that charms me. The men and things of today are wont to be fairer and truer in tomorrow's memory."

THE INFLUENCE OF WAR-TIME CONDITIONS ON DAIRY INSPECTION

ERNEST KELLY, *in charge Market Milk Investigations*, U. S. Dept. of Agriculture, Washington, D. C.

When your Secretary asked me to address the Association I accepted with a good deal of hesitation. There are a number of other associations that I would rather address than this one. That may not sound very complimentary, but it is because of the fact that every time I have addressed this Association it has been with the deepest sense of responsibility, because my association with you men as individuals and as a whole has brought to me the knowledge that you are a body of men who are absolutely intense in your work for the betterment of dairy conditions —a body of men who are well informed in the technique of their work as well as enthusiastic in the carrying out of their work; and it is always difficult to bring to such a body of men a message that is worthy of the audience that is to receive it.

Milk inspectors as a rule are thoroughly enthusiastic in their work. They have to be in order to be successful in coping with the problems with which they have to deal. I think the milk question is one of the most complex of the public health problems with which we have to deal today. The milk problem goes on forever. You can vaccinate against smallpox, you can use a prophylactic against typhoid, but the milk question is likely to bob up any day and any hour, and it takes a bright body of men to get the best of the milk dealers and the milk producers. In connection with that I was reminded last night that I have heard a good many stories involving milk dealers. I have heard only one, however, in which the milk dealer got the best of it. You may have heard the story of the Irishman who lived in a small town in which there was a general

store run by a Jew. The Irishman one day saw a sign over the store, "Everything sold by the yard." He went into the store and said, "Give me a yard of milk." The Jew dipped his finger in the can of milk and drew it along the counter for thirty-six inches. "All right," said the Irishman, "wrap it up and I'll take it home."

It is especially significant at this time that we as milk and dairy inspectors meet here in the capital of the nation. Everybody wants to do at this particular time everything they can to help the country in its present state. The common expression is for everybody to "do their bit," and it is peculiarly appropriate that we meet in the capital and discuss just what our bit is as regards the present world situation.

If the war is continued for a considerable time—and many predict that it will be—it is very probable that it will be ended because of certain economic conditions—either because of superiority in man power or because of superiority of food supply. Now the dairy inspector in his community is an extremely important individual from either of these standpoints. He is perhaps more important than he thinks he is as regards the maintenance of the man power of this country, and that is true because of several factors. First of all, as Napoleon has said, the army fights on its stomach. We have got to have well fed, well nourished men in order to fight well. Everyone knows that a well man is able to fight and a sick man is not able to. So that in so far as dairy sanitation touches directly on the health and the strength of the men who are going out to fight for us, it is vitally necessary to see that they be well nourished, that they receive the best of food of all kinds in their camps after they are called.

In this connection it might be well to say that the United States Government is paying particular attention at the present time to the quality of the milk that is being sup-

plied to the men who have gone out into our national army. The Public Health Service is looking after the sanitation of the zones around the army cantonments, and the Department of Agriculture has been helping in its way and has been cooperating with them by sending out men well trained in dairy sanitation and in dairy economics; because we not only have the question in the army camps of getting a pure milk supply, but a supply sufficient for their needs. The President of this Association has been stationed at one of the army camps with that very object in view, of studying the milk question as it applies at the army camps and suggesting remedies which will give the men in those camps a plentiful supply of pure milk.

I intended to bring with me a chart showing just how much the military authorities think of a good, clean milk supply. About 1909 or 1910 they had a serious epidemic of typhoid fever at the United States Naval Academy at Annapolis. It was found that milk was being procured from a number of farms scattered through the country around, where there was little or no inspection and where a very deplorable state of affairs existed as to sanitation. The Navy Department secured an appropriation to build and equip a model up-to-date dairy to supply milk to the midshipmen who are our future officers in the navy. The dairy was built, up-to-date in every respect, with model barns and milk house, and has since its establishment, about October, 1910, been furnishing milk for the midshipmen of at least the grade of certified milk. Very rarely do they have a count above 10,000, and the usual count does not run above 4,000 per c. c. If the statistics of the medical inspector are taken, we find the diseases that might be due to impure milk have decreased remarkably since the installation of that dairy. Perhaps that is not enough to satisfy a research man, but there is no doubt in my mind as to the effect of that milk supply. Other conditions, so

far as we have been able to ascertain, have remained nearly the same—the same water supply, same routine of life, same food supply except in respect to milk.

There is another feature emphasizing the importance of the dairy inspector in his community, perhaps an indirect factor, but nevertheless it is one which deserves our consideration and which I consider one of the vital points. If the war continues, if the same thing happens here as has happened in European countries, we must take every step within our power to increase the vitality of the coming generation. In war we select the men who are most fit to go to the front. They are especially selected because of their physical qualifications, and the discards, the ones who stay at home, are the men who are not so well physically qualified to fight the battles of life. Scientists tell us that where the strong are killed off, it has a decided influence on the next generation. That is, the fathers of the next generation are the weaklings, or the ones who stay at home. Now if that is true, and if the war continues so that our best men, the pick of our manhood, are lost to us, does not that strike you as making it vitally important that we should safeguard the health and strength of the generations that are to come? It has been said that the survival of the fittest is a good law, that the children who survive the vicissitudes of life in childhood and come through to manhood are more fit to carry on the battle of life. I do not believe that is so. You can't have a disease attack a child without leaving some scar. Most of our children's diseases have certain after effects which weaken the child, so that it is not safe to leave it to the law of the survival of the fittest; we must safeguard the children, protect them just as thoroughly as we can, so that they may make a complete growth throughout their childhood and grow up into stalwart citizens for their country.

Another phase of the work is that we must have enough milk. Reports coming from the other side indicate that thousands of children are dying in European countries for the lack of milk. It is a frightful condition when not only the adults suffer, but the children suffer because of the war. Our duty is to help to maintain the milk supply in this country. I think the sanitary and economic aspects of the milk question are so interwoven that you can't neglect one or the other. One of our duties in the community should be to encourage the production of an ample supply of good milk. We must not forget that if the dairy industry should be suddenly crippled—for instance, if farmers should suddenly decide to slaughter their cattle—it would take at least two or three years to build up the dairy industry to the point where it was formerly, because we would have to start and raise young stock to take the place of the cows that had been killed.

The dairy inspector will come into his fullest usefulness when he teaches the farmers in his community to produce better milk and at less cost. The cost question is absolutely wrapped up in the sanitary aspects of the question. If we teach farmers to produce milk at a lower cost, they will listen more readily to our suggestions along the line of dairy sanitation. The hardest farmer to deal with is the one who is not making any money. We must help the farmer to produce milk that will not spoil readily, not only for sanitary reasons but for economic ones. Milk that sours before it reaches the market is in many cases a loss. Milk which is condemned by the city health departments and is sometimes destroyed is an economic loss that the country should not have to bear. We should teach our farmers to produce milk that will reach the market in good, salable condition.

We must help to stop some of the wastes that have gone on in the past in the dairy industry—such waste as the

throwing of skim milk down the sewer. I have been receiving reports from all over the country recently, and I am glad to know that much less skim-milk is being wasted than formerly. I have been in city milk plants and have seen the floors white with skim milk going down the sewer. It has been one of our greatest economic crimes. It is a wonderful food, and yet we have long neglected it, and we have so surrounded the sale of it with restrictions that in many cases it has been wasted rather than sold. Some of the products of skim milk which can be made in the home or the smallest milk plant or creamery, such as cottage cheese or prepared buttermilks, are very nutritious. If we could just teach our people the food value of such foods and teach them to use more cottage cheese, and more skim-milk in cookery and for drinking purposes, we would do a great deal to prevent the waste of skim milk. As a question of economics, every drop of skim milk which can be used for human food should be used, and only the surplus fed to farm animals. If you produce cottage cheese from skim milk, you have for human consumption several times the amount of protein that you would have if you fed the same amount to a hog. The hog uses some of that protein for digestion, some of it is lost, and only part is recovered in the meat. You get back in the form of cottage cheese just about as much energy as you would get back through the meat product it produces. If you make cottage cheese and feed the whey to hogs, you get back even more protein. We should urge in our communities the utilization of much more skim milk; and we should try our best to stimulate the demand for some of the good, wholesome dairy by-products that have been wasted so much in the past. I have here a handful of leaflets on this subject—"Ways to Use Cottage Cheese as a Meat Substitute," etc. I think they have been sent to all the health departments throughout the country. If you have not had copies of these I

will be glad to see that any of you are supplied with any of this literature that you desire before the meetings close.

Everyone is here to learn how he can best do his bit. Just what do we mean by that? Some of us excuse ourselves very easily. We say, "I have bought a Liberty Bond," and so on. I want to tell you that in these present times no man has done his bit until he has devoted every ounce of the energy in him in his particular line of service. No man has done his bit until he has done everything that he can do, and our bit as dairy inspectors is to see that our children, our soldiers and sailors, and our allies across the water get the safest and cleanest and best dairy products that the world can produce, and that they get them in such a never-ending stream that their bodies may be properly nourished and their sinews and muscles strengthened, so that they can go into this war for democracy with the greatest possible power.

"The destructive side of war must of necessity go forward, but in the excitement of military preparation let us not forget that it is health and the other constructive forces of the body politic which will win this war."

REPORT OF COMMITTEE ON DAIRY FARM INSPECTION

JAMES A. GAMBLE, *Chairman*

Our country is at war. The opportunity for milk supervisors to demonstrate their usefulness to the industry and the cause of better milk is now. Never was the producer of milk in a more cooperative mood, never was the milk dealer more susceptible to helpful suggestions, and the consumer, as he scans war prices for meats, is perhaps for the first time genuinely interested in the cheapness of milk when considered from the food-value standpoint.

Your dairy farm inspection committee has endeavored to limit this discussion to the major essentials concerned in the improvement and conservation of the milk supply. In introducing this subject, we deeply realize that better milk does not come from the exercise of mysterious powers vested in milk officials or from milk and cream regulations. This must result mainly from the careful efforts of those who handle milk as it passes from the cow to the consumer. Our relationship to the problem is well illustrated by the following story:

An elderly gentleman observed a boy passing by with a large axe upon his shoulder. Seeing the axe, he humorously inquired whether the boy was a member of the Society of American Woodmen. "No," replied the youngster. "This is mother's axe. Our wood is hard to chop, so I am having the axe sharpened for her."

He was having the axe sharpened for the one who actually split the wood. So we, as milk supervisors, can but sharpen and make more effective the efforts of those who handle and determine the quality in milk.

A great deal has been said regarding the existing irregularities in the milk and cream regulations now in force in

our cities and towns. This heterogeneous mass of regulations and the many systems of buying milk are certainly not conducive to clearness and united effort. We all desire the same thing, and the major factors in the production, handling and care of milk are simple ones.

A few rules, necessary, workable, enforceable, easily understood, and one uniform system of buying milk from the producer and selling the same to the consumer, based upon food value and cleanliness, would do much toward furnishing a more stable basis upon which improvement, with the least expenditure of effort, could be brought about.

This committee is also cognizant of the fact that the hearty cooperation of producer, dealer and consumer are essential for the success of this undertaking, and that cooperation is, after all, the gateway through which better milk must arrive.

OUR RELATIONSHIP TO THE PRODUCER

In discussing the relationship of the producer to better milk, we should realize that dairymen are in the milk business, first of all, to make a living. Dairy farmers, as a rule, lead independent lives. Many of their ideas regarding the essentials of clean milk production have been influenced by the long hours and hard work demanded by the dairy business.

We are told, strange as it may seem, that dairy farming is still in its infancy and, as yet, undeveloped and unadjusted to economic laws. During this readjustment financial returns have been small and permanent improvement in the milk supply slow of accomplishment.

Largely through the medium of the dairy press, knowledge of the essentials in clean milk production has become general among milk producers to a degree not always appreciated. While many claim that lack of financial return

is the reason why they do not produce better milk, it seems probable also that, like the rest of humanity, not all dairymen, of their own initiative, have been doing the best they know.

No better outline of what we can expect from producers can be had than the few simple, self-imposed regulations of a group of dairymen in the State of Ohio. One of these dairymen, from whose address these thoughts are taken, has said that the adoption of such regulations has not only resulted in a better product, but a better price as well. If these requirements included also the washing of the hands before milking and handling milk, and cooling milk to and holding it at 50° F. or below, they would leave little more to be desired. This man has said:

> "No man has the right to produce any but the very best milk he can produce.
>
> "The cow must be clean and healthy.
>
> "The barn should be tight, well lighted and reasonably well ventilated.
>
> "Good floors of concrete or other material that is suitable should be provided. The cow should be well bedded.
>
> "Utensils should be of good quality, and be thoroughly sterilized before use.
>
> "Milk should be cooled immediately after production. This is within the reach of dairymen everywhere.
>
> "The milk house should be well lighted, tight and well screened. Some say we can get along with a half-barrel or a watering trough, but flies, June bugs and other farm insects find their way in such an arrangement."

In discussing the responsibility of the producer, it seems certain that if milk is to start in the best possible condition on its journey from the farm to the consumer, it should be produced under the conditions given above, and leave

the farm at a temperature as much below 50° F. as possible. Dairymen owe this to their product, whether those who afterward handle it maintain the milk at a low temperature or not.

Results are bound to crown our cooperative efforts with dairymen in the improvement and conservation of the milk supply, for we are but assisting them to do for the milk supply what dairymen intuitively know they really ought to do themselves.

RELATIONSHIP TO THE DEALER

The milk dealer is primarily a merchant and aims to distribute pure, clean and safe milk, and to spread such information regarding his merchandise as will promote sales. He wishes to have that to sell which consumers desire to buy. Our relationship to him also should be cooperative and cordial. In the past, the progressive milk dealer, as a rule, has welcomed the milk supervisor to his plant, for he realized that both he and the milk official desire the same thing.

In the absence of officials, hired by consumers to supervise the milk supply, milk dealers have, in some cases, been forced to assume duties which rightfully fall upon the municipality. Thousands of dairies are now visited and inspected by agents sent out by milk contractors. Milk dealers have realized that control of quality in milk begins at the farm, and that he who would have the best milk to sell must see that the same is first produced. Being closer to the situation than the general public, milk dealers have more keenly realized the need for this work, and the consuming public in many of our cities and towns owe a great deal to the pioneer work of their progressive milk dealers. It is a wise milk supervisor who will work in close harmony with these men who encounter the milk in the condition in which it is received from the farm every

day. Such cooperation can but result in improving the quality of milk received in any city or town. Without cooperation, a chaotic condition in the milk supply may result, for whether efforts in improvement are made by producer, dealer or supervisor, each must have a measure of support from the others in order to attain success.

Milk dealers also handle milk, and by this handling may influence its quality for better or for worse. Here is a great opportunity for the milk supervisor to be of assistance. After seeing to it that the milk leaves the farm clean, he should also see to it that a low temperature is maintained during transportation and that the handling of the milk at the plant is such that the minimum amount of inoculation takes place. Dealers, as a rule, welcome helpful criticism of their milk handling. Such suggestions, however, are not always new, for, while there are shining exceptions to this rule, not all milk dealers on their own initiative do the best they can. The milk supervisor, from his broader outlook on the supply, should be able to see methods of obtaining improvement that are not apparent to milk dealers whose whole attentions are taken up with the routine work demanded in the distribution of milk. It should be remembered also that the milk inspector receives a salary for supplying such information to the dealer and that a well-trained supervisor is the best friend a milk dealer has.

Suggestions

Be cooperative and cordial to the milk dealers in your jurisdiction.

See that the milk is transported from the producer to the consumer at as much below 50° F. as possible.

See that the efforts of the dealer in handling result in the least inoculation possible; that is, assist him in arriving at methods of washing and sterilizing milk-handling equip-

ment by which milk pumps, pipes, coolers and all machinery coming into contact with the milk are thoroughly sterilized before used.

See that he is getting maximum results from his system of pasteurizing.

See that the cans shipped to the producer in the country are sterile and dry when they leave the milk plant of the dealer. Milk producers, as a class, are unequipped for properly sterilizing milk cans at the farm. For this reason sterilizing the cans before they leave the milk plant of the dealer can but result in better milk.

Remember that the milk dealer, in many cases, has been the pioneer in the movement for better milk, and that much improvement in production and better cooling arrangements on farms and pasteurization in the city have been due to his efforts.

RELATIONSHIP TO THE CONSUMER

The relationship of the consumer to better milk includes the right to demand and receive accurate information concerning the food value, healthfulness, cleanliness and keeping quality of the milk supply. Upon the consumer also rests the responsibility of supporting the milk inspection which furnishes him with this information, for no system of milk supervision, however competent, can successfully combat the continued disapprobation of the public. Purchases by consumers should be made on the basis of the evidence presented by such information. Where this evidence shows distinct differences in the quality of the milk of the local supply, and the showing is followed by an increased commercial demand for this better milk, the reaction of the inspection upon the quality of milk furnished is most helpful. Without this reaction little improvement in local conditions can be expected.

Food Value

The consumer has the right to demand that each package of milk shall carry upon it a statement showing its relative food value, either in the form of a statement as to its fat content or the percentage of solids it contains, or both.

Healthfulness

The consumer has a right to demand that reasonable precautions which insure the healthfulness of the milk be taken. There is a growing feeling that milk should be pasteurized under proper supervision. While not an absolute guarantee of the healthfulness of the milk, pasteurization is a logical way to treat milk of uncertain safety and is an additional safeguard.

Cleanliness

Every consumer rightfully objects to the presence of dirt in milk. The consumer has the right to know, within reasonable limits, the degree of cleanliness of the package of milk presented to him for purchase. Where an increased price is paid by the consumer, he has reason to expect and demand a corresponding increase in cleanliness.

Keeping Quality

American taste demands a sweet milk for many purposes. The sale to the consumer as fresh milk of milk which is about to sour, or which has taken on objectionable flavors because of decomposition, is a fraud. The consumer has a right to know the keeping qualities of the milk offered for his purchase.

Inasmuch as essential elements in the quality of milk may exist in varying degrees, it is desirable for the convenience of the consumer that milk be gathered together into a limited number of grades, the characteristic of each grade, with regard to those elements of quality, being fixed as permanently as possible.

CONCLUSIONS

The demand for better milk should be increased by education and advertising so that sales may be stimulated and kept ahead of the production of milk with these characteristics. We have an increasingly intelligent public to appeal to, and it is the consumer alone to whom this appeal must be made, for, in the final analysis, the consumer is king. With his confidence, all who are working for better milk will win; without his confidence, we shall surely lose.

DISCUSSION

MR. BERG: I regard the inspection of milk as a matter of first importance, and the inspection of the dairy farms of secondary importance.

MR. KELLY: I believe the inspection of dairy farms and the inspection of milk in the laboratory should go hand in hand. Many producers are greatly benefited by a visit from an inspector who can locate the cause of a difficulty and show the producer how to correct it.

DR. WAKEMAN: We cannot depend wholly on farm inspection. Much can be done by educational work through the papers, women's clubs, farmers' institutes and other organizations.

MR. HOLT: Instead of less, we are having more dairy farm inspection in Connecticut.

DR. STATES: The stopping of dairy farm inspection should be the last thing to be considered.

DR. LOCKWOOD: I regard dairy farm inspection as a matter of first importance, and the bacterial examination of milk as a matter of second importance.

DR. KEARNEY: The bacterial count is the actual measure of results. If we follow up such work and carry the information to the producer and make him understand its significance and importance, and show him the cause of the

difficulty, he will be much more likely to correct it. We cannot stay in the laboratory and get results by notifying men by letter that their milk has a high bacterial count.

MR. LOMBARD: A little more of the laboratory work, combined with dairy farm inspection carried on by men who are well informed, will get results.

DR. JORDAN: In Boston we are trying a union of field and laboratory work.

DR. HARDING: The bacterial count is a measure of everything but cleanliness. The bacterial count is in a large degree a measure of keeping quality. The essentials of quality are best determined in the city.

DR. ROADHOUSE: Dairy farm inspection on the Pacific Coast is comparatively easy. The number of cows found on dairy farms ranges from 65 to 350. We would step backward if we were to stop country inspection for laboratory work.

"It may be possible by taking great pains to produce good milk in a dark or dirty stable, but it is extremely improbable that clean milk will be produced under such conditions by the average person."

REPORT OF COMMITTEE ON CITY MILK PLANT INSPECTION

Mr. H. E. Bowman, a member of the committee, in the absence of Chairman Salthe, read a communication from Mr. Salthe, in part as follows:

"I believe that in providing a scheme for city plant milk inspection emphasis should be put on such items as directly affect the milk. An inspector when inspecting a city plant should ascertain the extent to which milk is handled at the plant and then follow each step, and if the milk plant is used merely as a distributing plant and milk is merely stored thereat or transferred from one wagon to another, the inspector is only concerned with the fact that proper storage facilities are provided so that milk is kept cool and temperature will not increase and the milk is so protected that it is not subject to any outside contamination. On the other hand, if the milk plant is either a pasteurizing plant or a plant where milk is transferred from one container to another, the inspector is concerned only with the fact that in each operation milk is placed or put through clean apparatus or containers and the milk is not subject to any unnecessary handling or exposure.

"The inspector should emphasize the necessity of eliminating unnecessary handling and exposure and the need for thorough sterilization of all the apparatus or containers through which milk is passed. Requirements as to the construction of the milk plant are, of course, necessary but they should be subordinate to the requirements having direct relation to the quality of the milk.

"I wish to express my regret at not being able to appear and go over this matter more fully with my committee and submit a complete report."

DISCUSSION

DR. HARDING: Unless pasteurization is supplemented by the inspection of men with whom the milk may possibly come in contact, we are leaving one door to the barn unlocked.

MR. WIDMAYER: In Scranton we pasteurize 85 per cent of our milk supply, using a temperature of 145° for 30 minutes.

DR. STATES: We are starting to enforce medical inspection of milk handlers at city plants.

MR. MOORE: We require a clean bill of health before employees are permitted in the dairy.

MR. HUNTINGTON: In Cumberland one man employed in an ice cream plant had typhoid. This brought the others to vaccinate against typhoid.

In a restaurant a girl died suddenly with a communicable disease. One week previously she was waiting on table guests. This brings home to us the importance of the need for medical inspection in all food handling establishments.

DR. BOLLING: It is inadvisable to place too much dependence on one or two inspections in a year. One dairy selling 1,200 quarts daily had nine cases of diphtheria on one route. The dairyman's daughter, a high school girl, who was found to be a diphtheria carrier, had placed the caps in the milk bottles.

DR. JORDAN: How many States give authority for medical examination of employees? It seems necessary if good results are to be secured.

MR. CRILLY: In Altoona one girl serving ice cream in a restaurant gave typhoid to twelve people. All who have anything to do with the handling of milk should be vaccinated against typhoid.

DR. WAKEMAN: I have known of one case where the party was a typhoid carrier for fifty years, and although

the results of some examinations are negative and the patient has been treated, she is still a typhoid carrier. If necessary, some provision may yet be made for the placing of the more dangerous cases in some institution.

MR. BOWMAN: Although we are all working for the safety of milk supply, I have failed to grasp any real way of safeguarding milk except by proper pasteurization under conditions which make re-infection impossible.

"It may be truthfully said that the dairy industry rests on the science of bacteriology, and that nearly all the methods employed in the production and handling of these products are based on bacteriological principles."

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

ALFRED W. LOMBARD, *Acting Chairman*

The report of your committee this year by reason of necessity will be brief and free from statistical data as no questionnaires have been sent out. We do, however, believe that all dairy and milk inspectors should take an active part in causing the enactment of laws which will insure to the public a safe, clean and pure milk supply without seriously injuring the milk industry or lowering the efficiency of milk inspection service.

The various statutory milk standards in the United States are largely the result of legislative compromises, and are not in accordance with the best scientific knowledge of milk composition. In fact, only by actual adulteration can milk be made to conform to certain of these standards. We believe that as far as practicable uniformity of standards and requirements should exist. In this respect, however, we believe that standards should be unchangeable. We further believe that standards relative to the composition of milk should not apply to natural milk bought and sold according to its fat content. The question of defining definite standards at this time we believe to be inadvisable, as the possibility of gradation or labeling regulations may, in time, supersede the present standardization method for solids and fat content. The other requirements, however, should be sufficiently elastic to meet variations in local conditions.

It is also apparent that in most States too many laws relative to the milk industry already exist, and your committee feels that all the situation really requires is a very few simple laws easily understood and broad enough to

cover the ground both from a commercial as well as a public health standpoint.

The question of tolerance relative to milk standards and regulations is a very delicate one to handle and should depend very largely upon the conditions surrounding the case in point. In fact, a careful survey of this whole question would seem to indicate that the inspector himself should decide each case upon its own merits and should apply such tolerance as may by him be deemed necessary.

"The welfare of the people is the highest law."

OBSERVATIONS ON THE WASHING OF MILK CANS*

RICHARD O. WEBSTER,† *Bureau of Chemistry, U. S. Department of Agriculture*

READ BY DR. CHARLES THOM

The last container used for transporting milk between the milk shipper and the city dairy is the milk can. The invariable practice in the city in which this investigation was made was for the city dealer to wash the can before returning it to the shipper. Where the milk is shipped direct to the city dairy by the producer the milk remains in one can practically from the time it leaves the cow until it reaches the city. When the milk is handled through a receiving station two cans are used. The first belongs to the producer and holds the milk until it is delivered to the receiving station, where it goes into a can belonging to the purchaser. Cleanliness is a prime requirement. A dirty can will contaminate the milk placed in it. In the case of the direct shipper the cans are washed, and in the larger city milk plants, steamed, before they are returned to the producer. In the case of the receiving station, the practice varies. Producers' cans frequently are returned without even rinsing; thus the producer is required to care for the cans. In some instances the producer's cans are rinsed and hurriedly steamed while he waits for them. This investigation deals only with the handling of cans by the city dairy. The cans that transport the milk from the receiving station to the city milk plant are always washed by the latter.

*This paper presents a portion of the data obtained during an investigation of the milk supply of one of the large central western cities under the Food and Drugs Act.

†Mr. R. S. Smith, of the Bureau of Animal Industry, assisted in the collection of samples and in planning this work, which was finished and written up by Mr. Webster. Published by permission of the Secretary of Agriculture.

This investigation covers the handling of the milk cans by 32 city dealers in one of the larger central Western cities, and the condition of the cans as returned to the shipper. The shipper was either a receiving station or the producer.

Of the 32 dealers investigated two (D15 and D31) did not wash their cans but had them washed at another plant. The methods of washing practiced by the remaining thirty dealers, as well as their can-washing equipment, varied very much.

The following summary of the methods and equipment has been prepared:

SUMMARY OF METHODS AND EQUIPMENT USED IN CAN WASHING

Out of 32 city dairies:

30 wash their own cans.
22 wash cans in tank.
8 wash cans by pouring from can to can.
29 used warm water.
1 used hot water.
2 used clean water.
28 used dirty water.
29 used washing powder.
29 used brushes in washing.
26 brushed by hand.
3 brushed by machine.
1 brushed the cans thoroughly.
23 steamed the cans.
0 steamed the cans effectively.
17 drained the cans.
10 drained on the floor.
7 drained on a rack.
5 while draining exposed to flies and dust.
0 drained effectively.

3 dried the cans over air blast.
1 dried the cans effectively.
2 used disinfectants in cans.
0 washed cans satisfactorily.
3 had complete equipment.*

It is interesting to note that only 22 out of 32 of the dealers used a tank and that 8 out of 32 washed the cans by pouring the washing solution from one can to the next. In almost every instance the water was used over and over until it was dirty. In only one instance was the water found to be uncomfortably hot to the touch. Only three of the dealers were equipped with mechanical brushes and in each instance these were found badly worn, dirty and greasy. In one instance the brushing was fairly thorough. Steaming the cans after washing was not universally practiced and in no instance carried out in an effective manner, that is, sufficiently long to sterilize the can. The average time was about 7 to 10 seconds. Only 17 of the dealers drained the can at all. In five instances the cans were drained in such surroundings as to expose them to flies and dust. In no instance was the draining effective in drying the can. Only three of the dealers were equipped with a drying blast and only one of them used it effectively. Two of the dealers (D23 and D32) used a disinfectant; one after steaming the cans, one before steaming the cans. Three out of 30 dealers had an equipment that could be considered complete and even these three failed to make the washing process satisfactory or thorough. In all cases the work was hurried and careless. This was particularly true of the larger dealers where the equipment was more satisfactory but where a large number of cans were washed.

In order to obtain information regarding the sanitary condition of the cans as returned by the city dealers to the

*Complete equipment considered to be tank with mechanical brush, rinsing tank, steam jet and air blast.

shippers, cans were taken for examination at the city railroad stations either in the car or on the platform ready for loading. The time between the washing of the cans and testing was not determined but probably varied from a few hours to 24 hours or more.

EXAMINATION OF CANS

The physical condition of the interior of the can was first noted, i. e., whether wet or dry, and the odor classified as good, close, sour or foul. The amount of drain water was estimated in cubic centimeters, and this was sampled when present in sufficient amount. If the can was dry, or if the quantity of drain water was too small to sample, 200 c. c. of sterile water were placed in the can and the interior rinsed by shaking and rolling the can. This rinse water was then sampled for bacterial count. Only total organisms on plain agar were determined. If the drain water was sampled, the count per c. c. was multiplied by the estimated volume to secure the total number of bacteria in the can. This number was then divided by the volume of the can, computed in cubic centimeters, in order to determine the probable contamination per c. c. if the can had been filled without rinsing. Where the rinse water was sampled the number of bacteria per c. c. was multiplied by 200 plus the estimated amount of drain water, if any was present, thus securing the total number of bacteria in the can. This figure was then divided by the volume of the can in the same way as stated above.

The following table gives the results obtained on 184 cans sampled during June and July.

SUMMARY OF BACTERIOLOGICAL INVESTIGATION OF EMPTY MILK CANS RETURNED TO SHIPPERS

Cans examined	*Number*	*Per Cent*
5-gallon cans	6	3.2
8 " "	113	61.4
10 " "	63	35.3
Total	184	
Physical Condition of Cans		
Interior of can, wet	134	72.8
Interior of can, dry	50	27.1
Contained flies	7	3.8
Odor of Interior: O. K.	41	22.2
Close	46	25.0
Sour	14	7.6
Foul	83	45.1

Calculated Contamination per c. c. Transmitted to Milk if Can Is Used Without Rinsing

	Number	*Per Cent*
Less than 1,000 Bacteria per c. c.	46	27.2
1,000 to 50,000 " "	32	19.0
50,000 to 100,000 " "	18	10.7
100,000 to 500,000 " "	36	21.4
500,000 to 1,000,000 " "	12	7.1
Over 1,000,000 " "	24	14.2
Maximum, 4,332,000 per c. c.		
Total Analyses	168	
Plates spoiled, or sample lost	16	

An inspection of the complete table shows that a low calculated contamination is more frequently found in a dry can than in a wet can. This is not always the case,

for the reason that a freshly washed can will usually give a low count whether the interior is wet or dry.

72.8 per cent of the cans were wet, the amount of moisture varying from a few cubic centimeters to as much as 200 c. c.

The summary based on the physical condition of the cans agrees in certain points with the summary on "calculated contamination." First, 27.1 per cent of the cans were dry, while 27.2 per cent of the cans would give less than 1,000 per c. c. calculated contamination. Second, 52.7 per cent of the cans gave odors classified as "sour" or "foul," both indicative of bacterial activity, while 53.4 per cent of the cans examined would give a calculated contamination of 50,000 bacteria per c. c. or more. That there is a real correlation between the physical condition of the cans and the number of bacteria present in the cans is shown by an analysis of the detailed tabulation of the results which shows that of the 50 dry cans 40 were found to have an odor classified as O. K. Three were found to be close and 7 foul or sour. Upon bacteriological examination 33 gave a calculated contamination of less than 1,000 per c. c. Five ranged between 1,000 and 10,000 per c. c., 4 between 10,000 and 25,000 per c. c., 1 between 25,000 and 50,000 per c. c. and 4 ranged above 50,000 per c. c.

Of the 134 wet cans examined the odor of 5 was classified as O. K., 39 were close and 90 were foul or sour. Of these 130 were examined bacteriologically. Thirteen gave a calculated contamination of less than 1,000 per c. c. Six ranged between 1,000 and 10,000 per c. c. Six ranged between 10,000 and 25,000 per c. c. Ten fell between 25,000 and 50,000 per c. c. and 95 gave a calculated contamination exceeding 50,000 per c. c.

These figures are presented in tabulated form as follows:

	Dry Cans		*Wet Cans*	
Physician Examination	*No.*	*Per Cent*	*No.*	*Per Cent*
Odor O. K.	40	80	5	3.7
Odor close	3	6	39	29.0
Odor foul or sour	7	14	90	67.1
Total	50	100	134	99.8
Bacteriological Examination				
Less than 1,000 per c. c.	33	70.2	13	10.0
1,000 to 10,000 "	5	10.6	6	4.6
10,000 to 25,000 "	4	8.5	6	4.6
25,000 to 50,000 "	1	2.3	10	7.6
Over 50,000 "	4	8.5	95	73.0
Total	47*	100.1	130†	99.8

Thus these results show that 73 per cent of the wet cans will transmit an initial bacterial pollution to milk placed in them exceeding 50,000 bacteria per c. c. and only 3 per cent of these cans give an odor that can be classified as O. K. Of the dry cans, upon physical examination, 80 per cent gave odors that could be classified as O. K. and 70 per cent upon bacteriological examination gave a calculated contamination of less than 1,000 organisms per c. c.

Dairy investigators have shown that milk even when produced under insanitary conditions seldom has an initial bacterial content exceeding 20,000 organisms per c. c. The dirty milk can may introduce more bacteria to the milk

*Three cans not examined bacteriologically that were examined physically.

†Four cans not examined bacteriologically that were examined physically.

than is usually introduced by careless or slovenly methods of milking. In many instances the amount of filth introduced by the dirty can is sufficient to throw the milk out of the Grade A class even if milked under the most approved conditions. It is interesting to note that the number of organisms used for starter purposes in certain types of cheese making does not exceed the numbers introduced by the dirty cans as determined in this investigation.

In order to determine whether the figures on bacteria per c. c. obtained represented all or only a part of the bacteria really present, the following experiment was carried out.

Two freshly washed and steamed cans, each containing a small amount of drain water, were obtained from a local dairy and held three days at room temperature (approx. 85-90° F.). The cans were then rinsed with 200 c. c. sterile water four times successively with the following results:

Subdiv.	*Size*	*Drain Water*	*Rinse Water*	*Bacteria per c. c. in Rinse Water*
Can 1-a	10 Gal.	20 c. c.	200 c. c.	200,000,000
b		None	"	53,000,000
c		None	"	25,000,000
d		None	"	20,000,000
Total bacteria obtained in 4 rinsings				298,000,000
Can 2-a	10 Gal.	10 c. c.	200 c. c.	130,000,000
b		None	"	45,000,000
c		None	"	17,000,000
d		None	"	13,000,000
Total bacteria obtained in 4 rinsings				205,000,000

The first rinsing of can 1 gave 67 per cent of the total bacteria obtained in 4 rinsings, while in can 2, 63 per cent

of the total of 4 rinsings were obtained. By the first rinsing this would indicate that the figures on bacteria as obtained by the method used in the investigation were at least 35 per cent or more below the actual figure.

The investigation shows that many of the milk cans returned to shippers are in very bad condition. Some of the cans are in such shape that only a very thorough washing and scalding or steaming would put them into fit condition to receive milk. This is something that very few shippers are equipped to do, so it is necessary for the city dealer to remedy this condition.

The cause for these excessively high count cans during hot weather can be ascribed to a multiplication of the few bacteria left in the can after washing and steaming. This enormous development can only take place in a wet can. If the can is dried immediately after steaming all development is absolutely prevented and the can will remain sweet and clean.

One of the city dealers under observation had attracted attention on account of the uniformly objectionable condition of the empty cans returned by him to his shippers. During the course of the investigation a can washing machine with attached air blast was installed at this factory. The following analyses were made prior to the change:

City Dealer	*Date*	*Odor*	*Size of Can*	*Amount of Drain*	*Calculated Contamination Per c. c.*
D 21	6/26/16	Foul	10 Gal.	75 c. c.	23,700
		Sour	"	100	52,800
		Sour	"	150	178,000
		Foul	"	100	66,000
		Foul	"	100	Too numerous to estimate

City Dealer	*Date*	*Odor*	*Size of Can*	*Amount of Drain*	*Calculated Contamination Per c. c.*
D 21	6/27/16	Foul	10 Gal.	50 c. c.	88,400
		Foul	"	75	142,600
		Foul	"	50	11,800
		Foul	"	50	145,300
				Average	88,500

After installing the apparatus, the following analyses were made on cans as delivered to the railroad:

City Dealer	*Date*	*Odor*	*Size of Can*	*Amount of Drain*	*Calculated Contamination Per c. c.*
D 21	7/13/16	O. K.	10 Gal.	Dry	53
		Close	"	Slight drain	52
		Close	"	Damp	52
		Close	"	Dry	52
		O. K.	"	Dry	158
		Close	"	Damp	52
		Close	"	Damp	52
		Close	"	Damp	634
		Close	"	Damp	105
		Close	"	Damp	158
		O. K.	"	Dry	52
		O. K.	"	Dry	52
				Average	122

The improved condition of the dried cans is very marked. That this is not due to the fact the second lot may have consisted entirely of freshly washed cans is shown by the following test:

Cans tested immediately after washing, steaming and drying:

Size of Can	*Calculated Contamination*	*Time of Steaming and Drying*
10 Gal.	2	Steamed 7 sec., dried 30 sec.
10 Gal.	17	"
8 Gal.	20	"
8 Gal.	400	"
Average	109	

After holding for 48 hours at room temperature (approx. 85-95° F.):

10 Gal.	440	Steamed 7 sec., dried 30 sec.
10 Gal.	320	Steamed 15 sec., dried 30 sec.
Average	380	

CONCLUSIONS

The investigation shows that the empty milk cans returned by the city dairies to the shippers constitute a serious source of contamination, in many instances the degree or amount of contamination being sufficient to seriously injure or completely ruin milk even though produced under the most sanitary conditions.

The trouble is due to improper washing and drying by the city dairies. As practiced at the time of this investigation the washing process left many cans with sufficient organic matter and moisture to support bacterial growth. The steaming, where practiced, in no instance really sterilized the can and the organisms remaining multiplied rapidly. The high temperatures prevalent with summer weather in this region further aided the development.

Only when the cans are effectively dried can this development be prevented. This may be quickly and economi-

cally done by exposing the cans after steaming and while still hot to an air blast. Thirty seconds' exposure is sufficient to bring about a marked improvement.

No dealer should be permitted to return filthy milk cans to the shipper if the milk he purchases is to be used as food.

The use of disinfectants in the cans should not be permitted under any circumstance. It is unnecessary, and further promotes slovenly and careless washing. There is also danger that the disinfectant may remain in sufficient amounts to be detected in the milk. This would make the shipper liable to criminal prosecution even though he did not know the cans had been disinfected with chemicals.

Proper washing of milk cans calls for the use of tanks of clean hot water and washing powder, with thorough brushing by hand or by machine. After washing cans should be rinsed in clean water and steamed for at least ten seconds. Such steaming will not sterilize the can but will reduce the number of bacteria and heat the can sufficiently to hasten drying in the air blast. Any blast of clean dry air delivered from a blower of sufficient volume to dry the can in from ten to thirty seconds may be used. An arrangement for heating the air will hasten drying by increasing the moisture carrying capacity of the air delivered. No system of handling the cans is complete unless the lids receive a thorough washing and drying. After drying the cans the lids are put on and the cans are ready to return to the shipper. The cans thus washed will remain sweet and clean indefinitely even in the hottest weather as there is no opportunity for bacterial activity in a dry can.

DISCUSSION

DR. THOM: None fail to realize that contamination due to filth is comparatively important as compared with dirty cans and utensils.

MR. STEVENSON: A well steamed, dry can is a most important step in securing clean milk.

MR. TAYLOR: A wet can rusts, develops a bad odor, contaminates milk, and the cause of the odor increases greatly the bacterial content of the milk. The steaming of cans is important. Drying makes an increase in bacterial growth impossible.

DR. THOM: Steaming is most important. The air blast frees the can from water.

MR. LOWE: The bacterial count does nothing to get a clean supply. It tells us the condition of the sample examined. Look closer to the things in which bacteria grow.

"Bacteria are responsible for most of the difficulties met with in the handling of milk and milk products."

PRESIDENTIAL ADDRESS

DR. WILLIAM H. PRICE

The annual convention of the International Association of Dairy and Milk Inspectors has come to mean the closing of an old and the beginning of a new year of effort for the solution of the milk question. Annually our members have gathered from various parts of the United States and Canada to review the contending elements of the problem, to receive and impart information of progress made or obstacles encountered in the past year, and to formulate a program for future activities best suited to the social, economic and hygienic needs of the public with respect to the milk supply. As a result, each succeeding program has correlated itself with the last, to the end that the theory and practice of milk and dairy inspection may be established on firm and practicable foundations leading to a maximum of accomplishment with a minimum of wasted effort.

There are few things of so great importance to the country generally and to its individual citizens as the quantity and quality of the food supply and the state of the public health. Investigation has established, as practice has indicated, that milk is one of the best foods. Containing as it does the proteid, carbo-hydrate, fat and mineral matter and containing them all in an easily digested form, milk more nearly approaches the ideal than any other food. It is also established that, food value considered, milk is one of the cheapest animal product foods. In these respects milk is one logical answer to the food and economic living questions. On the other hand, certain dangers to the public health and wastes in food values occur in uncontrolled milk supplies. The possibility of transmission of bovine and human diseases and of the development of diseases of childhood as a result of insanitary production and handling is sufficient to

limit or preclude the advantageous use of such milk as food. It is also true that great economic waste is involved in the daily spoiling of large quantities of milk that a sanitary standard established by proper inspection would have saved. The development of milk production and its sanitary control are of importance, therefore, for these and other reasons, as factors in the solution of the food and public health problems.

The necessity for control of the milk supply was recognized many years ago, but early efforts were directed largely against the fraudulent practices of skimming and watering. It was only within comparatively recent years that the new sciences of bacteriology and epidemiology determined the greater importance of improved sanitation by efforts directed against ignorance and carelessness in production and handling. Present-day milk inspection has therefore come to be mainly educational and cooperative between the various parties concerned, the producer, the distributer and the consumer, and progress made has depended more on successful application of the sciences of economics, chemistry, bacteriology, sanitary science, human and veterinary medicine and dairy farm management than on routine police work, which is most satisfactorily reserved for the final elimination of hopeless elements among producers and distributers.

The object of this Association, as stated in the constitution, is "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." The necessity for including all the previously named sciences in accomplishing this purpose is amply evidenced by their prominence in the published Annual Proceedings of the Association and in the program of this session. The value of those sciences in the solution of the milk problem is testified to by

the public health and agricultural statistics of localities where they have been applied, and also in a negative way by personal observation in various districts where no scientific milk and dairy inspection prevails. It is unfortunate that in these latter places a coincident absence of adequate morbidity, mortality and economic statistics serves to conceal the detriment resulting to the locality and, in the present crisis, to the nation, because of a failure to standardize milk production and distribution upon a modern sanitary and economic basis. At least part of this failure proceeds from lack of initiative resulting from diseases such as malaria and hook-worm, which are not milk-borne.

An examination of the Proceedings of the International Association of Dairy and Milk Inspectors indicates that the necessity for "the development of a uniform and efficient inspection of dairy farms, milk establishments, milk and milk products" proceeds largely from the relations existing between the public health and the milk supply, the relationship of milk to communicable diseases and those of early childhood. Naturally the public health is paramount, not only to the consumer but also to the producer and distributer, as an indispensable requisite to the continuance and development of their industries. A review of those proceedings seems to indicate that a consensus of opinion with respect to the factors leading to a safe and satisfactory milk supply has been arrived at. They may be summarized as follows:

1st. Healthy cows.
2d. Healthy milkers and handlers.
3d. Clean production in clean surroundings.
4th. Clean utensils, small-top pail.
5th. Cooling to 50° F. immediately after production.
6th. Cool, rapid transit. Protection against tampering.
7th. Sterile apparatus and receptacles at city milk plant.
8th. Efficient pasteurization, 145° for 30 minutes, fol-

lowed by rapid cooling to 50° and immediate bottling by mechanical means.

9th. Prompt delivery.

10th. Bottles and cans to be thoroughly washed and returned to the producer or distributer in a cleanly condition.

11th. Milk to be graded.

12th. Adequate system of inspection.

13th. Proper care of milk in the home.

While these requirements are primarily arranged for their influence upon the public health, the fact must not be lost sight of that fundamental economic principles are likewise included. These sanitary standards promote efficient and economic production and distribution of market milk with a maximum of return and a minimum of waste. Several of these requirements may be combined under a single heading, leading to a reduction in number. Some may be less feasible or more difficult of application in certain communities than in others. Proper pasteurization, with efficient subsequent handling, doubtless limits the imperative urgency, so far as the public health is concerned, of the other factors. The methods employed for their attainment and results obtained, as published in the Annual Proceedings, indicate that success in market milk improvement is most likely to result as an evolutionary process wherein the technical scientific, economic and educational problems of the producer, distributer, consumer and inspector are adequately considered from their individual standpoint and as a whole.

It so happens that further light and revolutionary changes in the food situation since our last convention direct increased attention to the economics of the milk problem without in any way detracting from its sanitary aspects. Modern preventive medicine has successfully, but almost exclusively, been directing its energies toward the prevention of communicable diseases and those of early infancy. In the meantime, certain other diseases directly due to diet

deficiencies have come to occupy a prominent place and threatening aspect in the morbidity and mortality tables of certain localities. No scientific research has connected the increasing prevalence of these diseases with the character of the milk supply, but it is worthy of note that districts of highest pellagra incidence are those of lowest milk consumption, and this fact considered in connection with the value of milk as an article of diet may indicate a negative relationship between milk and diseases of diet deficiency. Increased cost has resulted in decreased consumption of milk to such an extent, in certain communities at least, as would indicate that detriment to the health of the people, notably children and those of a low order of nutrition predisposing to tuberculosis, must result.

Under these circumstances it would appear that added attention is due the economic side of the milk problem. The prevention of diseases of diet deficiency and of disorders of children resulting from reduction in quantity of milk consumed is as logical an activity to be undertaken by the members of this Association as the prevention of milk-borne epidemics and diarrheal diseases of infancy. Increase of per capita consumption of milk in those sections where a low rate has always prevailed and the maintenance of the present high per capita consumption in other sections seem essentials to the conservation and promotion of the public health. Low average consumption and reduced consumption must proceed from failure of appreciation of the food values contained in milk as compared with other foods, and of the cost of production and distribution of milk under present conditions. Investigation of these factors or the compilation of data already available with respect to them, and the dissemination of such information to the public by a disinterested agency such as this Association may be expected to be productive of better results than advertisements of dealers, which are looked upon as business promoting

enterprises. A scale of production and distribution costs wherein the various items entering, such as food, labor, interest, depreciation, bottles, caps, etc., may be indicated at a standard value and assigned a percentage of the whole cost so as to be readily adjusted to changing economic conditions, may come to be as important an asset to the successful milk inspector of the future as the Babcock and sediment testers have in the past. For similar educational purposes a scale of food values wherein milk and its products are compared with other foods and with certain beverages, of no value but in general use, may approach in importance the Government score card and the bacterial count.

Recent superficial investigations of milk supplies in various parts of the country where little, if any, dairy and milk inspection exists, gave evidence to the speaker of waste through spoiling of large quantities of milk that could have been saved through a definite system of milk inspection. Further, the methods inaugurated for sanitary reform in one section at least not only resulted in accomplishment of that purpose but also were the means of stopping that waste and of material reduction in cost of production and distribution. There is evidence to show that the whole dairy industry of such sections is retarded because of the absence of a standard of quality established through proper inspection. Doubtless every section can contribute to the economic necessities of the country by closer attention to sanitary and other expedients for the curtailment of waste.

Increased attention to economics involves no change in policy on the part of this Association, for the economic has always been regarded as secondary only to the hygienic side of the milk question. That relationship has not been changed; but rather the reorganization this country is undergoing has advanced the importance of the solution of both factors in the milk question over other and less urgent subjects.

One of the motives of this Association as stated in the constitution is "to place inspection in the hands of men who have a thorough knowledge of dairy work." It may be assumed that political appointments and interference are referred to by this clause, and such an assumption is justified by observation and by statistics contained in last year's proceedings, which show that 64% of 366 milk inspectors employed in American cities had no special educational qualifications for the work. But the recent investigation previously referred to reveals that educational advantages may not qualify their possessor with "a thorough knowledge of dairy work." The milk inspection authorities of one of the largest American cities are opposed to pasteurization, with the result that only one pasteurizing plant operates in that city and that one, though modern and complete in equipment and apparently efficient in methods, handles but a small percentage of the city's milk supply. In at least one city visited, marked progress had been made in the eradication of bovine tuberculosis, but efforts for improvement of the supply had stopped there. In several cities milk inspection concerned itself almost exclusively with the installation of cement floors. In all cities referred to, the milk inspectors were qualified medical doctors, bacteriologists or veterinarians, but their educational advantages seemed not of themselves to effect either a "thorough knowledge of dairy work" or a primary knowledge of modern principles of dairy and milk inspection. Communities are paying for "the establishment of uniform and efficient inspection of dairy farms, milk establishments, milk and milk products" in their respective localities. Unfortunately, in many instances they are getting an eccentric system of inspection which reflects the unsupported opinions or prejudices of an inspector who neglects to consider the relative value of each phase of inspection work. Such systems not only fail of

their prime objective, but become in effect a liability instead of an asset to the local public health organization.

Previous educational advantages are clearly an asset, but not in themselves adequate qualifications for the important work of milk and dairy inspection. Lack of such advantages by an inspector is certainly a handicap, but not necessarily an insurmountable one. Happily the principles involved and methods to be employed in improving a previously uncontrolled milk supply are relatively simple and can be readily acquired by the individual having a common education and an earnest desire to possess them. No better means to that end can be devised than membership in and attendance at the annual conventions of the International Association of Dairy and Milk Inspectors, where the knowledge and experience of local inspectors may be supplemented by that of others engaged in the same work. It is perhaps not altogether fortunate that this Association has never been obliged to engage in an active canvass for new members. To have done so would doubtless have resulted in further extension of efficient inspection. Someone wisely remarked at our last convention that an interested milk producer is a competent producer. An interested inspector may likewise become a competent inspector, regardless of the presence or absence of college degrees, and such interest should be stimulated in all persons having this important work in charge by active participation in the annual program of this Association.

"In these times we must not expect to lay plans and conduct our work according to our personal tastes and desires, but rather on the basis which will render the greatest and most effective service to our country."

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

A. F. STEVENSON, *Chairman*

Your committee on the relation of the milk supply to the diseases of man, somewhat apologetically begs to submit the following report. On account of the connection of the several members of the committee with the military activities in the various parts of the United States and Canada, the amount of time for committee work has been so small that the scope of this report is necessarily limited. They wish, however, to offer the following summary of the prevalence of milk-borne disease in this country and Canada during the past year and to call the attention of those interested to published articles on certain phases of such diseases as have been recently published. Also your committee has deemed it advisable to discuss with you the relation of heated milk to nutritional deficiency diseases such as infantile scurvy.

In general it may be stated that the frequency of milk-borne epidemics, reported in the literature during the past year, does not show any marked increase or decrease over those of other years. The few compulsory pasteurization laws passed during the year have served to slightly lower the great potential dangers of milk-borne disease in certain limited areas, but epidemics caused by infected milk supplies are still all too numerous. It has been thought well to discuss, in some detail, a few of these epidemics, chosen because they are typical of those occurring frequently over the entire country. It is hoped that a discussion of these epidemics will help to keep in the minds of all the importance of universal pasteurization.

In Canada there have been reported three typical milk-borne epidemics, two of typhoid fever occurring at Winni-

peg, Manitoba* and Orillia, Ontario†, and one of paratyphoid occurring at Brantford, Ontario‡.

The Winnipeg epidemic consisted of twenty-three cases of a rather mild type of typhoid and occurred on the route of a foreign milk dealer who supplied 166 homes with his product. This outbreak would doubtless have assumed much greater proportions had it not been the general practice of many of the foreign population of Winnipeg to boil all milk before using it. It is thought that the milk became infected from bottles and utensils rinsed with polluted water from a supply which, unknown to the health authorities, was put into temporary use while the regular supply was out of commission.

The Orillia epidemic was much larger than that at Winnipeg. More than two hundred cases of typhoid were reported, of which sixty per cent were children. All cases used milk received from one dealer. Investigation found that he purchased milk from a producer in whose family there had been three cases of typhoid, which were not reported to the health authorities until after the outbreak of the epidemic. The methods employed by the dairyman in producing his milk were supervised by the health department, but as the cases were not reported as soon as discovered, no precautionary measures could be taken to prevent the spread of the disease.

In Brantford an epidemic of a typhoid-like disease was investigated by Dr. W. C. Allison, Bacteriologist of the Provincial Board of Health. Twenty cases were reported in this epidemic, all of which, with the possible exception of two Russians, received their milk supply from one

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*Report of the Medical Officer of Health, Winnipeg, Man., for 1916.

†Report of Dr. R. W. Naylor, to the Ontario Provincial Board of Health, May, 1917.

‡Report of W. C. Allison to Chief Officer of Health, Ontario, September, 1917.

vendor. This vendor purchased milk from a dairy where a case of typhoid-like infection had occurred a month previous. Examination of the blood of this case and of the cases occurring in the epidemic showed a strongly positive agglutination with B. Paratyphoid Bacilli. Also an examination of the stools of the case on the dairy showed great numbers of the same organisms. It was concluded by the investigator that infection was carried to the milk by flies, bred in an open privy where the excreta of the patient was dumped. These flies were very abundant at this time and had easy access to the milking utensils left to air twenty-five feet from the privy.

In the United States the customary outbreaks of typhoid, diphtheria and septic sore throat have taken place. The *Journal of the American Medical Association* reports three outbreaks of typhoid due to infected milk or milk products. One occurred at Bakersfield, Kern County, Cal.* It was intermittent in its intensity and extended over a year. It was caused by infection from a carrier, who, from time to time during the year, had sold milk to three separate dairies, causing typhoid to spring up among the patrons of all of them. The milk furnished by the carrier was "Grade A raw," but inspection was not adequate to detect the presence of danger till the epidemic was under way.

An outbreak of typhoid at Helm, Cal.† was also reported, which was traced to home-made ice cream served at a school picnic.

The epidemic was rather intense, consisting of twenty-three cases and three deaths. All persons eating the ice cream came down with the disease in eight days or less, and

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*A typhoid carrier problem, Senftner, H. F., *Jour. A. M. A.*, Vol. LXVIII, June 23, 1917, page 1893.

†An epidemic resulting from the contamination of ice cream by a typhoid carrier. Cumming, J. G., *Jour. A. M. A.*, Vol. LXVII, page 1163.

those eating the largest amounts were the most seriously ill. It was learned that the person who made the ice cream was a "carrier" and had had typhoid seventeen years previous. During the intervening time, four cases of typhoid had occurred among boarders for whom she cooked.

Another milk-borne epidemic is reported from Colusa, Cal.* The milk became infected from cold polluted water used in rinsing milk utensils and glassware. An interesting feature of this epidemic was the occurrence of the disease in five people who had, within a year, been vaccinated against typhoid. In all these cases, however, the attack was extremely mild.

A very interesting study has just been made by officers of the Public Health Service of an epidemic of diphtheria at Newport, R. I. The details of the study are soon to be published in the Public Health Reports. An outbreak of 402 cases occurred in the spring of 1917, most of which were in older children and adults. Twenty-nine cases developed among the troops stationed at this point. The disease was of a mild type and no deaths occurred. An epidemiological study was made, which showed that the epidemic was started by infected ice cream. On one dairy which wholesaled its output to a pasteurizing plant there were found two active cases of diphtheria and four carriers. The pasteurizing plant was of the flash type and was out of order the greater part of the time. This plant sold cream to most of the ice cream manufacturers of the city, and the milk from the infected dairy was used in a raw state to standardize the previously pasteurized cream. One of the drivers, distributing ice cream, was also found to be a carrier, and may have contributed to the infection.

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*A milk-borne epidemic of typhoid fever due to the use of polluted water. Geiger, J. C., *Jour. A. M. A.*, Vol. LXVIII, March 31, 1917, page 987.

The most noted epidemic of septic sore throat reported during the year occurred in Galesville, Wis.,* a town of 1200 inhabitants. It was caused by an infected milk supply, and consisted of 200 cases. The infection of the milk was so great that one glassful was sufficient to cause the disease. A most excellent bacteriological study of the disease was made by Drs. Rosenow and Hess. They were able to produce the disease in rabbits, mice and monkeys by either inoculation with the infected milk, or by swabbing the throats with the milk. A streptococcus was isolated which was proven to be the cause of the disease.

An exceedingly careful study of the Beta Hemolytic Streptococcus of the Smith and Brown type, the organism causing septic sore throat, was reported by Smillie in the *Journal of Infectious Diseases*†. To those interested in this disease this article is recommended. Among other interesting facts brought out, Smillie showed that the organism of septic sore throat occurred in fairly large numbers in one per cent of normal throats, and persisted for months in the throats of persons who had recovered from some kinds of tonsillitis and scarlet fever. Among his conclusions he states that septic sore throat is "not a disease due wholly to the drinking of contaminated milk. This disease may exist not only in the epidemic, but in the sporadic form."

The foregoing examples prove that disease organisms have gained access to the milk supply from (1) diseased cows, (2) dairy employees actually suffering with disease, (3) carriers, (4) utensils not protected from contamination, (5) polluted water supplies and (6) flies.

The fact that practically all of the infected supplies mentioned were under the supervision of the local health in-

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*An epidemic of septic sore throat due to milk, Rosenow, E. C., and v. Hess, C. L., *Jour. A. M. A.*, Vol. LXVIII, May 5, 1917, p. 1305.

†Studies of the Beta Hemolytic Streptococcus (Smith & Brown), *Jour. Inf. Diseases*, Vol. XX, January, 1917.

spectors proves that mere inspection alone is not sufficient to safeguard a milk supply. Drs. Rosenow and Hess, in their discussion of the Galesville epidemic, summarized the conditions admirably when they said, "It is practically impossible to handle milk without risk of contamination from human and other sources, even though the rigid technic of the operating room be employed. * * * Inspection of dairies, certification, grading according to sediment tests and bacteria count as now practiced * * * cannot permanently safeguard the public health. Efficient pasteurization should be universally adopted."

For many years pasteurized milk has been criticized by many people who claimed that it was responsible for infantile scurvy and rickets. This criticism was, to a great extent, temporarily quieted by the experience of the immense feeding experiments conducted by such organizations as the New York Milk Committee in its infant feeding stations. The results of these experiments seemed very conclusive. Ten thousand children were fed pasteurized milk daily for three years at the New York stations, and no case of scurvy developed. The one objection to this evidence is that the children were not always under observation of the station nurses and other foods may have been given them, which counteracted the effect of the heated milk.

Within the last few years the subject has arisen again, and much more definite proof has been presented relative to the subject. It has been shown that proper food substances contain exceedingly small amounts of compounds which are absolutely necessary for the maintenance of healthy life. These essential compounds have been styled vitamines. There are several classes of vitamines, some being responsible for the growth of organisms, and without which the young do not develop properly, and some being absolutely essential to ordinary metabolism. Any process which breaks up or destroys these compounds in an article

of food should be avoided. These vitamines have not been definitely isolated from foods and little is known of them in a pure state. Their presence or absence can only be determined in a food substance by its effect on animals, when used exclusively as a food by them.

Experiments have been conducted by a number of scientists to determine the effect of heat on the vitamines contained in milk. Special attention has been given to those compounds which prohibit the occurrence of infantile scurvy in children. The best known work along this line was done by Hess in New York.* Since 1912 he has had a considerable number of cases of scurvy develop in infants being fed on pasteurized milk in an institution where the diet can be absolutely regulated. This milk was pasteurized at the hospital at a temperature of 165° F. for twenty minutes. During the past year, however, pasteurized milk which had been heated to 145° F. for twenty minutes at the plant of a New York dealer has been used. Several cases of scurvy developed on this diet. While some of the children developed scurvy others in the same ward, fed on the identical diet, did not contract the disease. Hess therefore states that pasteurized milk is not the sole factor in the production of the disease, but that it plays an important role. This is shown by substituting raw milk for the pasteurized and keeping all other conditions the same, when in two weeks' time the scorbutic symptoms wholly disappear. Hess concludes that there is a sufficient amount of anti-scorbutic substance in cows' milk to prevent the development of infantile scurvy, but that this substance is destroyed to

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*Hess, A. F. Infantile Scurvy. The blood, the blood-vessels and the diet. *Am. Jour. of Diseases of Children,* Vol. VIII, December, 1914, pp. 386-405. Hess, A. F. Subacute and Latent Infantile Scurvy, *Jour. A. M. A.*, Vol. LXVIII, January 27, 1917, pp. 235-239.

such an extent by ordinary pasteurization that it is not safe to feed an infant, solely, a diet of pasteurized milk even modified with barley water. The disease can be prevented or quickly remedied by feeding a small amount of orange juice. He has also found that potato is an excellent anti-scorbutic and recommends that potato water be used in the place of barley water for the modification of milk. He also concludes that a large proportion of our infantile scurvy is, no doubt, caused by pasteurized milk, but that he does not wish to discourage the use of such milk. He merely points out the important fact that pasteurized milk is not a complete food and that it is imperative to give an anti-scorbutic substance in addition.

Considerable work has been done on the effect of pasteurized milk on small animals such as guinea-pigs, but the results of this work on the face of them show that they have no bearing on human scurvy.

The studies of Moore and Jackson* substantiate this statement. Pasteurized and raw milk were exclusively fed to groups of guinea-pigs under otherwise identical conditions. It was found that scurvy developed in three weeks' time among the animals of both groups. Those receiving the pasteurized milk were in no way more seriously affected than those receiving the raw milk. The work shows that guinea-pigs cannot subsist on cows' milk alone and points out the fallacy of attempting to draw conclusions applicable to humans from experiments on small animals.

To *summarize:* Recent studies show that pasteurized cows' milk when fed exclusively, may, in some cases, produce infantile scurvy, a disease which will not develop

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*Moore, J. J., Jackson, L., Exp. Scurvy produced in Guinea-pigs by Milk and Milk Products, Vol. LXVII, December 23, 1916, page 1931.

among children fed on raw cows milk. This disease may be prevented by modification of pasteurized milk with potato water instead of barely water. The number of cases of infantile scurvy produced by pasteurized milk is so small compared to those of infantile diarrhea produced by raw milk that they have little weight when the benefits of pasteurization are under discussion. A study of all phases of the relation of the milk supply to the diseases of man point to one fact:—that pasteurization is the only known method of safeguarding a public milk supply.

DISCUSSION

MR. LLOYD. The ordinary proprietary foods are probably responsible for more scurvy, etc., than pasteurized milk.

MR. KELLY. In view of the greatly increased use of pasteurized milk is there an increase in infantile scurvy?

MR. STEVENSON. No, I do not think so. In the home there is usually orange juice, barley water, etc., given with the milk, and even the occasional use of orange juice is probably sufficient to supply enough vitamines.

DR. STATES. What is the relation of septic sore throat to the milk supply?

MR. STEVENSON. The organism from the throat of patients was found by Rosenow to be the same as those found in the udders of some cows.

DR. B. T. WOODWARD. In one instance where 125 cases of mammitis had developed in one herd the people using the milk from that herd were found to be suffering with sore throats.

DR. HARDING. I think the septic sore throat is a sort of a bugaboo. Scientists have discovered that most everyone has organisms of septic sore throat. If the theory was true, the only wonder is that everyone of us has not had

septic sore throat. Streptococci no doubt are sometimes associated with milk, but we don't know where they come from or much about them.

MR. STEVENSON. Only one per cent of our people are carriers of the organisms that cause septic sore throat.

"One thing this war has taught us: men are not so cheap as we once thought them. Human life and human efficiency are the two most precious things on earth. If out of this awful labor of war a strong public health sentiment for the entire nation can be born, then will our sacrifices not have been in vain."

REPORT OF COMMITTEE ON METHODS OF BACTERIAL ANALYSES OF MILK AND MILK PRODUCTS AND THE INTERPRETATION OF RESULTS

GEORGE E. BOLLING, *Chairman*

When laboratory men listen to the arguments of the advocates of sanitary inspection of dairies, who extol the virtues of this or that form of score card, it is a matter of some satisfaction for them to reflect that no number of inspections or reinspections will suffice to compel a milk producer or dealer to furnish a product within the law until the final, or so to speak, "acid test," is applied to that product and its actual condition stands revealed.

It would be far more reasonable to require a dairyman to own specified numbers of Jerseys and Holsteins and assume the chemical analysis of the product would be satisfactory without actually performing the analysis than to have numerous sanitary rules for the dairyman and to assume the product to be correct in such respects without further examination.

It will not answer to report that such a dairy repeatedly scores ninety per cent and such a one ninety-five per cent and by all appearances should produce a low-count milk, well within the regulation, for far too many instances of high-scoring dairies turning out undesirable milk have been available in recent years to dispute the fact that in the final analysis the sanitary condition of the milk is told best by its bacterial content. If the owner of or the hired help at a dairy are disposed to deceive, the presence of an inspector at that plant for 365 days a year will be necessary to compel actual and not merely perfunctory compliance with regulations looking toward the production of sanitary milk.

These remarks, of course, do not apply to cases where milk is infected by presence of transmissible diseases among

the dairymen, the search for such specific organisms being well known to be a waste of time.

But also in this same instance does medical inspection of dairy employees fail to produce the desired protection as no municipality, State or nation can be expected to furnish such medical inspection frequently enough to ward off occasional infections by suddenly occurring diphtheria or scarlet fever and the like.

The genuine hopelessness of the task of guaranteeing the purity of a city's milk supply by dairy inspection alone has, without doubt, served to influence the health authorities of New York, Chicago, Boston and other cities in their recent diminished activity in such work.

Following this prefatory plea for the recognition due bacterial milk analysis in securing cleaner and more healthful milk supplies, your committee wishes to state that it will consider its work for the year, though of small amount, to have been well worth while in bringing one additional phase of the subject before this Association.

One year ago this month the Committee on Standard Methods of Bacterial Milk Analysis of the A. P. H. A. reported to their parent body a method of conducting such analysis that embodied certain changes from the older established method, and these changes have been such as to be viewed with much concern by bacteriologists engaged in enforcing bacterial limit regulations.

At the aforesaid meeting certain changes were recommended in the method of making media, the most striking of which were the reduction of the acidity from 1½ to 1% and the use of beef extract in place of meat infusion. The newer media, as is known by all who have conducted comparative tests between it and the old, yields total counts from but 50 to 70% of those obtained with the old.

This fact has served to effect considerable confusion among milk bacteriologists. All desired to use none but

standard methods in their work but when they found that the so-called standard method yielded counts so much lower than the actual and hence their department records of years of such work were not at all comparable with present day results, many such workers declined to change their method of making media as far as concerns the two items spoken of. This is especially true in Massachusetts where over 90% of the milk inspectors have refused to change to the newer media.

It is hard to conceive of a health official desiring to employ methods that he knows do not tell all the truth about the investigation he is making. On the other hand we have the bacteriologists more or less constantly retained by the dairy interests and it is not at all surprising if the newer media should meet with their perfect accord and approval.

The original official medium was fixed upon by such men as Slack, Park, Stone, Russell, Marshall and Harrison after thousands of experiments showed it yielded the greatest growths—that is, it came nearer to telling the truth about the milk under examination. It had been hoped that this media would be used until replaced by one giving higher average counts—that is, one coming even nearer the actual truth. It is felt that the change is retrogressive and many would like to have the old standard method again restored.

If it be necessary members should refresh their memories by reference to the work of the earlier Committees on Bacterial Milk Analysis of the American Public Health Association and are urged not to be led astray by the present committee which is confessedly advocating a medium more suitable for water bacteriology.

A paper read before our Association three years ago by S. Henry Ayers cogently presents much that is pertinent in this matter. And a still more recent paper by Dr. F. H.

Slack in the August, 1917, issue of the *American Journal of Public Health* presents anew conclusive reasons against any such changes in media.

DISCUSSION

DR. JORDON. Boston still clings to the old method, using culture media of 1.5% acid.

DR. HARDING. Two days' incubation at 37° C. does not give total count.

DR. BOLLING. With the old meat infusion medium at 37° C. we get higher counts than with the beef extract medium.

The following resolution was adopted by the Association:

RESOLVED, That this Association go on record as believing the changes adopted by the American Public Health Association in the matter of making media for milk plating by altering the acidity from 1½% to 1% and the use of meat extract in place of meat infusion is inadvisable, in that such changes give lower results than the older media, and that a change to the original method is desirable.

REPORT OF COMMITTEE ON BOVINE DISEASES —THEIR RELATION TO THE MILK SUPPLY AND TO THE PUBLIC HEALTH

DR. HARRY E. STATES, *Chairman*

Tuberculosis

Tuberculosis is probably the most widespread of cattle diseases. It could be almost certainly detected in the milk supply of any of our cities. The tuberculin test and pasteurization are our greatest safeguards.

A rigid physical examination of many tubercular cows, even including some dangerous spreaders of the disease will not *always* reveal the tubercular condition. Personally, I have little faith in it. Guinea-pig inoculation with suspected milk will usually show the disease, if present, in about six weeks following such an injection. This, however, is a long time to deprive the dairyman of a cow's milk. When one considers, too, that the test is not infallible, and that a cow *may* become *dangerous* at any time, such a test is not wholly satisfactory. I know of no quick and satisfactory method of determining if a given sample of milk contains tubercle bacilli.

The passing and enforcement of laws in *all* States, making it compulsory that all creamery and cheese factory by-products be efficiently pasteurized, would be an important step forward. This is of great importance, not only in limiting the spread of tuberculosis in dairy herds, but also reducing the great annual loss in hogs, who contract the disease very easily by being fed on these products as has been proven many times in actual experience.

Farmers' Bulletin 781, recently published by the United States Department of Agriculture, states that of the hogs slaughtered during 1916 at establishments under Federal inspection, which includes all important ones, 9 per cent

were found to be affected with tuberculosis. While this is the general average for the entire country, it is noticeable that a much larger per cent of diseased hogs comes from some sections than from others. For example, hogs from some of the southwestern States, such as Arkansas, Oklahoma and Texas, are remarkably free from the disease. This is doubtless due to the fact that hogs in that section are pasture fed to a very large extent.

On the other hand, corn belt hogs and especially those from dairy States are altogether too frequently affected with tuberculosis. While only 2.4 per cent of the 451,478 hogs slaughtered at Fort Worth, Texas, during 1915 were tuberculous, 9 per cent, 10.9 per cent, 12.1 per cent and 25.1 per cent of those slaughtered at four cities in a leading dairy State showed tuberculous lesions.

From this it is evident that the subject is of importance to dairy farmers, and especially so since the bulletin referred to reports that packing houses are beginning to discriminate against hogs from localities known to be badly infected.

The most frequent infection of hogs occurs through the digestive tract and is intimately related to tuberculous cattle. In those localities where a large number of hogs have been found affected with the disease investigation showed that most of the hogs in question had been fed upon unpasteurized skim milk, or occasionally that the carcass of some animal succumbing to the disease had been thrown to them to dispose of. Another source of infection is the practice of allowing swine to run behind tuberculous cattle. Still another is the infection of young pigs through the milk of a tuberculous sow, but to dairymen, at least, the first is of most importance.

Experiments show that milk from cows affected with tuberculosis will produce the disease in swine. When hogs were fed such milk for only 3 days and held for 107 days

more, 83.3 per cent of them showed tuberculous lesions when slaughtered. Of those fed tuberculous milk for 30 days and then allowed to live 50 days longer, 100 per cent developed generalized tuberculosis.

Nor is this true of experimental cases only. In one instance a shipment of 74 hogs showed tuberculosis in 61 and investigation brought out the fact that the hogs had been fed skim milk from a creamery in a nearby town. The separator slime from the creamery contained tubercle bacilli. Accordingly, unpasteurized skim milk from creameries is not generally a safe feed for hogs or calves. The creamery skim milk is more dangerous only because it is the mixed product from numerous herds, any one of which may be infected, and because it in turn may be fed to a number of lots of hogs and calves, rather than one, thereby doing greater damage.

Pasteurization of creamery products is not an expensive process. A little inexpensive apparatus at a small extra cost for operation, as reported in Bulletin 85 of the U. S. Department of Agriculture, is all that is necessary. I have the exact cost figures for this method for any one who may desire them.

Michigan has had a law for over two years covering this important work, but our former Dairy and Food Commissioner did not enforce it. Our recently appointed Commissioner has promised early action, and full cooperation in the enforcement of this law.

Mastitis.

One of the members of this committee submits the following regarding this disease:

"I beg to say that we milk approximately 225 head of cows daily—all of the milk being used for certified milk—

and that because of mastitis about 8 per cent of our cattle are out of the herd, either temporarily or permanently.

"We are of the opinion that this is a contagious form of mastitis and have used every means to check it, so far without success. We are now having made an autogenous vaccine, with which we intend to try to combat this disease. Most of these cattle affected lose one or more quarters of the udder and are sold for beef. I regard this disease as most serious from the standpoint of the consumer as well as the producer, and we sustain a most serious loss in the appearance of this disease in our herd."

Bovine Infectious Abortion

In a recent bulletin, "A Study of the Milk in Bovine Infectious Abortion," by Ward Giltner, L. H. Cooledge and I. F. Huddleson, Laboratory of Bacteriology and Hygiene, East Lansing, Mich., the authors say:

"Great emphasis has been laid during recent years on the economic importance of infectious abortion in cattle. Some efforts have been made to warn milk consumers against the possible danger of humans drinking raw infected cows' milk.

"Concerning the former matter we doubt if its importance has been overestimated. Concerning the latter, we have doubts as to the seriousness of the situation. * * * We have no proof that Bact. Abortus (Bang) is pathogenic for human beings."

Educational Work

It seems to me that the greatest good can be done by milk inspectors by educational work, convincing dairy owners of the importance and the economic value of having their herds cleared up, by testing, disposing of, or isolating reactors,

through disinfection of stables, yards, etc., raising all healthy heifer calves and exercising *great care* in replenishing herds, as to the health record of the *entire* herd from which they purchase. Much damage has been done by simply having only the animals tested which are purchased.

"The education of the people is a slow process. But the public education is a surer foundation for public health than lawmaking."

THE SERIOUS ASPECTS OF THE MILK SITUATION IN MASSACHUSETTS

HERMANN C. LYTHGOE, *Director,* Division of Food and Drugs, Massachusetts State Department of Health, Boston

The milk question is one of so many phases that it is not thoroughly comprehended even by those who have given the question much thought and study. The producer, the transportation agencies, the wholesale dealer, the retailer, the health authorities, and the consumer, as well as the various organizations representative of more or less of these interests, have grappled with the question primarily from their own viewpoint. It may be said that all persons interested in the milk question have an axe to grind. The farmer primarily desires to sell milk at a profit, organizations of commercial interests are primarily interested in the commercial development of the sale of milk, the milk dealer is in business for the purpose of making money, the consumer is mostly interested in the price he pays, and, to some extent, in the quality of the milk he receives, and the health authorities are interested in the health of the people as it may be affected by the milk supply.

A careful consideration of the source of the milk supply of Massachusetts will show that Boston obtains nearly all its milk from out of the State, the cities and towns surrounding Boston obtain the most of their milk from out of the State, the cities of Springfield and Worcester send to other States for a large amount of milk, and the cities bordering the neighboring States, such as Fitchburg, Lowell, Lawrence, Haverhill, Newburyport, Fall River, North Adams and Pittsfield obtain some milk from other States. The balance of the milk consumed is produced locally. Without doubt, more than 50% of the population of Massachusetts obtains

at least 80% of its milk supply from beyond the State borders, and, to some extent, out of its control.

The control of the milk supply is provided for by statutes relating to licenses, permits, standards, adulteration and regulations of the various local boards of health. The statutes provide a standard for milk solids and for milk fat, with which milk must conform in order to be sold. This statute is necessary in order to control many cases of adulteration which may be too slight for detection by our present methods of analysis. This statute, originally passed in 1880, provided for a standard of 13% of milk solids. This was amended in 1885, providing, in addition to the 13% solids, a standard of 9.3% of milk solids exclusive of fat. In 1886 the standard was amended by a reduction of the solids to 12% during May and June. In 1896 a fat standard was established of 3.7%, except during the months of April, May, June, July and August, when the standard was 3%. The low standard for solids was extended to be included during these additional months. In 1899 the standard was again amended by the addition of the month of September to those when the low standard prevailed. In 1908 this dual standard was abolished and a standard of 12.15% solids and 3.35% fat for the entire year was adopted. This standard was changed during the present year to 12% solids and 3.35% fat. The statutes therefore permit milk to be sold at present which is 7.7% inferior to that required in 1880.

The law requires that cities *shall* and towns *may* appoint milk inspectors whose duty *shall* be to issue licenses, and who *may* collect samples and cause them to be analyzed. The various milk inspectors comply with the mandatory conditions of the statute and license all their milk dealers. A few, only, of these inspectors carry out the provisions of the law relating to the examination of milk samples in a manner adequate for the protection of the citizens. A

relatively small number of these inspectors are efficient and trained men, some of whom are doing the work in a public-spirited manner for a price far below that which should be paid for their services. Some of the local inspectors who are laymen without scientific training have developed efficient systems of control, and by cooperation with the State Department of Health have succeeded in greatly improving their local milk supply. In general, most of the cities and towns of Massachusetts are not warranted in appropriating sufficient money to pay for the services and the transportation of the men, and to buy the necessary apparatus to carry out the duties which the statutes impose upon them.

The law also provides that boards of health of cities and towns shall inspect all the dairies from which the town obtains its milk, and shall also inspect the milk produced at these dairies. If the conditions are satisfactory to the board a permit shall be issued. It is unlawful to sell milk without a permit from the board of health of each city or town where a dealer does business. More than 70 per cent of the Massachusetts dealers are violating this law because the local boards of health are not enforcing its provisions. When one considers that it would cost the town of Hull about $40,000.00 per annum to do this work it is not to be wondered at that the inhabitants of many cities and towns can ascertain nothing about the conditions under which their milk is produced and handled.

In addition to statutory requirements the milk business is subject to regulations by local boards of health. In the State of Massachusetts, 88 of our 353 cities and towns have succeeded in enacting about 800 different regulations under the provisions of the statutes empowering them to do so, thereby creating some confusion in the localities where several boards of health are inspecting one milk supply.

The entire sanitary control of milk is exercised by local boards of health. Contrary to popular opinion, the State

Department of Health can enforce only those laws relating to milk which can be enforced by any citizen, and it is as citizens of this State, and not as officials, that the agents of the Department enforce these laws. In carrying out this work during the past thirty-five years the Department has collected some valuable and interesting statistics which tend to throw some light upon the subject.

The quality of milk sold in Massachusetts varies with the localities, it being best in the region of Cape Cod and the Berkshire Hills, and worst in Essex, Worcester and Norfolk Counties. The following figures are compiled from the analyses of 7,958 samples collected in 1916, from which the analyses of the adulterated samples and those from suspected producers had been excluded.

MILK FROM MILK DEALERS

County	Above Standard	Below Standard	Total Samples	Total Solids in Lowest Sample (Per Cent)	Skimmed Milk Sold as Such	Skimmed Milk Sold as Pure Milk	Watered Milk	Milk Containing Dirt
Barnstable	97	22	119	10.60	1	5	..	..
Berkshire	187	33	220	11.35	..	2	..	..
Bristol	635	261	896	8.70	2	17	31	..
Dukes	28	3	31	11.60	..	1	..	..
Essex	909	245	1,154	9.22	4	18	8	3
Franklin	39	8	47	11.10	..	..	..	..
Hampden	270	80	350	8.92	..	6	2	..
Middlesex	1,509	271	1,780	9.02	4	10	9	..
Nantucket	31	5	36	11.18	1	1	..	..
Norfolk	617	110	727	9.20	2	16	11	..
Plymouth	502	111	613	8.30	..	9	28	4
Suffolk	299	50	349	9.20	5	5	3	..
Worcester	539	225	764	8.86	14	19	10	6
Totals	5,662	1,424	7,086	8.30	33	109	102	13

County	Samples	Per Cent Solids	Per Cent Fat	Per Cent Solids Not Fat
Barnstable	113	13.31	4.13	9.08
Dukes	30	13.64	4.57	9.07
Nantucket	34	12.87	4.07	8.80
Plymouth	576	13.73	4.17	9.56
Bristol	846	12.68	3.74	8.94
Norfolk	698	12.38	3.66	8.71
Suffolk	336	12.88	3.77	9.11
Essex	1,124	12.50	3.65	8.85
Middlesex	1,757	12.58	3.63	8.95
Worcester	721	12.48	3.64	8.84
Berkshire	218	12.72	3.92	8.80
Franklin	47	12.88	3.88	9.00
Hampden	342	12.66	3.74	8.89

The composition of the milk sold in Massachusetts indicates a marked deterioration in quality, a considerable decrease in the sale of high grade milk and a marked increase in the sale of low grade milk. For example, in 1899 nearly 12% of the samples collected and examined by the State Department of Health contained more than 14% of milk solids, while during 1916 only 4% of the samples were of this high quality. The following table is computed from samples examined during 1899, 1916 and 1917:

Year	1899	1916	1917 (8 mos.)
No. of Samples	6088	7796	4412
Above 13% Solids	47.9%	24.0%	14.3%
Between 12 and 13% Solids	40.1%	53.5%	63.2%
Below 12% Solids	12.0%	22.5%	22.5%
	100.0%	100.0%	100.0%

Note the decrease in the percentage of samples above 13% in solids and the increase in the percentage of samples below 12% in solids.

The following table shows the average composition of samples of milk sold in Massachusetts during December, 1898 and 1916, and during June, 1899 and 1917:

Date	*Samples*	*Solids*	*Fat*	*Solids Not Fat*	*Calories Per lb.*
Dec., 1898	905	13.26	4.39	8.87	330
Dec., 1916	320	12.69	3.75	8.84	309
June, 1899	698	12.66	4.06	8.60	320
June, 1917	698	12.45	3.68	8.77	308

Calculated from the calories these figures show a decrease in food value of 6.4% in one instance, and 5.6% in the other instance.

The following table is taken from the 1916 report of the State Department of Health and shows the variation and the composition of the Massachusetts milk during the past eight years:

Year	*No. of Samples*	*Solids*	*Fat*	*Solids Not Fat*
		Per Cent	*Per Cent*	*Per Cent*
1909	4,242	12.78	4.10	8.68
1910	5,032	12.85	4.02	8.83
1911	4,341	12.83	4.00	8.83
1912	4,516	12.66	3.89	8.77
1913	6,154	12.69	3.84	8.85
1914	5,502	12.70	3.82	9.88
1915	6,765	12.68	3.82	8.86
1916	7,458	12.66	3.72	8.94

The average figures obtained during the past twenty years show a gradual deterioration of the food value of milk, amounting to nearly 4%, and this has been accompanied with a gradual increase of price, amounting to more than 80%.

There is a shortage of milk in Massachusetts at present. The large dealers have sufficient milk to supply their needs because they bring milk from farms located at great distances and place the surplus milk in cold storage, using it as the supply decreases and as the demand increases. The local producer of milk and the small milk dealer cannot compete with this "long haul" milk, and therefore have more or less difficulty when the hot weather causes an increase in the demand. The local producer keeps only enough cows to supply the farm with fertilizer and he naturally regards the milk as a by-product. He does not raise grain, but must buy it at an exorbitant price. He is therefore tempted by the high price of beef to sell his

cattle to the butcher. The statistics of the State Department of Health may here be of value in shedding light upon this phase of the subject.

Between October, 1915, and June, 1916, there were slaughtered under Massachusetts inspection 22,776 cattle and 62,023 calves. Between October, 1916, and June, 1917, there were slaughtered 25,325 cattle and 73,513 calves, an increase of 11.4% in the cattle and 18.6% in the calves. These figures tend to show that a number of cattle were killed which otherwise could be used for the production of milk, and the figures also show that in all probability less calves will be raised this year than last year.

Notwithstanding the milk shortage, there has been a decrease in milk consumption, unfortunately to the detriment of the children. The information submitted leads one to believe that considerable of this curtailment has occurred among comparatively well-to-do families who should have known better. In at least one instance, the family ceased purchasing cream and the mother stole the top milk from the baby's bottle in order that her husband could have cream for his coffee. The work of the district nurses among the poor has taught them the necessity of taking care of the milk for the baby, even if the family's milk is not so well cared for. It may be advisable to extend the efforts of the district nurses to classes of society other than their usual clientele.

The shortage of milk has resulted in a recent influx of an unusual quantity of adulterated milk, which, it may be incidentally stated, usually accompanies a rise in the price of milk. The Department has prosecuted a number of cases in the courts during the past few months, and the incidents connected with the cases, as well as the excuses offered, may possibly be of interest.

A merchant in a large city resided in a small town. He had a few cows and sold his surplus milk to a store.

Watered milk was found in a store and five days later samples taken directly from the merchant were found to contain added water. The excuse was that strainer cloths were placed on the pails after they were cleaned. The pails were hung under the eaves of the barn, the rain flowed into the pails, and the milker did not notice the additional weight of nine pounds due to the water which flowed in. Incidentally it developed that there was no rain for twenty-four hours before one sample was taken or for forty-eight hours before the other sample was taken. The accused person paid a fine of fifty dollars.

An inspector found watered milk in a store. The following day he was there when the dealer delivered the milk. The bottles were covered with two forms of caps; one upon those containing milk produced by the dealer, the other upon those containing milk which he purchased. The latter were found to contain watered milk. The following day thirty-two samples were taken from the farmer, all of which were found watered. The farmer made no excuse whatsoever. The judge calculated the amount of money which the farmer had made upon the water he sold, and ascertained that the fine was not sufficient to cover this money. He therefore did the best he could, and imposed the maximum fine of two hundred dollars.

In another instance poor milk was found in a store, left by a milk dealer who had a herd of forty cows. The dealer requested investigation of his producers. This investigation was made. Eighteen of the producers were found to be selling pure milk and two were found selling milk with 15 to 25% of added water. Incidentally it may be mentioned that these two producers were furnishing the largest amount of milk. Both protested their innocence, both were prosecuted and fined. One producer promptly shrunk 20% in quantity and he was retained by the milk

dealer. The other did not shrink in quantity and was dropped.

Watered milk was found in the possession of a milk dealer buying all his milk. He was not at all anxious to have his producers investigated. Investigations of the milk received upon his premises showed that it was not watered. The dealer pleaded guilty in court and paid a fine of fifty dollars.

Watered milk was obtained from a milk dealer producing all his milk. This dealer stated that his customers demanded a certain quantity of milk, and when his production dropped off he added water to make it up. The customers, he claimed, were more anxious about the quantity of the milk than the quality. This is a most unusual admission. Not more than ten such admissions are on record in the Department during the thirty-five years it has been enforcing this law. Two of these admissions have occurred during the past month.

Another instance showing the scarcity of milk may be cited from a case of a milk dealer who was delivering watered milk to stores. After the dealer received the results of the analyses of the samples he came in and stated that he purchased his milk from a certain farmer who had previously been convicted for the sale of watered milk. He had realized that this was going on for some time but did not care to make a complaint for fear the farmer would sell to somebody else and he could not find another dairy from which to buy milk. The dealer was convicted for selling adulterated milk.

It is evident that milk will soon cease to be a cheap food. It has been, and is still, the cheapest form of food that can be purchased, but owing to the curtailment of the supply it will soon command such a price that its use will be limited, and the supply be diverted to those who most need it, that is, infants, children and sick persons.

The above was written in August, since which time there has been a change in the situation. Owing to the prevalence of colder weather, the consumption of milk as a beverage has ceased and many dealers operating small routes in certain portions of Massachusetts are unable to utilize all the milk their producers are furnishing, which situation is disadvantageous both to producer and dealer. This does not affect the large dealer, who takes care of this surplus by means of the cold storage warehouse.

A few weeks ago I was at a farm in Massachusetts obtaining samples of milk of known purity for analysis. The farmer asked my opinion of the future milk business, and I replied that I believed, much to my regret, that the small dealer would inevitably be forced out of business and the delivery of milk would be controlled by a few large dealers. The farmer stated that he believed I was correct, but he looked with less alarm upon the situation, as the small producer would undoubtedly have to go out of business and the production of milk would be carried on by farmers on such a large scale that the supply would be better controlled and the overhead charges reduced, thereby benefiting the dealer and public as well as the producer. Let us hope that this farmer's viewpoint is correct, but in the meanwhile let us put no undue burdens upon this vitally necessary industry.

DISCUSSION

MR. HOLT. The sale of milk on the fat basis is desirable, as there is no incentive for adulteration.

MR. LYTHGOE. The freezing of milk is an industry that has been developed within a few years. Fresh skim milk and cream is also homogenized.

MR. HOLT. Fresh butter and skim milk is also homogenized into cream and so sold.

DR. HARDING. Dairy cows produce practically all our veal, there being twelve to fifteen million excess calves each year. The cow takes two years to develop. She is then good for about four years. From 40 to 50 per cent of our meat supply comes from discarded cows and bulls. Under normal conditions one-sixth of our cows are slaughtered yearly. Therefore the 25,000 cows slaughtered in Massachusetts is about one-sixth of the total cow population. I believe the business is progressing in a reasonably normal way.

DR. MALONEY. I believe our cow population has increased.

A MEMBER. The proportion of dairy and beef cattle slaughtered remains about the same as formerly.

Mr. Kelly. There is no evidence of an increased slaughter of dairy cows. About the normal supply of milk is being received in the large cities. There is, as a matter of fact, a considerable surplus of fluid milk, which is most unusual at this time of year.

REPORT OF COMMITTEE ON RULES AND REGULATIONS NECESSARY FOR SECURING A CLEAN AND SAFE MILK SUPPLY

ERNEST KELLY, *Chairman*

Your committee realizes that the task set before it is one of the most important, as well as one of the most difficult, that could have been selected. It is important because upon it depends the protection of the consumer against impure milk, the safeguarding of the dairyman against unreasonable requirements, and the unifying of inspection systems; and it is difficult, because out of a diverse and multitudinous mass of regulations must be selected the clear, simple directions which will make possible the accomplishment of the desired results.

Much of the dissatisfaction with milk inspection in the past has been due to the fact that local authorities have had enacted into law their personal opinions which were often based on insufficient experience. Such a course was natural; bad conditions had to be dealt with; action was necessary; and officials moved along lines that seemed best to them. Many health officials have not the facilities for carrying on research work and must depend to a great extent upon the findings of others. Slowly but surely investigating bodies have been at work on the problem of dairy sanitation and we now understand more fully some of the basic principles.

Your committee feels some trepidation in dealing with this subject, because we realize that many men have many minds; and it is almost impossible to draw conclusions which will satisfy everyone and which will not be liable to misinterpretation. In outlining the following regulations we do so realizing that we have not perhaps incorporated in them all that should be incorporated; but we do believe that they constitute the fundamental principles of clean and safe milk. We further believe that if these rules are carried

out our cities will have all reasonable assurance of a pure milk supply. We have not attempted to deal with chemical standards or other considerations more or less of a local problem.

Rules for Production

1. Every dairy producing market milk should be licensed by the city or State so that a complete record may be kept.

2. Cattle should be healthy as determined by the tuberculin test and a physical examination by a competent veterinarian. They should be tested at least once a year and where reactors are found they should be removed and a retest conducted within six months. If the milk is to be properly pasteurized, the physical examination may suffice, but the committee wishes to affirm its belief in the economic and sanitary importance of the tuberculin test. Milk should be unsalable from cows within 15 days before calving and as long thereafter as the milk is abnormal.

3. All persons engaged in the production of milk should be free from communicable disease and from contact with any such disease. Medical examination of employees is advised where feasible.

4. Every operator of a dairy farm should, within 24 hours, notify the health department having jurisdiction over his milk, of the presence of any communicable disease on his farm or among the milk handlers.

5. The water supply on premises where milk is produced should be abundant and protected from contamination. It should be free from any disease-producing organisms.

6. Privies on dairy farms should be fly-proof, and provided with a water-tight receptacle for the excreta. The excreta should be removed frequently and buried at least two feet deep, where it cannot contaminate the water supply.

7. Cows should be clean. They should be free from accumulations of dirt and their udders and flanks should be wiped with a clean, damp cloth just previous to milking.

8. Milking should be done with clean, dry hands or with a properly sterilized mechanical milker. Milkers should milk in clean clothing.

9. Some type of small-top milking pail should be used.

10. Milk should be removed as soon as drawn to a clean place, strained through a new cotton or other clean, efficient strainer and be cooled within one hour to 50° F. or less. It should be kept covered and be held below 50° F. at all times.

11. All utensils which come in contact with milk should be thoroughly washed and sterilized for at least five minutes with steam or boiling water. They should be kept inverted and protected from contamination until used.

Rules for Transportation

During transportation from farm to city milk should be kept free from contamination and should be held at or below 50° F.

Rules for Handling and Delivery

1. All persons engaged in the sale of milk should be licensed by the State or city in which they conduct their business.

2. All persons engaged in the handling or delivery of milk should be free from communicable diseases and from contact with such diseases. The operator of any milk plant should immediately advise the health department of the presence of any such diseases among his employees or in their homes.

3. The water supply of all establishments where milk is handled should be pure and free from disease-producing organisms.

4. Proper toilet facilities should be provided for all employees, together with washbowl, soap and towel for the cleansing of hands.

5. Where pasteurization is performed, a temperature of approximately 145, and never less than 142° F. should be maintained for at least 30 minutes.

6. All machinery, cans, bottles, etc., with which milk comes in contact should be thoroughly washed and sterilized with steam or boiling water; and they should be protected from contamination until used.

7. At all times, except during pasteurization, milk should be held at or below 50° F. until delivered to the consumer.

8. Milk should be delivered to the consumer only in bottles or sealed cans.

RECOMMENDATIONS

Production

Your committee wishes to emphatically state that many things are desirable in the production and handling of milk that may not greatly affect the bacterial count. Common decency, economy and the esthetic effect on the buyer demand close attention on the part of the dairyman to many details regarding which it may not be advisable to legislate. Such things as clean stables, whitewashing, bedding, etc., come in this category. The comfort and health of the herd depend to a certain extent on clean, light, airy quarters, and abundant, wholesome food and water.

In view of these facts your committee considers that a system is advisable, which combines sanitary inspection and laboratory examinations. Practical experience has shown that the dairy score card offers the most useful medium for sanitary inspection because it serves as a guide to both

inspector and inspected. We therefore urge the continued use of a uniform standard score card based on the fundamentals of dairy sanitation.

Transportation

It is recommended that covered platforms be maintained for the protection of milk awaiting shipment. Milk should be shipped in refrigerator cars or in special or jacketed cans which will maintain low temperatures. Cans of milk should be sealed at the farm to prevent tampering en route.

Handling and Delivery

Considerations regarding general cleanliness apply in the city as well as at the farm.

Your committee is of the opinion that the proper pasteurization of milk provides an additional safeguard without any appreciable disadvantages and is necessary with all milk except certain special classes; and it is probably advisable with those. Automatic temperature controls and recording devices are recommended.

We recommend that no dipped milk be sold either from stores or wagons. We further recommend that milk bottles be capped by machine and that the mouths of the bottles be protected by a covering.

Repasteurization of milk is undesirable.

Conclusion

Your committee wishes to state that it has had no intention to cover the whole, broad field of milk control, but simply to define the necessary regulations from a sanitary standpoint. Following such rules will eliminate many

needless burdens on the dairymen. At the same time those things which have a definite effect on milk quality must be maintained even though they may result in additional costs which must be passed on to the consumer as his share in a national health insurance.

DISCUSSION

DR. HASTINGS. I am impressed with the importance of health measures in every meeting I attend. It becomes imperative that in framing regulations we free them from all frills and cut out all that are not necessary. The best authorities now recognize the fact that we must have clean milk. That can only be had by pasteurization and an antiseptic conscience among the producers of milk. Education is the foundation for all progress. We for the most part do not appreciate the need for clean milk until some trouble comes to our homes.

DR. WRIGHT. We must have clean milk and milk free from dangerous bacteria.

DR. BISSELL. The outline in the report is ideal.

DR. ROADHOUSE. In California we have specialties in agriculture because of climatic conditions. In butter making sections that business is specialized. Near San Francisco we find from 30 to 300 cows per dairy. One inspector can inspect all dairies supplying San Francisco in six weeks. From an agricultural standpoint a few cows on each farm is all right, but in the supervision of the milk supply a much more difficult problem is presented.

MR. STRAUCH. Dairying is a basic industry. Among the dairies supplying Richmond we find 30 cows to be about the average number. Ninety per cent of our supply is near the city. We find but few bacterial counts running above 200,000 three to four hours after milking. In many cases

we have two deliveries daily. Our restrictions are such that producers must be in the business rather than produce milk as a side issue.

DR. SMITH. In 1908 eight dairies were supplying Greenville. The highest scoring dairy rated about 30 points, and 20 cows was the largest number of cattle. Dairying was a side line, most producers having from two to three cows. At the present time (1917) our dairy scores range from 65 to 97, all cows supplying the city have been tuberculin tested and reactors eliminated. Our supply comes from 25 producers having from 18 to 170 cows. The price has advanced from 6 cents per quart in 1908 to 15 cents at the present time.

I regard legislation as the first essential and education as the second. I believe the average dairyman is more or less honest.

Beginning November 1st every bit of milk sold must be pasteurized.

DR. HARDING. If a control element alone is desired, look after utensils first. If you are going to promote cleanliness, then look after the dirt on the cow. If health is to be considered, pasteurize the milk first; then look after the bottles and the men who bottle the milk; then examine the cow. I try to distinguish between dirt and bacteria.

DR. WRIGHT. I do not believe we can get good legislation enforced without education first, then publicity regarding dirt and bacteria. I would like to hear discussed the subject, "How to Get Around the Politicians in Getting Desired Legislation."

DR. MALONEY. These suggested regulations seem to be the essentials of regulations in force, and they are summed up in an excellent way. After ten years of work we have not got quite uniform regulations in Massachusetts. No city or town has an educational bureau. You cannot make

a man wise or moral by legislation. A trained mind, that can bring to the farmer the reasons why he is asked to do certain things and appeal to the reasonableness of the man, will get results.

DR. CHAPIN. Insist on essentials. Leave off the frills. The committee has taken a long step in advance.

The Association authorized the immediate printing and distribution of the foregoing report among its members in order that it may be carefully studied by the members who are urged to offer such suggestions and constructive criticisms as may be helpful.

REPORT OF COMMITTEE ON CARE OF MILK IN TRANSPORTATION

PROF. JAMES O. JORDAN, *Chairman*

At this time, when conservation of resources and elimination of waste are vital issues, the subject of milk transportation, involving both the health and food supply questions, becomes of more than usual importance. Consequently it was deemed best by your committee to submit a report at this meeting, even though the requests for information did not bring the number of responses anticipated, and the data procured was not as complete as desired.

The control of shipments of milk and cream between States in the United States is now in the hands of the Interstate Commerce Commission, which body, by its interpretation of law, has brought about the introduction of an agency, i. e., railroads and their employees, into the handling of these commodities for part car shipments, which is to a degree irresponsible and with no special interest in their condition or their influence upon the community, from either the health or monetary standpoint. Its effect appears to be the infliction of further hardships upon the consumer in the way of payment for needless waste. Formerly, in New England at least, cars were under the control of dealers, who leased them from the railroad companies, and under these conditions the care of milk was supervised by trained employees of the milk firms. These dealers, having greater interest in the subject, gave the product more attention than do railway men. At the present time, where a car is completely loaded at one shipping station, the icing of the contents is done by the milk concerns. For intrastate traffic the control of milk cars appears to be under the direction of railroad companies.

Except as especially indicated this report will deal with the handling of milk by railway corporations. From the

evidence which has been secured it may be stated that in the majority of instances the amount of ice furnished by these companies for the cooling of milk while in transit is insufficient, and that frequently where the quantity is adequate its distribution is faulty, so that the purpose for which the ice was provided is defeated. Cans also come through which have not been iced at all, and it has sometimes been necessary for the milk firms to provide the labor for the proper distribution of ice, the latter being furnished by the transportation companies. Milk and cream have been kept and shipped in warm cars for hours without ice, and in extreme hot weather no more ice is used than during periods of lower temperature. In one case, as a result of efficient oversight, a railroad official made a hasty journey into the country to provide ice at shipping points where it had been found that milk was being improperly refrigerated. This meant that a competent inspector was doing the work for which the railroad was paid. Complaint is general that for short hauls there is no attempt at icing, or if ice is used, the amount is too small. In one territory, milk from receiving stations is iced, while that of individual shippers is not given this protection. This latter condition applies with equal force to much of the milk transported in baggage cars, and the same may be said of some sections regarding shipments in less than carload lots. Concerning the subject of icing, of forty-eight investigations or statements of individuals, ten reported no ice for the cooling of milk; twenty-six that the supply of ice was inadequate; three that ice was improperly distributed; and nine that conditions were good. Observations as to the care of milk while being transported on trolley cars or auto trucks justify the statement that there is little or no attempt at cooling. In the hauling of milk between States, where the Interstate Commerce Commission has stated that milk should be in cars "iced in summer" and "heated in

winter" by railroads, the Commission should determine at least the essentials for proper icing of milk under all circumstances. Health authorities should also be given access to these cars at all times, a privilege which they do not now possess. If railroads are to ice milk during transit they should be obliged to care for it properly.

A specific instance illustrates the difficulties confronting dealers. One day last September a carload of out-of-State milk arrived in Boston uniced, but with steam turned on and so effectively heated that the entire shipment was spoiled. The only redress for the milk dealer is to sue for the loss of the product. It will then require at least ten months to obtain recompense from the railroad; meantime this transportation company exacts weekly payments on freight bills from this and other milk firms.

Regarding intrastate traffic, the problem of compelling the requisite care of milk by conveyancing companies is one for adjustment by State legislation. There should be no shipments of milk without sufficient amounts of ice in high temperature periods, regardless of whether the shipments are interstate or intrastate.

An element has been introduced into this discussion, which is presented for consideration, namely, as to whether or not railroads should be expected to cool milk, while in their possession, to a temperature lower than that at which it was received, or simply to maintain it at the temperature of delivery. Your committee believes, however, that milk is a commodity which should be regarded on a different basis from other foodstuffs, owing to the rapidity with which it deteriorates and the desirability of its being consumed as soon after production as possible; and that it should be obligatory for railroad concerns to cool milk while in their possession, whether in carload or part carload lots, to as low a temperature as possible. For this additional task they should be given reasonable compensation.

Railways ought to be required to take the same care of milk that health authorities exact from dealers. Otherwise we shall be attempting to haul with a chain minus a link. It has been suggested that this problem would solve itself if milk above a designated temperature was refused shipment, but this proposition would result, in some sections, in holding over for twenty-four hours by farmers the milk most recently produced. The latter feature would be objectionable, even though it was agreeable to the railroads. Such delaying of milk at the farm as just indicated would probably be followed by higher bacterial growth than though the product, when fresher, was promptly brought, properly iced by railways, to the point of delivery to dealers.

Lack of shelter for milk while waiting shipment in the country is so well known that it is needless to offer facts as to prevailing conditions. The evidence is so pertinent as to be the subject of comment and criticism by the laity. The weathering of milk in containers under the methods usually existing is likely to be disadvantageous under the best circumstances, but the most harm results during periods of high temperature. It is apparent also that producers cannot be reasonably expected to always bring milk to stations just prior to loading upon the cars in which it is to be shipped. Consequently it is felt that railroads should be compelled to provide at all points where milk is received for shipment a covered shed or box in which milk may be placed, where necessary, before being put upon the cars. After delivery at points of destination, milk is frequently unloaded from cars and left unprotected on receiving platforms from temperature and other weather conditions. The censure under these circumstances falls upon milk dealers who fail to haul the product away as soon as unloaded from cars rather than upon the forwarding corporations. Furthermore, while being transported to han-

dling plants by dealers, milk should be well iced during all seasons of high temperature.

From the evidence adduced it is apparent that in some localities refrigerator cars are not furnished, even when milk is being shipped in quantity. Your committee is of the opinion that the providing of refrigerating car service should be required, at least for the transportation of milk in substantial amounts or for considerable distances. There have been delays in train or delivery service, and in most cases such dilatory tactics were optional rather than unavoidable. The proposition is advanced that shipments of milk or cream should have precedence over other commodities in movement after delivery to transportation concerns.

The sentiment seems to be general that, while additional labor and expense will be involved, all milk conveyed by common carriers should be shipped in sealed containers. This method would have the advantage of preventing tampering while in transit, which usually takes the form of removal of cream, with or without the later substitution of water. The sealing of milk vessels, with the further safeguard from labels or identifying marks, would enable both authorities and consignees to readily identify shipments, and simplify locating responsibility for faults, and both devices are deemed essential. In practice this plan evidently works satisfactorily, for in Toronto, Canada, it is contrary to law to ship or receive milk which is not sealed with two seals bearing the name or initials of the producer. In this connection it is enlightening to note that of twenty-one reports from individuals, eleven drew attention to pilfering during shipment in conjunction with their business. The sealing of cans, if obligatory, would necessitate the substitution of other types of cans in place of the eight and one-half quart containers with insanitary wooden plugs, which are in use in some sections.

Knowledge is lacking regarding the considerable monetary losses from the theft of milk or cream, or their spoiling from neglect while in the control of railroads, and there is the same deficiency of exact data pertaining to the waste of empty containers through faulty handling. The loss from cans, covers and product, however, which is wholly avoidable, amounts to a stupendous sum, and is unusually embarrassing at the present period of high prices, but is one which should not be permitted, even in normal times. Dealers find it difficult to regulate the return of cans to different stations, shortages occurring at some points and over-stocking at others. There were also reports of delayed deliveries; loss of cans and covers; or their actual smashing; shipment in the wrong car; rough and careless handling at stations; displacing covers and permitting the access of filth; throwing cans on ground with loss of stoppers so that dirt and coal dust found entrance; in one instance of this sort the train was not stopped, when the cans were thrown off, for which neglect the entire crew was dismissed. The abuses which empty cans and covers receive are believed to be increasingly prevalent, due partly to an irresponsible class of labor. The loss caused in this uncalled-for manner merits the severest censure, and it is an unnecessary prodigality. This mistreatment cannot be checked unless the railroads either assume or are obliged to promptly bear the responsibility.

In all phases of the milk situation the personality of the individual, regardless of the particular connection with the traffic, is the predominating and essential factor, and employees of railways who handle milk are no exception to the rule. Some of the latter fraternity realize the importance of the problem, and either give the proper oversight, or endeavor to do so when they are not overburdened with duties. This is the only type of employee who should be permitted by railroads to take any part in the milk

business; they form a distinct class and should be selected for their special labor and remunerated accordingly. The careless, thoughtless and inefficient individual, who does more harm than good, should have no connection with milk transportation. A spirit of indifference involves hardship for the shipper, dealer and consumer.

Inability of individuals to control railroads seems to be the chief element of the milk transportation question. From one large city comes the information that railways give no receipts for milk received in the country, and there is no redress at the city end from loss of cans or product. From other places there are reports of unconcern relative to suppression of faults, and very few statements of fact as to their permanent correction. A "don't care" attitude predominates. It is folly to argue that the accountability for abuse of milk cans and spoilage of milk, due to improper care of railroads, should not be promptly borne by the conveyancing companies. This is a burden which, if speedily placed, would bring needed improvement. Is there not hope for a change for the better from a combination of endeavor coupled with the adjunct of publicity?

SUMMARY

Milk at country stations awaiting shipment should be protected from weather conditions by a covered shed or box.

No milk or cream, unless iced, or in jacketed cans, should be shipped in baggage or express cars.

Railroads frequently ship milk uniced, or with too little ice, or with the ice not well distributed.

Refrigerator cars should be provided for the shipment of substantial amounts of milk or cream, or when cars carry these commodities a distance of one hundred miles or more.

The sealing and labeling of cans of milk or cream before delivery to transportation companies is recommended.

Shipments of milk or cream should have precedence over other commodities in movement after delivery to transportation concerns.

Destruction of cans, their loss or imperfect distribution, and spoilage of milk or cream through carelessness on the part of transportation firms results in an uncalled-for waste, for which these companies ought to be held speedily responsible.

The Interstate Commerce Commission, in its order of July 11, 1916, for interstate shipments of milk with reference to its care in cars, states that the latter should be "heated in winter and iced in summer." It is essential that the words "heated," "winter," "iced," and "summer," as used by the Commission, should be clearly defined. It is also vital that the ruling as to the amount of ice employed should apply to the care of milk after delivery to railroads and while awaiting transit, the distance it is to be hauled, the quantity of milk and the outside temperature.

Insofar as the Interstate Commerce Commission can be legally interested in the control of shipments of milk, it should compel transportation concerns to give the product proper care while it is in their possession.

If the Interstate Commerce Commission would adopt corrective promulgations and appoint agents for their enforcement, many of the present milk transportation difficulties would be eliminated.

Publicity and unity of action by interested parties would be more helpful than the individual effort now prevailing.

"Science is simply common sense at its best—that is, rigidly accurate in observation, and merciless to fallacy in logic."

AGRICULTURE, INSPECTION AND THE WAR

DR. R. A. PEARSON, *Assistant Secretary,* U. S. Department of Agriculture, Washington, D. C.

One important honor that has come to me which your President failed to mention in his introduction was that I have actually had some contact with milk inspection. I have been right there, close to the scenes, trying to find the person who was doing the crooked work, as well as close to the scenes trying to encourage the man who was doing good work.

I said to your Secretary when he invited me to speak that it was something of an imposition to bring a person into a meeting such as this to talk upon a subject that is more or less general, because it would be almost impossible for me to take up phases of the subject that had not been well covered by experts who had previously appeared on the program, and on looking over your program it seems to me you have a surplus of good things here.

I am one of those who appreciates the importance of the work of the dairy and milk inspector, and I am one of those who appreciates some of the great difficulties under which you people have to work. I think some of the chief difficulties are the unsatisfactory State laws and municipal regulations. We were discussing them yesterday in a committee meeting which I was attending. If all the milk laws and ordinances now in force in the United States were brought together and printed they would comprise an enormous volume, and most of it would be trash. The real essentials in milk legislation can be stated in a very few, clear-cut paragraphs, and anyone who will help to secure legislation of that kind will be performing a real service in the interest of the milk industry as well as in the interest of those who have to make the inspections and enforce the laws. A great many people think that a food law or a

dairy law calls for all that should be desired. It does not. On the contrary, it provides *the minimum that should be tolerated,* and a very large proportion of the public desires to have something better than that minimum.

I think the time has about come when we should do away with those requirements embodying a standard relating to the composition of milk. I would prefer to see an exception made which would permit any person to disregard the requirement as to the composition of milk and offer any good, clean, normal milk that he desires, requiring him to state the percentage of fat that he guarantees in what he sells. If it is 2.5 per cent fat he wishes to guarantee, very well, then; he will be held responsible. If it is 5 per cent, then very well again; and if he should fail to come up to his guaranty, then he should be prosecuted in the same manner as his neighbor who has not made a guaranty but is selling milk below the legal standard.

With all their faults, milk laws and food laws nevertheless, I believe, may fairly be regarded as among the strong moral forces of our country, and I like to think of them in that way. They permit persons who would be honest to be honest. Now I need not take time to illustrate that, but I want to make it clear. Assume for a moment that there is no such legislation. Then one person who is dishonest may put in five or ten per cent of water in his milk and claim that it is pure, and sell his milk for a smaller price than the other person who sells milk that is pure. It is so with foods; for instance, take olive oil. Someone can put in a small proportion of cottonseed oil, and with a good liberal amount of advertising sell the adulterated product. Then other people selling olive oil must resort to the same practice if they would keep their trade. The pure food law or the milk law steps in and prevents such practices.

I think of persons who are engaged in the production and handling of milk as comprising four different groups, and in the milk and dairy inspection business I think it is helpful to have those four groups in mind. They should all be treated differently. First, there is a group comprised of those who know how to furnish good milk and who will do it anyhow, whether there is inspection or not. All praise be to them! There ought to be some system by which an honor roll could be established, and those who are doing that fine work should have their reward by being given due recognition, and I want to commend that thought to you most earnestly. There ought to be some way of singling out those persons who know how to produce good, clean milk and keep it clean.

There is a second group: Those who do not know how, but who would produce good milk if they did know; and there are lots of them in the milk business. A great deal of the present knowledge of dairy science has been developed in recent years. Lots of people have had very little time or opportunity to learn. Those people would do it right if they knew how, and what they need above all things is instruction. They need to go to school, and if they cannot go to the school, the school should be brought to them. Every man or woman who is engaged in dairy and milk inspection should have a reasonable knowledge of the fundamentals of chemistry and bacteriology. We should be able to picture to the average farmer what a bacterium is, what it is made of and how it develops, and bring that thing before him as a reality. We must be patient with that class of men and teach them, and when we get the lesson home they will have become the same as the first group.

The third group consists of those who know how to produce good milk, but will not do it unless compelled. A considerable number of these people have to be treated rather severely, and they are the ones that the milk and dairy

inspectors must deal with chiefly, because they require treatment by a person who has the power and the authority of the law. The number of those persons should be reduced. They should be suppressed, but we will always have some of them with us. There is not a city or town in the United States but what has producers in that group.

A fourth group includes those who do not know how to produce or furnish clean milk, and would not furnish it if they did know how, unless they are constantly compelled by force of law. This group also requires a great deal of attention from the inspectors. They should be utterly eliminated from the dairy industry, and any treatment that can be given to them under the law should be given to them and given promptly.

Along with that group I will class that large number of people who insist upon buying milk in large quantities solely upon the basis of the lower price for which they can secure it, and absolutely regardless of its sanitary quality or wholesomeness. They also should be eliminated if it can be done, but unfortunately there are a very large number of so-called intelligent persons in that group.

Now there is no clear line of distinction between the duties of those who should work in an educational way—and primarily they are the college extension people—and those who should work primarily with the force of the law behind them—and they are the dairy inspectors. The inspectors particularly should and do overlap in the educational field. It will greatly postpone the accomplishment of the things they are attempting to do if they fail to get into that field. Not only should inspectors be well posted, but there should be very close cooperation between inspectors and those who are engaged in the educational work in any State. They have absolutely common interests, and they ought to get together often. The inspectors ought to attend the educational meetings and participate in them,

and when a special campaign is on the educational people should be invited to cooperate.

Now I want to comment on just a few phases of the work which the inspector has to perform. These are important in times of peace. They are more important in time of war, because everything which contributes to the strength and good health of our people is of the highest importance in war time. In the first place, consumers should be educated to know the value of milk as a food. How many consumers, do you suppose, know that one quart of milk contains as much protein as seven ounces of sirloin steak, or as four and a fraction average eggs? How many consumers know that one quart of average milk contains as much energy as about twelve ounces of the best steak, or about three-fourths of a dozen average eggs? How few of them know the value of the constituents of milk—and that is important now, because some people are doing all they possibly can to confuse us, whether intentionally or not, as to the value of milk fat. They say that substitutes may be used for milk fat. *Some* chemists tell us that. I am sorry that they do it. Chemists know a great deal, but I deny that they know it all. The chemist by chemical method cannot tell a diamond from pure graphite, and we do not care to have fine chemical methods brought into an argument to show that something else can be substituted for milk fat, when other scientists show us that undesirable results follow the use of a diet that does not contain milk fat. Every dairy and milk inspector ought to know the food value of milk, and if he does not know it he ought to have its value written out for him and then add it to his devotions. Let us get that lesson clearly in our minds, so that we may pass it on to others.

Producers and consumers should be educated regarding different grades of milk. The greatest obstacle to milk improvement that I know of is the fact that people fail to

distinguish between grades of milk, and I refer particularly to the sanitary quality of milk. We are grading wheat, and it makes little difference to you or me whether our bread be made of Grade 3 or Grade 4. We are grading almost everything, but in most instances we are failing to grade our milk. I want to call your attention to a report issued by the United States Public Health Service, being a resumé down to date of the work of the National Commission on Milk Standards, appointed by the New York Milk Committee for the purpose of studying milk standards and making recommendations to States and cities. I am sure you would do well to take a copy of this report and study it, for at least it will suggest to you ways in which the ordinances governing your work may be strengthened, and maybe it will suggest methods of work in your own sphere that will be helpful.

I want to say a word in favor of the score card. Occasionally I hear a suggestion that it ought to be abolished. I think that would be a mistake. If we should abolish the score card after having talked so enthusiastically for it, we would be open to the charge of bad faith. If the score card is not adaptable to our purposes, let us make it adaptable. I think that a serious mistake has been made in formulating a good many score cards by making it possible for a dairy that was producing absolutely unsafe milk to get a good score. That ought never to occur, and if it does occur it is the fault of the person who made the score card or the fault of the person who uses the score card. It is not necessary for that thing to occur. It is perfectly easy to say that certain vital conditions underlie the production and handling of good milk, and we can say that if any one or more of these things is deficient, then that score shall be deducted at least fifty points. There are several ways by which a dairy that is producing poor milk can be thrown

into the class where it deserves to be by the use of the score card.

As to the inspection of dairies, the ideal, of course, is a condition that does not require it, but all the dairymen will never be in the first group I referred to. The next best thing, in my opinion, would be to have inspectors stationed in small districts, working only a few hours a day, and those hours during milking time; these inspectors themselves selected because they are producing or know how to produce good milk, and living in the district where they work. The objection is made that a man who is known in a district cannot inspect the dairies in that district. That is true only if he has the final authority. If you leave it to him, it may be impossible for him to do impartial work and live in that community on friendly terms with his neighbors, but it is possible if he is accountable to a higher authority. Here is Dr. Hurty, in charge of inspection in Indiana. Suppose he appoints a man at Smithville, where there are only fifty dairies shipping, and suppose he pays him forty cents an hour. Suppose Dr. Hurty says to this man, "You give as much time as you can each week. Take this score card and visit every dairy in your vicinity. Make your score card in duplicate and send one copy to me. Spend the rest of the time in reinspecting the poor dairies, and some day I or my representative will appear and we will have in our hand the last ten or twelve score cards, and we will visit those dairies and check you up, and if you have made mistakes or misrepresentations they will be discovered." That is all that an inspector needs to enable him to get along with his neighbors. I hope I have made that plain, because I have had some years of experience in connection with the inspection of milk and I want to say to you that that little plan is one of the results of my experience.

Now a word about that scourge, bovine tuberculosis. I do not believe that bovine tuberculosis will ever be success-

fully handled in connection with the dairy work of this country until we come out man-fashion and acknowledge that we have it and that its presence is a challenge to us to get rid of it. As long as we try to deal with that disease under cover and slink away and hide the traces of it and pretend we haven't got it, just so long that scourge will remain with us. I greatly admire the dairy farmers in Denmark, and Dr. Bang told me that men having tuberculosis in their dairies had organized into tuberculosis societies and no one was permitted to join unless he had tuberculosis in his herd. Having organized, they employed the best veterinarian they could find and they said to him, "Tell us what to do," and he told them. When they made a mistake and got an animal in the wrong place, they acknowledged the mistake and put her back in the right place. Producers were very successful in getting rid of tuberculosis in their herds, and buyers came in and paid a premium to members of this association when they could have bought animals outside. I am hoping that the time will come when we will be just as open and frank in dealing with bovine tuberculosis as with smallpox. It is possible for any farmer who will be careful to get rid of bovine tuberculosis by the Bang method. Suppose that tonight a farmer should say that he is going to adopt the Bang method immediately, and that for purposes of convenience he will consider all the members of the herd tuberculous, and every little calf that appears on that place will promptly be put into another pen or building. In four or five years he will have another herd in this other building. Once or twice a year the herd will be tested for tuberulosis, and all the milk will be pasteurized. That is not difficult. It is not necessary to get a new set of men to do the work. It is a very simple matter, a matter of education, and think what it would be worth if we could eradicate tuberculosis from this entire country! They say

that a single baby is worth five thousand dollars. I know one that is worth a whole heap more than that.

The food situation in the world is serious. We in America seem to be unable to appreciate the fact. The wheat supply in this country is low. The Department of Agriculture is taking strenuous measures to increase it. The meat supply is low, and strenuous measures are being taken to increase that. The milk supply is affected. Prices are advancing. We are confronted by decreased consumption. I want to say to you that it is for you and for me to overcome these difficulties that are arising in these peculiar times. We must show the people that even at fourteen or fifteen or sixteen cents a quart milk is relatively a cheap food. On the other hand, we must show to the farmers that they must put more intelligence in the production of their milk. They must take advantage of market conditions to get rid of unprofitable cows and do everything they can to reduce the cost of production.

What about the duty of dairy inspectors in war time? They should help relate agriculture to the war by giving attention to the quantity and quality of the finest food that comes to mankind. So much for your technical work. But above all, we must all be good citizens, and dairy and milk inspectors, as all public servants, must give constant thought and action to national interests. It is bad enough for a private citizen to be indifferent. It is infinitely worse for a public official who is drawing pay from the public purse to be indifferent to the national situation. It would be well for some persons to be paralyzed rather than to have them continue their chatter which is resulting in estranging them from the Government rather than drawing their support to it. When all public servants think right and act right, together with the best citizenship, then this country is becoming invincible. As long as some are standing aside, hostile or indifferent or attempting to make unfair profits, then our

country is weak. We who are in public positions must help to produce and enforce the determination to win this war. Paul Revere's voice in the darkness and knock at the door was a summons for every man. Those people all felt alike. No one stopped to find a hiding place. Every person in this room ought to have a liberty bond, and almost every farmer that we come in contact with ought to have a liberty bond. We should help them to see that a tiger is springing at the throat of their motherland, and we may all help through these liberty bonds to ward off that attack. Every person should help to conserve food; many should help to produce it. Every person should be behind their Government. Dairy and milk inspectors are under a definite obligation to assist in bringing this condition to pass, and when it comes, then we shall fulfill the prophecy of the poet who wrote:

"Through all our history, to the last,
In the hour of darkness, and peril, and need,
The people will waken and listen to hear
The hurrying hoof-beat of that steed
And the midnight message of Paul Revere."

The President himself is sending out the call to the country, and the hurrying hoof-beats of the steed are the clicking of thousands of telegraph instruments and the roar of the printing presses. Will we hear as readily and promptly as our ancestors? If we do, the war must soon end, and in our favor.

"At the head of all the sciences and arts, at the head of civilization and progress, stands—not militarism, the science that kills; not commerce, the art that accumulates wealth—but agriculture, the mother of all industry and the maintainer of human life."

EFFECT OF WAR ON MILK

DR. W. A. EVANS, *President,* American Public Health Association, Chicago, Ill.

As Dr. Price has told you, I have previously had the pleasure of meeting with your membership, and it has always been not only a source of pleasure to me, but a source of information and inspiration as well. I count myself fortunate in having had for a considerable number of years the friendship, support, counsel and help of your President and many members of your Association.

I feel that I have the right in anticipation of the meeting of the American Public Health Association to bring you the greetings of that association. Let me suggest that as you have not anything on your program in the earlier part of the forenoon tomorrow, that you slip over to the mezzanine floor of The New Willard Hotel and there register, and that when your convention finally adjourns tomorrow night and from that time on throughout the week, that you attend the sessions of the American Public Health Association.

And let me also make bold to offer this further suggestion, that you consider the advisability of making joint meetings with the American Public Health Association your yearly custom. I believe that it would add to the attendance of your organization and that it would broaden your point of view; and I am sure that it would be of material service to the American Public Health Association.

And now, gentlemen, perhaps the best thing that I could do would be merely to state that I am in thorough accord with everything that has been said by the previous speakers. Our subjects run quite parallel; there are many overlapping points. I agree with everything that has been said by Dr. Neff. I have here before me the October 5th report of the New York City Department of Health. The first article

in that report is on "The High Cost of Milk a Health Menace." They are not only writing on the subject, but they have appointed a committee to investigate existing conditions and perhaps to suggest some methods of improving them.

I also agree with everything that President Pearson has said. On Saturday last, gentlemen, I read an article in the *Los Angeles Times* contributed by a special writer for that paper, who had been asked if milk was the best food. To this he replied, "Yes, milk is the best food for calves, but for human beings it is poison." Then he proceeded to develop the idea, evidently a fad with him, that milk was no fit food for human beings. It was one of those articles in which there is injected just enough of truth to float a great deal of untruth. It was an article of the type in which a little truth or an infusion of truth is used to do violence not only to the facts but to the general cause as well. And yet we are compelled to admit that there is some ground for the conclusion that was arrived at. To people who were not well informed, it would be possible to build up quite an appealing argument. Dr. Neff has called your attention to the fact that in human history it has been noted that where there has been great stress upon society, that baby death rates have decreased. I dare say that nothing disappointed our popular concepts more than the facts that came out of the siege of Paris. There were people who had not food sufficient for their adults, and far short of cows' milk for the babies, and yet there was a decreased infant mortality rate in Paris during the siege.

You will find a very interesting article by Lucas in the *Journal of the American Medical Association* for the latter half of 1916, a study of conditions in Belgium from July, 1915, to July, 1916, in which it is shown that though there had been an increase in tuberculosis, there had been a material decrease in infant mortality, and few American

cities have as low an infant mortality as Liege and Namur and Brussels in 1916. Before the war broke out, there was but one infant welfare station in Belgium. In 1916 there were more than three hundred such stations.

The conclusion that facts such as these warrant us in drawing is that, in the first place, milk is used for a great many purposes for which it was not intended that it should be used. The second conclusion is that a great many babies are being fed cows' milk who should not be fed cows' milk.

Now there is not any question whatsoever but that for economic reasons, or reasons of convenience, a great many people are making use of cows' milk for infant feeding who should be making use of mothers' milk, and in such occasions as the siege of Paris or the calamity that overtook Belgium, those people are thrown back on the necessity of making use of breast milk rather than cows' milk. The result of this more intelligent, of this more natural use of milk during such periods of stress is a lowered baby death rate.

Just a few words as to the importance of milk as a food. After what you have listened to, it is scarcely necessary that I should argue its importance; it is only necessary that I should state its importance, the argument for it having been furnished by President Pearson and Dr. Neff. In the first place, milk is important, extremely important, as an article of diet by reason of the fact that it is more nearly balanced as a food than any other food. The gentleman who was writing in the *Los Angeles Times* was arguing that milk was unfit for human food because when adults and children over a certain age used it as their sole article of diet they did not thrive. He would not be willing to apply the same test to any other article of diet. He would not be willing to say that a man could permanently thrive if he ate nothing but meat, or bread, or oatmeal, or any other single article of diet, but he argued that milk was a poison because people

who attempted to live upon milk exclusively did not make out very well. Of course, we know that milk as an exclusive article of diet is only to be thought of in connection with the young babies, that even older babies require some addition to their diet when they are using milk as a chief article of diet, and adults use it as an adjunct rather than as the staff of life. Nevertheless, I do not believe that anyone would argue against the statement that milk is the best *single* article of diet, and that if it were necessary that children and adults as well were compelled for months or years to live upon a single article of diet, were to be deprived of all others, that the judgment of all men would be unanimous in selecting milk as the article which comes nearer meeting all of the requirements than any other single article.

It is of extreme importance for another reason, and that is that it is an economic food even at the prevailing prices for milk; that it is especially an economic food when we take into consideration certain factors that are of importance. The first of these is that it is more easily digested by the average person than other articles of food, and we must and should take this into account.

The second one is that there is no waste in the use of milk as a food. It is all net, not only in the kitchen, but in the stomach and the digestive and the assimilative apparatus. This is not the case with potatoes that are to be peeled, or beef that is to be trimmed, or any other food.

Then there is another, and, of course, most important of all reasons why we should regard milk as something of vital importance. We can afford to run risks with certain other food supplies. We cannot afford to run risks with the milk supply, for one additional reason besides those I have already given. That is on account of the physiological effects of milk. If a man is fed on a milk diet exclusively, there is a diuresis that is entirely out of proportion to the amount of liquid that is consumed. You do not get the same

amount of diuresis from taking the same amount of water or the same amount of liquid in any other way that you get from an exclusive milk diet, demonstrating the fact that there is a physiologic action in milk that we have not taken advantage of, that we have not even studied and do not understand very much about, and yet which is a fact that can be and should be taken account of in the economics of man.

The second is very much better known, and infinitely more important. There is a growth principle in milk and in milk products, the nature of which we do not understand, but a vital necessity, a something that cannot be reckoned on the same basis as calories, a something that cannot be figured as we figure the other elements that enter into our balancing of rations. As it is absolutely necessary that babies and children should grow, it is absolutely necessary that there should be a milk supply.

Now if milk is not only a good food and an economical food but is a vital necessity, if we are to bear in mind even faintly this study of Irving Fisher's to which Dr. Neff has called our attention, we are bound to come to the conclusion that the Government is going to control the milk situation as it controls the munition situation and as it controls the purely military situation. The time was when a government at war thought of nothing as a part of its governmental responsibility except the proper development of the purely military situation. The necessity of our twentieth century advancement broadened the concept of the duties of the Government in war. Now there comes a proposal that the real test of the efficiency of a government is not so much in the development of its military or its munitions manufacture, as the conservation of its people as demonstrated by the developments of twenty or thirty years after the war. If it is a logical necessity that the Government should

give thought to a plan for milk, and the development of administrative machinery to make possible an adequate supply for those not otherwise provided for, I think we can safely assume that our Government, which is developing new functions every week and every day, will presently get around to consider this as one of its functions.

Suppose the Government would come to the conclusion, as the result of a great deal of investigation, that there are certain uses for milk that are fundamentally necessary, that must be cared for if society is to survive. For instance, that it is absolutely necessary that all children under one year of age who have not mothers' milk shall have cows' milk, and that children between one and two years shall have a diet composed largely of cows' milk, and children up to ten years of age shall have a diet in which cows' milk is a very important part. That children who have not attained growth shall have food made from milk. If these are the fundamental necessities, they would conclude that they would take some of the burden from the supply by prohibiting the use of milk, not only for certain commercial and manufacturing purposes, but for certain food purposes. We may even come to the point where, in order that there should be enough of milk at a reasonable price, that some part of the load that is now being carried by milk should be relieved, as they are trying to raise the load that is being carried by wheat. Wheat bread is quite as good on the second day or third day as it is on the first day. That is not true of corn bread. These are questions that have nothing to do with the nutritive value of wheat and corn and other flours, yet the demand has been put upon the wheat supply, and governments by one device or another are attempting to relieve some part of that demand. Perhaps they will attempt to relieve some part of the demand that is put upon milk, perhaps not improperly in times past, but improperly in times of emergency. Fresh milk is

carrying a burden that it is not absolutely necessary that it should carry.

At this time, when we are considering such fundamental things as establishing a fixed price for milk, or if milk cannot be purchased at a price that is in reach of the pocketbooks of those that are in greatest need of it, that the Government should step in and supplement the buying capacity of the people who need milk by giving a million and a half dollars' a month to poor mothers or others who should purchase cows' milk—when we are getting thus closely to the fields of socialism, it is a first-class time to bring into public view certain phases of the subject that have never been possible to get expression for under our floating or drifting policy. The first of these is that now would be a first-class time to study the distribution of milk and organization of that distribution with a view of taking some of the burden from price. Some of you may be familiar with the demonstration that if we had an organized distribution of milk, we could sell milk at several cents under the present price and the producer and dealer would have a larger profit.

The second suggestion would be the organization of the milk industry in its entirety. The great difficulty of the milk situation from every standpoint lies in the fact that it has never been organized as other merchandising propositions are organized. There has been ample reason in times past why we should allow a drifting policy in regard to the milk business, but is not now the time to consider the possibility of putting the milk industry on the same basis of organization that prevails with regard to other food substances?

When it is proposed that the Government shall force down the price of milk, men protest that they will sell their cows, that they cannot be forced by anybody to produce milk at a loss, that it is an inconvenient business, a fatiguing business, and not a business that they or anybody else will continue in

if it is not profitable. Of course, there is logic in that point of view, and, of course, it is true that the consumer should pay the price that is the proper price for milk or any other product. But when the consumer is asked to add a few dollars a year to his milk bill, I submit that in justice it is right that the consumer should insist that the producer should make use of every expedient for the lessening of the cost of production. For a great many years men who were entitled to the position of leadership have been telling the farmers that independently of the questions of health, keeping tuberculous cows in the herd was unprofitable, that in the long run it meant expensive production unless the selling price went up. The producers have refused to heed the information that is given them, and I submit, when the consumer is called upon as a matter of justice and equity and decency to pay a higher price for milk, that he has a right in submitting his case to demand some offset for the fact that the farmer has refused to heed what has been told him so many thousands of times about the unprofitableness of allowing his tuberculosis question to go uncared for.

"War its thousands slays: peace its ten thousands."

DECREASE IN MILK SUPPLY; ITS EFFECT ON INFANT MORTALITY

JOSEPH S. NEFF, M.D., Narberth, Pa.

The amount of milk produced and the amount consumed can be accurately ascertained; its effect on infant mortality, however, can only be estimated at the present time. The question were better put, "the increased *cost* of milk and its effect on infant mortality," as there is no general decrease in the milk supply of the United States at this time. In many localities the handling of the surplus milk is embarrassing (Illinois, New York, Pennsylvania and District of Columbia). Much of the surplus, however, is due to decreased consumption, there being from 5 per cent to 40 per cent decrease in our large cities, varying in accord with local conditions, the greatest decrease being in tenement house and industrial sections, which is most marked immediately after the increased price goes into effect. A dealer in Chicago sold 4,000 quarts of milk per day in September last. The raise in price of milk took place October 1st, and on October 3d he sold but 2,500 quarts, a decrease of 40 per cent. A number of large dealers elsewhere reported similar results, with merchant reports of increased demand for baby foods, canned and evaporated milk and similar substitutes.

Prices have risen with considerable frequency throughout the country, varying at present from 11 cents per quart retail (Philadelphia) to 15 cents (New York) the average butter-fat being less than 3.8 per cent. Contracts have been made with many producers for October at 7.04 cents per quart (Chicago, New York and Philadelphia) and for November at 7.8 cents (New York), butter-fat 3.8 per cent.

Milk has been entirely discontinued in many families among the poor. Baby foods, evaporated or condensed milk, potatoes, macaroni, bread, tea and coffee take its

place. In other families cheaper milk of poor quality has been purchased for infant feeding (New York, Philadelphia and Washington).

Testimony is now being taken by a commission in one State as to cost of milk production. Another commission, known as the Tri-State Commission, appointed by the Governors of the States, reported after an investigation concluded August 28th, that the maximum cost of production was 7.45 cents per quart, including freight; cost of handling and delivering to the consumer was 5.925, a total of 13.375; but we believe some profits of management were included in these figures.

Infant mortality rate during the first six months of this year, in large cities, has varied from a decrease of 11 per cent (Milwaukee) to an increase of 18 per cent (Philadelphia). Since July 1st the figures vary from a decrease of 33 per cent (New Haven) to an increase of 29 per cent (Indianapolis); but deaths from diarrhea and enteritis under one year of age for the first six months, with the exception of a few cities (Baltimore, New Haven, Newark and New York), show an increase over 1916. About the same ratio is shown for July, but a much greater increase is shown for each succeeding month. For example, New York City, which decreased its infant death rate 12 per cent for the first six months, increased its rate 29 per cent since July 1st. In Washington the death rate from diarrhea and enteritis under two years of age decreased until August 1st, since which time it has increased 55 per cent; while total deaths under one year of age have slightly decreased during the same period. Notable exceptions are New Haven, Milwaukee and Newark. In the latter city this is accounted for by the fact of the large number of babies that are breast fed. In 3,000 cases under study there were 88.1 per cent entirely breast fed for six months, 8.7

per cent partially breast fed for six months, and 3.2 per cent entirely artificially fed.

The increased mortality from diarrheal diseases is believed to be due, in a number of cities, directly to the decreased amount of high grade milk purchased by mothers for infant feeding, and the substitution of cheaper grades of milk or other foods. The continuance of this practice will increase mortality from malnutrition more than mortality from diarrheal diseases, *per se*.

As but little statistical information can be obtained in the United States since the war bearing on this subject, we must look to the experience of foreign countries, which may furnish an additional guide for recommendations for the handling of these problems now confronting this country.

GERMANY. Germany at the beginning of the war exerted all her efforts in the care of the army, but soon realized the importance of conserving child life. The Imperial Government assumed the burden of maternity benefits, paying extra to mothers who would nurse their babies twelve weeks. There is no evidence that infants have suffered on account of decrease of milk supply, owing to the extra efforts of the government, which assumed full control. Milk, apart from making cheese, was grouped under four heads:

1. Use of milk by nursing mothers and weaned babies.
2. Use of milk by children from 2 to 14 years.
3. Use of milk by the sick under care of a physician.
4. Use of milk as a beverage by healthy adults.

The latter was considered a luxury, and no milk was allowed for this purpose until all requirements were filled in the order given. The decrease in milk supply was felt most in the cities, although we have no figures.

Infant death rate in 1913 was 151, in 1914 was 164, with a decided drop in 1916, when social service organizations

acquired high efficiency and the Red Cross appointed special committees to take care of mothers and infants.

ENGLAND AND WALES. In England and Wales the infant death rate in 1913 was 108; in 1914, 105; in 1915, 110; in 1916, 91. The comparative cool summer and increase in wages played a part in the lessened mortality in 1916, but much was due to increased governmental activity. A National Council in charge of child welfare work, of which the Prime Minister is president, had in the metropolitan boroughs 600 professional health visitors in 1914, 812 in 1915, 1,000 in 1916 and 1917. It opened the first year of the war one hundred schools for mothers and two hundred more in the second year of the war, with ever-increasing number of voluntary infant welfare workers until 1916, when their number became legion, in addition to the organized work of private associations concerned in the promotion of the care of motherhood and infancy, of which three are national, namely: The National League of Physical Education and Improvement, the National Association for Prevention of Infant Mortality and the Association of Infant Consultation and Schools for Mothers. To these associations the local government board gave $57,000 in 1914; $207,000 in 1915; $340,000 in 1916 and $700,000 in 1917.

FRANCE. In Paris infant mortality decreased during the first year of the war, when there was a remarkable decrease in the number of babies placed to board outside the city (10,071, being over 67 per cent) and many less were abandoned. At the outbreak of the war in August, 1914, a complete military organization was formed to take charge of pregnant women and infants, who were never before so well cared for. During this year the infant mortality rate fell. The death rate under two years of age, however, remained the same. When the lack of milk was felt, this organization provided pure milk for babies from special

herds kept within the city limits, distributing 12,000 litres per day. In the second year of the war the percentage of abandoned children increased and was even greater than before the war; the number placed outside the city to board was greater than in the first year of the war, notwithstanding the work above alluded to was continued. Infant mortality rate among babies remaining in Paris was less this second year than in the first, but the death rate of children under two years of age was higher. The only explanation offered is the entrance of pregnant women and nursing mothers into industries, especially ammunition plants.

BELGIUM. In Belgium the infant death rate has been decreasing, due to probably the most efficient child welfare work in the warring countries, as there is now more being done for mothers and babies than before the war, and milk and cereals are being supplied to over 52,000 children under three years of age. Three hundred and twenty-nine feeding rooms are established for nursing and expectant mothers; previous to the war there were two. These rooms are medically supervised and have large corps of visiting nurses who continually go out into the homes.

As private interest and support is diverted to more dramatic appeals of the Red Cross and Liberty Loan and other worthy and urgent needs of our Government and soldiers in camp and at the front; as doctors and nurses are called into active military service, making it more and more difficult to finance and handle the many activities relating to child welfare (in one of our largest cities the only incorporated activity of this kind is about closing down for these reasons); as the continued decreased consumption and increasing cost of milk will eventually, without special control, interfere with proper infant feeding, thereby increasing infant morbidity and mortality; and as the conservation of child life is as important as the casualty rate of the war and will constitute our greatest asset for the

future; it is recommended, that the Federal Food Administrator should be urged to have maintained an adequate supply of cows' milk of proper quality at a reasonable price for maternity and infant feeding, and for this purpose Governmental or other aid be provided; that an educational campaign should be organized to impress parents of the value of milk as a food for babies and young children and of the deficiencies of patent baby foods for that purpose.

As this is not a local but a nation's problem, it is also recommended that all that pertains to child welfare work should be conducted under national or at least central control by such an organization as the Children's Bureau, Department of Labor, the National Red Cross or the Council of National Defense.

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REMARKS BY DR. HARVEY W. WILEY

Mr. President, I am quite unaccustomed to extemporaneous speaking, but I don't mind trying to do my bit.

I have been intensely interested tonight. I have just returned from a town some of you have heard of—Boston. I gave them a lot of valuable information. I was paid for that. You will get something cheaper.

I think in this eloquent plea that we have heard for bringing the cow back to town we have what the logician would call a case of false conversion, or in the vernacular, putting the cart before the horse. What we ought to do is to send the baby to the country. He will do a great deal better there than the cow will do in town. I am very intimately acquainted with both babies and cows, and I know whereof I speak. We want to send the babies to the country, and we want to change the cow into a goat. A goat is a good deal better for a baby than a cow. You can handle a goat a great deal more easily than you can a cow, and goats have a very grave disinclination to have tuberculosis, which cows seem to love better than alfalfa; and for that reason I would like to see the cultivation of the goat. It is much easier to keep a goat in the back yard than it is to keep a cow in the hallway.

I am in deep sympathy with the sentiments which have been expressed here tonight, for the most part. I, however, am not an inspector, but an inspectee, though I try to keep ready for the inspector any day. I belong also to the cow testing association, which has been mentioned here tonight as a means of determining whether or not a cow should be kept, and it is a most valuable asset to the dairyman to belong to an association of that kind. I know pretty well those cows who are staying with me for my benefit and those who are staying with me for their benefit, and I have quite a different attitude toward those cows; and yet you must

not dispose of cows. You don't get much for cows, anyway —three or four cents a pound on the hoof. It is pretty hard to steer the way between economy on the one hand and cow-manity on the other hand.

There was one thing that Secretary Pearson said that I can't agree to. I don't believe in taking the standards away from milk. I don't believe in letting a man himself state what is in his milk and let it go at that. The people who drink the milk never look at the can. The man's guaranty is worth nothing except between him and the first purchaser. The person who drinks the milk does not know anything about it. I believe that milk should be fit to drink in every respect, in its sanitary respect and its nutritional respect. The vital element in milk is mostly in the butter-fat. If you were to try to bring up a calf on skim milk, you would see what I mean. If you don't feed a bull calf whole milk, he won't grow. He will be a runt or he will be dead. In three months he will eat his head off several times, and you are never going to make it economical for a dairyman to keep a bull calf for meat. I sell mine the day they are born, and glad to get five dollars apiece for them. I can't make more off him if I feed him and keep him for five thousand years. And yet the legislature proposes to make it illegal to dispose of a calf. If that is done, we will have to get more for the milk we sell.

I believe everything Dr. Evans said about the extreme importance of milk as a food. That man who wrote the article in the Los Angeles paper should be hung. The idea that the Government should intervene in everything is growing, and the law of supply and demand has already been repealed. It is proper that we should go the length of this measure. If it is right to say to the farmer, "You shall get $2.20 for your wheat" it is right for the Government to see that everybody in this country gets some of that wheat; and if the Government is going to distribute the

wheat—and I believe it is constitutional—then the Government should say to the poor child, "You shall have good milk and plenty of it," and see that every child gets that milk.

I am deeply touched with the idea that we are not living for today, but for the next generation also, and the real measure of what the war does for humanity will not be shown until the next generation comes along. I am told that in war times a great many more boy babies are born than girl babies. That may be true. Nature has foresight. So ought we to have, and we ought to build up a race of men as the result of this war and the lessons it is teaching us that is a better race of men than we are.

Several years ago, in 1863, before most of you were born, I went to enlist in the United States Army with a neighbor boy. I was the first to be examined, and I was accepted as a soldier, and my chum was rejected. Why was I allowed to serve my country and he was not? I will tell you the reason. I was the son of poor parents. We did not have much to eat, and all we had to wear was grown on the place. I was brought up on whole cornmeal, and whole wheat meal, and milk, and sorghum molasses, and the Bible. When I went up to be examined for a soldier I had good teeth. My friend was the son of well-to-do parents. He had cake and candy—and no Bible; and as a result of his diet he had no teeth. You all know the condition of the teeth of the children of this country, because they have not had the kind of food that milk is to eat, as infants and as children; because they have had nothing out of which to build their teeth and their bones and their sinews as children ought to have; and the child that is deprived of milk is threatened with inefficiency, short life, and inability to serve his country, or his family, or his God. This idea of diet is now coming home to the people of this country as it never has before in the stress of war, and it is not so much munitions that our friends across the water are crying

for—it is food, more than soldiers or munitions or guns, and we in this country ought to see to it that we understand all the facts as to the food value of milk, and then we can lay the foundations for the next generation and lay them broad and deep.

DR. MALONEY. *It seems to me that when an organization can attract such men as we have heard this evening, and have brought to us in their remarks a message, from many angles of the problem, that we will take home with us, that we could do no less than to express our gratitude to those gentlemen by a rising vote of thanks. I move that we so express our thanks to the gentlemen who have addressed us this evening.*

ADDRESS OF HERBERT C. HOOVER

United States Food Administrator

I will tell you something about our problem. The Food Administration has five functions, part of which are shared with the Department of Agriculture and part of which are shared with various other Governmental agencies, but we look at the thing from one point of view and that is from the point of view of food as distinct from production.

But we cannot escape an interest in production, and our first interest is in that field. We can do little without the maximum production in the country. It is useless to control price or distribution of food unless we exert ourselves to increase production throughout the country.

The second problem is conservation. With all of the stimulus to production that can be given, the world's demands cannot be met without a reduction of consumption.

The next phase is the result of both of those problems, and that is the control of distribution. An excess of production in a given commodity will require assistance from us to see that such excess food supplies are promptly transported to points where production is below normal. If we allow a commodity to go to waste, it does not remunerate the producer; he will have a shortage in that community in the future. We have an interest in surplus production as well as an interest in short production. Where quantities are insufficient our labors are infinitely more strenuous. That requires a great deal of control.

Out of those things comes the question of the control of exports. We have always supplied the world generally with foodstuffs, and now we have demands from the Allies which absorb more than we are capable of producing in those commodities that can be shipped, and therefore we

must restrict the supplies to the rest of the world. We must handle those things with judiciousness as to our foreign relations in many quarters. For instance, we must feed the people of Cuba. We draw our sugar and the Allies draw their sugar from Cuba. This year we must supply Cuba with rice, although we can ill afford it, but we must come to adjustments with Cuba in order that the whole will react to the Allied cause. We also have other interests that we must look after of a more or less minor order.

The Department of Agriculture has the prime responsibility in the problem of production, but nevertheless we are the function of the Government that more or less sets the criterion of what we want produced, and we have the international problem to take care of. The production we need for many years to come is going to be on the side of animal products. It is difficult to lay sufficient emphasis on that point. We have Europe in a situation where they are killing their herds today. They are making inroads into their amount of animals. They have always imported a certain amount of fodder and grain to maintain their herds. With a shortage in shipping, it is the logical thing for them to eat their cattle, reduce their imports and temporarily at least to absorb less products from us. But they have arrived at the point where their demand for those commodities increases rapidly. We have got into that period now. The actual killing of animals among the three Allies amounts to something over 35,000,000 head. The effect of that in the future is going to be most serious. When the war comes to an end they will find themselves short of animal products; they will find themselves possessed of a larger area of productivity in cereals. They will have less demand for the production of fodder, with less herds, and therefore they will import less quantities of the cereal products for bread purposes.

On the other hand, they will be faced by a very large shortage of animals, and also in a period of more intense shortage of animal products. So that our agricultural industry can look forward in a general way to the fact that there will be a comparatively little demand after the war for bread grains, but an enlarged demand for animal products. If our agriculture is guided aright, we will have turned it from production of bread grain for export to the production of animals and animal materials.

Those things can't be done over night. It requires from two to three years to produce a dairy cow, or to grow a steer for beef. It takes a year to increase our herd of hogs. So that it becomes of interest to all of us that we should stimulate the production of cattle, save all the calves that are useful for growing purposes, and get them into those sections of the country which should enlarge their herds. We need at once and for war purposes a stimulation in our production of hogs. The Allies can more or less take care of their beef interests during the war, but they are short of fat supplies because the Germans are taking the supplies they normally receive from the Scandinavian states, and they are cut off from Siberia.

The world is faced by a shortage of fats. They have substituted vegetable fats for animal fats in Europe to a large degree. They are taking all the measures they can to make use of vegetable base fats, but even then the human family must have a certain amount of animal fats. You all know the dietetic advantages of butter. We on the other hand over-exported last year of our fat products, and we have a less supply confronting us than we had last year, so that the immediate outlook for the raising of hogs on one side is a large price, and because we have a surplus of feed and grains in the country this year the farmer should take advantage of the low prices of feeding stuff.

Much of that same argument applies to the dairy products of the country. We have a large demand for butter and for cheese abroad, and we have not been able to supply it. This country has not been a butter exporting country. Today we have a very strong demand from the Allies for considerable shipments of butter. We have not the butter in the country today to supply them. We are not at the present time supplying any butter to the Allies at all. They are enlarging their taking of cheese and they are putting their population on a part cheese diet in substitution for butter.

We have another phase of these matters that I mentioned to you in conservation; that with an inability to supply the food products of the world it is of immense importance to us that we should have no waste in milk, that we are in that position where we need to save every atom of the milk into some preservable form. I know how difficult it is to implement this sort of measure by purely voluntary action on the part of producers and of consumers as well. It is easy enough to preach to the public as a whole, but it takes a good deal of preaching to bring that down to the individual and what the individual should himself do, and there is a point where the inspectors as a whole could do us an enormous service, if they made this a personal matter in all of its different phases, in the saving of waste and the putting of these things into forms which can be used and to some extent can be preserved.

The situation in the dairy industry is difficult enough at the present moment because we are in an area of terrific high prices of feed, and the products do not reciprocate to the cost of production. The dairyman is in a great deal of difficulty with his customers now because he is endeavoring to lift his prices to a point that will give him compensation. The consumer of fresh milk is probably the most obstructive consumer in the world. The price of fresh

milk, together with the price of a loaf of bread, make ninety-five per cent of the psychology of the consumer in living costs, and therefore he resents a rise in either of those two commodities more than any of the rest, and he is less willing to meet the producer in those matters. So that the milk producer today is in an extremely difficult position. He has advanced his prices to a point where they are resented by the customers, and for that reason alone should have a certain amount of moderation in his demands. If he is a good merchant his attitude of mind should be that he should nurse his customers and take time to work out the situation, rather than do it abruptly and create resentment in the consumer's mind.

The problem of conservation as a whole is one in which you can be of a great deal of service. We have a fairly definite position in regard to the commodities which we must save. We are practically limiting our shipments of foodstuffs to Europe to cereals, beef, pork and pork products and dairy products. We have plenty of other food materials in this country. Conservation becomes with us a question of substitution. We do not ask the American people to eat less, so much as to substitute. There is limitation of waste, not of commodities. Many of our people consume more food than they need. If we can get our people down to a point of food intake that is the most advantageous from the public health point of view, I think we will have made all the conservation that we need for the next six months at least.

All these problems of waste and reduction of consumption have another phase that is of vital importance. At the present moment this Government is spending somewhere from seventeen to twenty billions of dollars per annum. That money to a minor extent can be raised by taxation. Beyond that it must be raised by loans. Loans cannot be raised out of the capital of the people. It is useless to

expect people to sell one security to buy another. Our only hope of being able to absorb these enormous borrowings is to get the people to reduce their expenditure in order to be able to carry this load. The Germans have built up a complete financial system so that they can carry the financial burden of this war with the greatest possible ease. They have by measures chiefly of force brought the people down to a form of saving that enables them to carry the total cost of the war. Out of a population of 65,000,000 they are able to keep 10,000,000 men under arms, supply them with munitions, and supply the army and the civil population with food. So far as I can see, they could go on fighting this war to eternity. There are other forces bearing on the Germans that give us hopes, because with all of their effort they have not been able to maintain their fat supply. Their shortage of fat will increase next year. It is a slow and terrible process, but it is active and is affecting the morale of the whole nation. The blockade of Germany is yet going to be possibly the deciding factor in the war.

That is somewhat afield from our problem, but it has a bearing on the future outlook for our country. When peace comes there will be an enormous rush on American supplies, for fat supplies in Europe. And that demand will be maintained for many years. So that in general we ask for the stimulation of production and the foundation of an enlarged production of dairy products and of our other animal products, and on the other hand the elimination of waste in every possible direction.

We have no implement with which to effect those things but voluntary service. I am doubtful in my own mind if stimulation can be obtained in any other way. The last thing we would like to see in this country is the permanent enlargement of Government bureaus to take the life of every man in hand and tell him where he should go. We have formulated the whole basis of our work on both sides on a

voluntary footing. We are asking every one to guide his particular occupation from a national point of view. It is only by the stimulus of people like yourselves that we can hope to meet this situation. We have the belief that if we can mobilize the activities of our people by this measure, we will have done more than to have actually fought the war itself. We will have demonstrated here that democracy and the forces of democracy can be preserved and can defend themselves in so doing. Therefore it becomes of transcendent importance that we shall have been successful in carrying this through on a voluntary basis.

War is a losing game. This is solely a war of defense. It is the only type of war that is justified, but defense or otherwise, it is a loss, and there are but few compensations for the enormous loss that we face; and one compensation is that we should have created in our people a sense of service which they had not hitherto had. One of the difficulties with our form of government and the life we have led has been in the development of selfishness among our people, and if we can get out of this war a proper sense of service, we will have got the compensation for its entire cost.

"If the cause and end of war be justifiable, all the means that appear necessary to the end are justifiable also."

THE PRESENT DAY SUPERVISION OF THE MILK SUPPLY

JOHN J. COUGHLIN, *Dairy Inspector,* Elizabeth, N. J.

The supervision of public milk supplies has, during the past score of years, been in a state of constant and rather rapid evolution. At first, the principal object sought was the detection of adulteration. This phase of inspection still exists, but it is generally recognized that the addition of water or the extraction of cream are but fraudulent practices, and as a rule have only a secondary bearing upon public health.

It was not until the latter part of the past century, when the science of bacteriology had shown facts pertaining to bacterial contamination of milk, that the medical profession, health officers, sanitarians and various private organizations and individuals interested in public health conservation were aware of the dangers that lurked in unclean and contaminated milk.

As the result of these revelations these various bodies assembled, discussions were held, volumes were published and distributed, and further scientific research work was carried on for the one purpose—clean and safe milk.

The appreciation of these conditions and findings led to a complete survey and study by health officers and others. These findings were formulated into ordinances, embodying temperature, bacterial and tuberculin-testing standards, score card ratings and other factors necessary to the improvement of the production and distribution of their milk supply. This was the foundation by which successful, vigorous campaigns were waged against the deplorable conditions that prevailed, and as a result, milk inspection and bacterial testing were instituted.

With the results already accomplished and the continual progress being made towards attaining the ideal, there

still exists difference of opinion as to the proper methods of control. We see laws of recent adoption being constantly revised, the construction of new codes delayed awaiting the outcome, and widespread discussion prevails as to the values of grades, score cards, bacteria counts, inspection and pasteurization. I venture to state that controversy over these features is directly responsible for the lack of uniformity of laws, codes and methods of supervision at the present time.

Every community has several grades of excellence in its milk supply. The better class of dairymen and dealers have greater regard for cleanliness and decency than the slovenly ones. The former is, however, forced to compete with his excellent product with the inferior product of the latter, and as an incentive to continue he should be recognized and rewarded for his efforts. Moreover, the successful application of the grading system has been fully demonstrated in a number of cities the past few years both from a public health and economic standpoint.

The question, of course, resolves itself into what grades should be adopted. From observations and study I am convinced that greater benefit will be derived if only a few grades are provided for; as, for instance, Certified, Grade A pasteurized and Grade B pasteurized. It must not be forgotten, however, that the efforts of cities to secure a clean and safe milk supply must, of course, differ and be adapted to local conditions, but they must all be governed by the same principle.

Recent investigations have shown the possibility of producing clean milk in dairies of extremely dirty outward appearance, and continuous high counts have been obtained in high scoring dairies. It is therefore a well established and recognized fact that the present score card in individual cases has but little direct relation between the dairy and the bacteria count and a revision may be necessary so as

the card will become a better guide for instructing dairymen in cleanly methods of production and also serve to record the results of inspection in a concrete and convenient form and at the same time become a better guide for the grading of milk.

The possibility of milk being subject to both bovine and human tuberculosis, typhoid fever, diphtheria, scarlet fever and septic sore throat is clear to all of us. This justifies us in making milk the subject of more frequent examination than any other article of diet. And yet it is rarely examined, in so far as I know, with a view of determining the presence or absence of pathogenic organisms. The futility of this is obvious to you gentlemen and needs no further comment. It is not my purpose to criticise bacteria counting, but rather to encourage it, as it is the most valuable index to the method of pasteurizing, milking and cooling, the three cardinal requirements for producing clean milk.

Laboratory examination can detect contaminated milk and serves as a guide to inspectors to devote their efforts at a place where most needed. On the other hand, knowledge of the number of bacteria has little value unless the history of the milk is known; when this is the case it often serves as an aid in controlling the procedure and detecting possible sources of danger. In brief, the bacteriologist makes the diagnosis and the inspector ascertains the cause and applies the remedy. Therefore, as a means of attaining perfection of control and in the interests of economy a closer and a more definite relationship should exist between these important branches of control.

The final element of control can only be assured in pasteurization, pasteurization not only of inferior grades of milk, but of all milk. When we take into consideration that bacteria may owe their origin either to a diseased or

healthy cow, a diseased or healthy attendant, unclean utensils, or to multiplication, the importance of these sources and their effect on the consumer are significant. Prevention of the infection of milk from both bovine and human origin should be the primary object of milk inspection.

"Diseases desperate grown
By desperate appliances are relieved
Or not at all."

AN EXCEPTIONAL OPPORTUNITY FOR MUNICIPAL HEALTH OFFICERS AND DAIRY INSPECTORS TO SECURE THE CORDIAL COOPERATION OF THE PRODUCERS AND DISTRIBUTERS OF MILK

BENJ. L. PURCELL, *State Dairy and Food Commissioner,* Richmond, Va.

An exceptional opportunity for municipal health officers and dairy inspectors to secure the cordial cooperation of the producers and distributers of milk is present.

Those of us who have been officially engaged in the promotion of the dairy industry and charged with its supervision and inspection have long since been convinced that until the confidence and cooperation of the producer is secured we make but little headway in bringing about effective, desirable changes in methods and practices that are in themselves bad and which perhaps deleteriously affect the milk produced.

There is no surer way to secure the confidence and cooperation of most men than in recognizing and appreciating the difficulties and obstacles that they must overcome and in giving constructive assistance to their solution.

The producers of milk at this particular time, in almost all sections of the country, are facing one of the most critical periods of their business life, insofar as the reward obtained by them for the result of their labor is concerned. The increased cost of practically every item entering into the production of milk has made an increased return to the producer for his product essential in order that he may continue in the business. Increased prices to the producer almost invariably mean an increased price to the consumer. This is most unfortunate, but still a condition, and must be dealt with through a systematic campaign of information

to the public, which campaign should be encouraged and cordially supported by the local and State official charged with the supervision of the milk supply or with the encouragement of the dairy industry in his particular State.

So far as Virginia is concerned, it has been the effort of our Department to assist the producers of milk in almost all of the various distributing centers of the State to secure from the distributing dairies an increased price for the milk produced. We have further endeavored to show the public, by interviews and articles written in explanation of the increased price to the producer, that this extra price is necessitated by reason of the increased cost of production, and we have, with the assistance of the producers, further specified the items of expense entering into the cost of production, showing that in many instances there was no margin of profit to the producer, and that if the milk supply was to be maintained the prices paid to the producer would have to be increased. Our greatest difficulty has been in finding where the limit of the added price put on by the distributer could be fixed to cover the cost of distribution and a legitimate profit for the distributer. We have not had from our largest distributers that cooperation which would have enabled us to clear them from all suspicion of taking advantage of the present exceptional war conditions and adding to their prices for this necessary article of the daily diet a charge which is not warranted.

It seems therefore that when the opportunity offers, as it must do in nearly all localities in this country, for the supervising official to give the practical assistance to the producer which has been outlined above, and the official embraces the opportunity, that the products will in his turn show his appreciation of the help extended him and give his cordial support to the official charged with the enforcement of the laws covering the production and distribution of milk.

I trust, therefore, that those of us who have not already embraced this opportunity will, when we go back to our respective homes, diligently inquire into the cost of production of milk and the prices paid for it by the consumer, and where there are inequalities, that you will use your earnest efforts to see that the dairy farmer receives a fair return on his investment, bearing in mind that the man engaged in intelligent dairy farming is doing more to build up and conserve soil fertility and for the promotion of permanent agricultural development than those engaged in any other line of agricultural effort, and that he is diligently following the advice of our President in giving by his daily labor a practical illustration of the "conversion of patriotic impulse into constructive action."

"Prudence is that virtue by which we discern what is proper to be done under the various circumstances of time and place."

THE IMPORTANCE OF CLEAN UTENSILS IN CLEAN MILK PRODUCTION

GEORGE BARKLEY TAYLOR, *Market Milk Specialist,* U. S. Department of Agriculture, Washington, D. C.

Clean utensils may be defined as those which on physical examination show no evidence of the presence of foreign organic matter and give off no odor, and which on bacterial examination show the presence of only inappreciable numbers of bacteria. It might be added that clean utensils should be dry.

Any process, or combination of processes which gives these results without the outlay of too much time, labor, or expense, is satisfactory. The essentials for obtaining clean utensils are hot water, in sufficient amounts, labor, either hand or machine, and steam. The question may be raised that steam is not a basic factor in obtaining clean utensils. That is true only to a limited extent. It must be admitted that in the vast majority of dairies and milk plants where steam is not used, the utensils do not meet the conditions given in the above definition of clean utensils.

The cleaning of utensils has never been given the consideration it deserves either at the dairy farm or in the milk plant.

On the average dairy farm there are no separate facilities for washing utensils. After the morning milking, the pails and strainer cloths are taken to the kitchen where they are made a part of the kitchenware to be washed after the morning meal. They may have an additional scalding with a little water much under the boiling temperature. In fact the small kitchen kettle is the only reservoir for hot water. As a rule, after the evening milking they do not fare as well. The shipping cans come in for worse treatment. They are too large, heavy, and unwieldy to be handled in the kitchen. Very few dairymen have proper facilities for

washing cans. For this, a tank, large enough to hold a can, and plenty of hot water are needed. Here, the dairymen who ship milk have, in a great many instances, a just complaint against the average milk plant. Cans are returned to the shipper in all conditions of cleanliness or uncleanliness, from clean to absolutely foul. Dairy Division Milk Plant letter 28 says: "Many different methods are used by various dealers in caring for the cans after the milk is removed from them. Some of these methods are as follows:

"1. Returning the cans unwashed.

"2. Rinsing with water (either hot or cold).

"3. Rinsing out by means of hose with either hot or cold water.

"4. Rinsing out with hose and then steaming with live steam.

"5. Washing the cans out by means of washing powder and hot water and a hand brush; then rinsing.

"6. Same as 5, with an additional rinsing with boiling water or steaming.

"7. Cleansing by means of machines of various kinds."

As there is a division of responsibility between the producer and the shipper in regard to the cleaning of shipping cans it is thought best to emphasize these conditions.

A great deal of work has been done to show to what extent the average shipping can harbors bacteria. I wish to refer to two sets of experiments showing the effects of washing and of washing and steaming shipping cans.

At a milk plant where one of the experiments was conducted the method of washing consisted of a rapid scrubbing of the cans with warm water, washing powder and a brush. The wash water was used over and over again, being transferred from can to can. The cans were then rinsed with hot water in large amounts; and after hurried emptying of the rinse water, they were set aside

with cover on. From one ounce to several ounces of water were left in the cans and the utensils were not drained.

Within a few minutes after the above treatment the cans were rinsed out with 400 cubic centimeters of sterile water. The results were as follows:

Bacteria Removed	*Odor After Washing*	*Odor 24 Hours After Washing*
76,800,000	Slight	.....
716,800,000	Musty	Strong mouldy
49,200,000	Slightly milky	Musty milky
2,356,000,000	Milky	Disagreeable
3,660,000,000	Disagreeable	.....
1,348,000,000	Disagreeable	Mouldy disagreeable
672,000,000	Slightly milky	Disagreeable
.....	Slightly soapy	Slightly disagreeable
.....	Disagreeable	Slightly disagreeable

The variation is so great that there is nothing gained by averaging the counts, although the cans were all washed in the same manner. They were all ten-gallon cans, and were in fairly good condition, except for rust places especially in the bottom.

Other cans washed at the same time in the same way were steamed over a jet from ten seconds to one minute. This steaming apparatus consisted of an old jet system can rinser and sterilizer with foot control. Only the steaming part was used. This piece of apparatus was 18 x 19 x 22 inches, occupied little room and consisted of an iron frame with brass nozzle outlet for steam and water. The steam pressure was 90 pounds.

The results obtained were as follows:

Time Steamed (Seconds)	*Bacteria*	*Odor After Steaming*	*Odor 24 Hours After Steaming*
10	2,176,000	.....	.....
15	79,000	Slightly musty	Mouldy
20	50,000	.....	.....
	68,000	Musty	Fresh
	3,660,000	Slightly sour	Fresh
	2,280,000	Slightly sour	Musty
	7,760,000	Sour, disagreeable	Fresh
	1,400,000	Slightly sour	Fresh

Time Steamed (Seconds)	*Bacteria*	*Odor After Steaming*	*Odor 24 Hours After Steaming*
30	55,200	Slightly milky	Fresh (dry)
	1,160,000	.....	Fresh
	720,000	Sour	Disagreeable (dry)
	396,000	Disagreeable	Fresh
	320,000	Slightly disagreeable	.....
	112,000	Slightly disagreeable	.....
	320,000	Milky	.....
	.....	Musty	Fresh (dry)
	.....	Musty	Fresh (dry)
	.....	Disagreeable	Musty
	.....	Musty	Slightly musty (dry)
45	53,200	None	Fresh (dry)
60	92,000	Slightly sour	Fairly fresh (dry)
	.....	None	Fresh (dry)
	.....	Slightly musty	Fresh (dry)

The bacteria removed averaged one million. Although this may be considered high, it is a reduction of over 99 per cent over the unsteamed cans. Out of twenty-four examinations in which steam was used from ten seconds to one minute, the cans gave off a clean odor after twenty-four hours, in fourteen cases. In four instances the odor after twenty-four hours was not observed. Steaming from thirty seconds to one minute produced a dry can in nine out of fifteen times. In two instances observations were not made. In some instances steaming seemed to bring out foul odors in cans which before steaming did not seem so bad. These odors usually disappeared on cooling. It is very doubtful whether a jet of steam applied only momentarily does much good. The can does not reach a high temperature and does not dry out on standing. In fact, if the cans are steamed at all, it should be at least for 30 seconds.

Another series of experiments was conducted in a machine which washed, steamed and dried the cans by means of warm air. Cans were held in the machine six minutes before being released. They were then rinsed out with 400 cubic centimeters of sterile water; counts were made and the physical condition of the cans noted.

The following table gives the results in detail:

Outside of Can	*Inside of Can Condition*	*Odor in Can*	*Bacteria Per Can*	*Remarks*
1. Rusty	Dry	Slightly disagreeable	2,240,000	Pin-point colonies
2. Slightly oily	Dry, bright	Slightly disagreeable	000	Three dilutions
3. Dry, clean	Dry, bright	None	800	
4. Dry, slightly oily	Dry, bright	None	3,600	
5. Clean	Few rust spots	Slightly musty	40,800	
6. Oily	Dry, bright	Slightly musty	11,200	
7. Slightly oily	Dry, few rust spots	Slight	23,200	
8. Slightly oily	Dry, bright	None	1,200	
9. Dry, few rust spots	Dry	Slightly musty	400	
10. Slightly oily	Dry, few rust spots	None	116,000	
11. Few rust spots. Oily	Fairly bright, rough soldering	Slightly disagreeable	3,176,000	
12. Dry, clean	Dry, rust in bottom	None	17,600	Rinsing water, clear
13. Dry, clean	Dry, few rust spots	Slightly disagreeable	68,800	Rinsing water, slightly turbid
14. Slightly oily	Few drops water	Slightly musty	156,800	Rinsing water, slightly turbid
15. Oily	Dry, few rust spots	Slight	17,600	
16. Slightly oily	Dry, few rust spots	None	4,608,000	Rinsing water, clear
17. Fairly clean	Dry, bright, no rust	None	16,800	Rinsing water, clear
18. Dry	Dry, bright, no rust	Slightly musty	2,000	
19. Slightly oily	Dry, very few rust spots	None	14,200	
20. Slightly oily. Bright	Dry, bright, no rust	Slightly musty	3,200	Rinsing water trace turbid
21. Dry, clean	Dry, dull color, no rust	Musty	232,000	Old can, good condition Rinsing water trace turbid
22. Dry	Dry, large number small rust spots	Slightly musty	9,216,000	Rinsing water trace turbid
23. Dry, clean	Dry, few rust spots	Slightly musty	25,600	Old can, good condition
24. Dry, clean	Dry, heavy rust on bottom	Musty	100,000	Old can, good condition Hole in cover. Wash water clear

25. Dry, clean	Dry, no rust, dull color	Musty	56,000	Old can, good condition Wash water clear
26. Dry, clean	Dry, bright	Slightly musty	000	New can
27. Dry, clean	Dry, few rust spots, dull color	Slightly musty	2,800	Old can, good condition
28. Dry, clean	Dry, no rust	Slightly musty	4,800	Old can, fair condition
29. Bright, clean	Dry, bright	Slightly musty	8,400	New can
30. Dry, clean	No rust, dull color	Musty	193,200	Old can, fair condition
31. Dry, clean	Dry, no rust	Slightly musty	528,000	Old can, fair condition
32. Dry, clean	Dry, few rust spots	Slightly musty	192,000	Old can, fair condition
33. Dry, clean	Dry, no rust	None	17,200	Old can, good condition
34. Dry, clean, bright	Dry, dull in spots	None	49,200	New can
35. Outside very rusty, dry, clean	Few rust spots, dull color	Musty	1,304,000	Old can

Summary of results of mechanical washing, steaming and drying, examination being made just after the cans had come out of the machines:

18 cans, inside dry, bright, averaged 227,000 bacteria per can.
13 cans, inside dry, rust spots, averaged 1,210,000 bacteria per can.
10 cans, giving off no odor, averaged 484,500 bacteria per can.
4 cans, giving off disagreeable odor, averaged 1,370,000 bacteria per can.
17 cans, giving off a musty odor, averaged 696,500 bacteria per can

5 cans contained over 1,000,000 bacteria per can.
1 can contained between 500,000 and 1,000,000 bacteria per can.
6 cans contained between 100,000 and 500,000 bacteria per can.
2 cans contained between 50,000 and 100,000 bacteria per can.
10 cans contained between 10,000 and 50,000 bacteria per can.
11 cans contained between 000 and 10,000 bacteria per can.

Information at hand would seem to indicate that for milk plants—

1. Mechanical washing, steaming and drying of cans is uniformly preferable to any other system.

2. Hand washing should be followed by steaming for at least thirty seconds, and cans allowed to dry before covers are put on.

3. If steaming is not practical, cans should be washed with clean water, washing powder and brush, followed by rinsing with clean hot water and by draining until completely dry.

Going back to conditions on the dairy farm, it is necesfor the producer to have—

1. An abundant supply of hot water.

2. Some form of steam sterilization.

This subject must be considered in an intensely practical manner. The initial cost and the cost of operation should be low. The operation must be simple and not take up too much time.

In considering this question, we have taken up two types of water heater already in use in several parts of the country. The first consists of a galvanized iron box, 30 x 36 x 30

inches deep, with removable cover built to hold four ten-gallon cans. This box has an outlet on one side about three inches from the bottom for drawing off water. There is a grating to fit inside the box three inches from the bottom on which the cans are to be placed. This box should be put on over a low brick furnace with a chimney made of brick or stove pipe. No grate is necessary. The method of operation consists of putting into the box sufficient water for washing and rinsing purposes; then building a good fire under the box. After the water is hot enough it is drawn off to the level of the faucet. The utensils are then washed. The water remaining in the box reaches the boiling temperature in a short time; and the utensils are then put back into the box, resting on the grating which is just above the water level. The cover of the box is then put on. As a rule no additional firing is necessary. After the fire dies down, and the box becomes cool, the utensils may be taken out. They are for all practical purposes sterile. Drying may be accomplished by inverting the cans on the box, while it is still hot, leaving an air space under each can.

The next type of heater used is built upon the principle of the hot water heating system for dwellings. The apparatus now in use in some parts of the South consists of a brick furnace with coil water heating system and a barrel for reservoir. On the lower side of the barrel there is a pipe outlet which extends into the furnace, where by a system of coils of three-quarter inch pipe it forms the grate for the fire. The pipe then extends to the top of the furnace, where it forms another coil in order to give the greatest possible heating surface. From the furnace the pipe extends to the outside where it enters the barrel reservoir near the middle of the upper half of the barrel. This is an excellent system for heating large quantites of water quickly. This outfit may be changed to include a sterilizer by adding over

the furnace, somewhat enlarged, a sterilizing chamber of brick lined with concrete. In this chamber the excess steam may be used for sterilizing purposes. Experiments have proved the efficiency and practicability of this form of water heater and sterilizer.

I shall not go into the subject of the sterilizers further, except to say that there is no longer any excuse for the producer to neglect to properly wash and sterilize his milk utensils.

The large dairy should have a steam boiler and sterilizer; the moderate producer can readily provide one of the systems described above in order to obtain both hot water and steam; the small dairy farm can get excellent results by using the cheap but efficient and simple farm sterilizer described in Farmers' Bulletin No. 748.

DISCUSSION

MR. STEVENSON. What is your opinion regarding chemical sterilization?

MR. TAYLOR. Farmers will not as a rule use chemicals intelligently.

MR. STEVENSON. Do the farmers use steam?

MR. TAYLOR. Steam is preferable to anything. Every farmer knows what steam is and how to use it.

DR. ROADHOUSE. I must endorse Mr. Taylor's position regarding the use of steam. In California caldrons are used for heating water. The records for bacterial counts are fine.

"The bacteriologist makes the diagnosis and the inspector ascertains the cause and applies the remedy."

THE NECESSITY FOR THE PASTEURIZATION OF ALL MILK

HOYES LLOYD, *Chemist in Charge of Milk Control*
Toronto, Ontario

Perhaps you have already decided that pasteurization is necessary to prevent milk from conveying infection, and yet there is not sufficient work being done to prevent milk-borne disease. As long as milk epidemics are occurring it is incumbent on us to teach that there is an important simple preventive measure within the reach of all, which when used with care will almost completely prevent the conveyance of infection from the cow to man, or from man to man. We hear of many places, even of some size, where there is no milk inspection and consequently not even this protection is afforded the milk consumer.

In Canada probably 90 per cent of milk consumed as such is consumed raw, and when this fact is considered in connection with the large percentage of tubercular dairy cows in the country it must be obvious that very many children are still exposed to bovine tuberculosis infection, and for this reason alone it behooves us to preach the pasteurization of all milk.

The idea is growing that a very considerable portion of the tuberculosis of adult life has been acquired from bovine sources in childhood, and that it has recurred after lying dormant for years. This disease, septic sore throat, typhoid, diphtheria, scarlet fever and others may all be milk-borne. Pasteurization of all milk and milk products will eliminate the danger, and nothing else will.

Three epidemics traced to milk during the past year in Canada have been reported to the Committee on "The Diseases of Man, their Relation to the Milk Supply and the Public Health," and have been dealt with by that committee in its report. It suffices to say that these three epidemics would all have been prevented by pasteurization.

Certified milk itself is not free from danger in spite of all the precautions that may be used. I recall several epidemics traced to its use and reported in the literature.

We all know that tubercular cows are sometimes found in the herds at the time of the semi-annual tests, and one only of these infected cows might become a serious source of danger during the six months between tests. In addition, not even dairy medical inspection of employees will pick out with certainty milkers who are capable of infecting the milk they handle. The presence of carriers and persons in the incubation stage of various diseases makes the protection of milk by inspection of employees extremely difficult.

The continuous and complete safeguarding of a raw milk supply so as to prevent its becoming a source of infection is, I consider, an absolute impossibility. If you believe that it can be done and done well enough, remember that epidemics of septic sore throat, diphtheria and scarlet fever have all been traced to certified milk.

The chief argument one hears against pasteurized milk is that the enzymes are destroyed. This is a difficult point to decide, although extensive work has been done on it.

Of twenty-two milk enzymes mentioned by Rosenau, five are destroyed or weakened and seventeen are unaltered by the heating of milk for some time to a temperature of 140 to 145° F. There is no reason to believe that there is any special virtue in enzymes in milk as compared to the enzymes in meat, vegetables or other foods, and most of these foods are eaten cooked. A satisfactory procedure to replace such enzymes as are destroyed in heating is to add orange juice or potato water to the milk, and both these are used in infant feeding. On the other hand, it is fortunate that a temperature of 140° F. will destroy the non-spore-bearing organisms, which include all those producing serious infection in man, without injuring materially the enzymes, whatever their real value may be.

The advantages of pasteurization have been considered of sufficient importance for the Province of Ontario to protect calves and hogs by the enforcing of a regulation requiring the pasteurization of skimmed milk and whey returned to the farms from creameries and cheese factories. Certainly all the children in the land are entitled to the same protection, although it has not been given them as yet.

One of our greatest aims in Toronto has been to get all milk pasteurized. For the last three years pasteurization has been compulsory except for certified milk. The total certified milk sold is 0.5% of the total, and I believe a considerable portion of it is heated or even boiled before use.

Although pasteurization of milk is compulsory, we have not relaxed in any way our efforts to obtain the raw milk in as good a condition as possible.

Much has been done by teaching the mothers through baby clinics the value of general hygienic measures and proper care in the preparation of the baby's food. The general improvement in the milk supply and the pasteurization of all milk has been of value, but we cannot say just what portion of the improvement has been due to it.

Other contagious disease figures are given in the following table.

DEATH RATES, TORONTO, CANADA

	Death-rate per 1,000	*Typhoid Fever p.* 100,000	*Scarlet Fever p.* 100,000	*Diphtheria per* 100,000	*Tuberculosis per* 100,000, *including deaths of Toronto people in sanitaria*
1910	13.95	40.81	23.78	41.89	121
1911	13.40	19.95	30.79	36.95	115
1912	12.76	12.13	12.13	35.96	104
1913	12.86	10.45	9.84	17.83	95
1914	11.47	7.68	6.46	16.97	96
1915	11.69	1.89	2.97	13.68	100
1916	12.61	6.81	4.26	23.40	110

	Deaths under two years per 100,000 *Total Population*
1910	441.4
1911	419.7
1912	402.5
1913	435.5
1914	341.4
1915	349.3
1916	342.5

The lowering of the typhoid death rate is largely due to the improvement of the city water supply, although the pasteurization of all milk has prevented the occurrence of milk-borne epidemics.

The possibility of infection of the pasteurized milk is largely eliminated by our regulation requiring all milk to be sold in sealed cans or bottles.

In conclusion we will consider briefly milk products. All of these milk-borne diseases can be transmitted by infected cream and probably also by ice cream. Butter and other

products can certainly transmit bovine tuberculosis. Again our remedy is pasteurization. We have succeeded in Toronto in having all cream pasteurized, and some of the butter is now made from pasteurized cream and labelled as such.

Have the farmers eliminate tuberculosis from their herds, and teach them its danger; have the milk as clean and produced and handled in as sanitary a manner as possible; and then have the milk pasteurized under strict inspection if you would make it a safe food.

"There is no military necessity which is more important than the maintenance of a healthy people."

THE VALUE OF HUMAN MILK ANALYSIS

HOYES LLOYD, *Chemist in Charge of Milk Control,*
Toronto, Ontario

Human milk analysis offers a new field of usefulness to the milk laboratory. This field may be covered by medical men who are experts in infant feeding, or by the hospitals in some places, but generally speaking there must be many localities where the analysis of human milk is not used because the medical practitioner has no laboratory at hand which is regularly doing this work, and to which he can submit samples.

Any milk laboratory can undertake this work without expense, because the equipment is already provided. *Service* has become an aim with the members of our Association, and if the members feel that they can be of further service to the physicians by testing human milk samples submitted to them, I am certain that the extra time required will be given gladly. Conservation of life has become more than ever of national importance, and this is one of the minor points in conservation which is of value now, and which will become of greater value as its use becomes better understood.

By furnishing the physician promptly with accurate analyses of human milk samples you can assist him in deciding how to treat some infants which, being breast-fed, are still not thriving. The analysis is used by the doctor in conjunction with the amount of milk which the infant receives at a feeding. He determines this amount by carefully weighing the infant before and after feeding. All guess-work concerning the amount of butter-fat, protein, and sugar which the infant is receiving is eliminated, and

the facts are at once obtained if the doctor has the weight of milk which the baby gets at a feeding, and the composition of this milk. If any correction is necessary it can now be made, and the usual ones are (1) to discontinue breast-feeding; (2) to supplement breast-feeding with modified milk; (3) to dilute the mother's milk either by increasing the flow by diet and proper hygienic measures, or by feeding the infant a definite amount of barley water or other diluent before giving it the breast.

There is no reason to believe that human milk can be varied more than cows' milk by diet, except in unusual cases, and consquently the simple changes just mentioned are the ones usually adopted. The physician may decide in some cases to change the mother's regimen, and he can decide then, by submitting several samples at intervals, whether or not the necessary improvement has taken place.

The division of child hygiene of our department has submitted about one-third of the samples which we have examined, and they have found the examination useful as shown by the following cases.

Case 1.

The infant was suffering from eczema which did not respond to treatment. The doctor submitted a sample of milk for analysis and it was found to be very rich in fat. He reported that the eczema disappeared when the child was given barley water before each breast feeding.

Case 2.

The infant was not gaining in weight. The quantity of milk was normal. Analysis showed it to contain 1.6% butter-fat and 10.03% total solids. After four weeks of improved diet for the mother the milk tested 3.9% fat and 12.98% total solids, and the infant was doing well and gaining in weight.

When we were ready to begin the analysis of human milk we advised the doctors in Toronto through the Health Bulletin. This announcement pointed out that it was necessary to take the greatest care to obtain a complete sample from one or both breasts. The samples are always taken by the physician or nurse.

The method of analysis is practically the same as for cows' milk. The amount submitted is often small, and has made a few modifications necessary. We usually determine butter-fat and total solids. The determination of protein is generally unnecessary because the amount of lactose in human milk is very constant, being from 6 to 7%. Hence the protein can be estimated by subtracting this amount from the solids not fat. If the per cent protein is required we use a Kjeldahl digestion and determine nitrogen.

The butter-fat is determined in the usual way by the Babcock test. Sometimes when the sample is small it is necessary to use less than 17.6 c. c.; we reduce the amount taken for analysis, use an ordinary Babcock bottle, and calculate the result; or we measure one or two cubic centimeters into a skim milk test bottle and calculate the result.

There are small lactometers on the market for use with human milk samples, but we have considered them too inaccurate, and always determine the total solids by evaporation.

The following table gives a summary of results for analyses made in our laboratory. These results should not be considered an average of normal human milk, as many abnormal samples are included, and some samples have probably been taken without due regard to the necessary precautions:

Year	Number of Samples	Average Butter-Fat.	Number of Samples	Total Solids
1914	27	3.05	22	11.25
1915	55	3.13	51	11.70
1916	42	2.93	42	11.45
1917	16	2.98	16	11.59
	140	3.04	131	11.53
Maximum		6.2		15.37
Minimum		0.17		8.30

Summary

1. Human milk analysis can be done in any milk laboratory.

2. It has value in certain cases.

3. It provides a means of cooperation with the physician, and may enable him at times to correct improper feeding and so save life.

THE NEED OF SOME IDENTIFICATION MARK FOR COWS REACTING TO THE TUBERCULIN TEST

SAMUEL G. SHARWELL, *Chief Dairy and Food Inspector,* Newark, N. J.

Nothing was attempted in regard to having herds supplying raw milk tuberculin tested prior to adoption of Newark's present ordinance in 1912.

For the three years after its adoption the veterinarians and dairymen sent to our Department reports of tests, and in consequence I furnished them with the identification tags which were used by the veterinarians who made the test. My understanding with the dairymen was that no tags were to be placed on reactors, but that all reactors should immediately be removed from the dairy. It was impossible for me personally to see that this was done, due to the fact that I had at that time very inadequate assistance. Our time was chiefly occupied in the collection of milk samples, investigating high bacterial counts and the scoring of dairies.

While personally making several inspections in the fall of 1915 I discovered after close investigation that the disposal of reactors and the tagging of cows was being done in a very unscrupulous manner. This prompted me to solicit aid from the veterinarian of the State Department of Health, who with the veterinarian of our Department and myself made a thorough physical examination of the cows supplying raw milk. The conditions found by us were certainly amazing. In some cases cows were described on charts which on inspection were found to be bulls; reactors tagged as healthy, and in some cases, cows were not tagged for two months after the test. In the meantime, cows from Canada were added and those were tagged as being tested by the veterinarian who made the test two

months previous. Of the 58 herds visited in two months, there were 32 positive reactors still in the herds being milked. These cows had reacted to the test several months previous.

Of the 2,007 cows examined, 92 cows were suspected of having tuberculosis on physical examination; 23 had tuberculous udders; 17 had abscesses in udders; 4 cows were being milked while suffering from septic metritis; 291 had no ear tags for identification; 1,029 had tags adopted by the Board of Health; of those, 763 were correctly tagged and 266 were incorrectly tagged, and description of the cows did not tally with the number on the last test.

Among 28 cows taken from dairies and slaughtered 10 cows were so infected with tuberculosis as to be condemned as unfit for food.

On a subsequent test of the above mentioned cows there were 163 reactors to the tuberculin test. Among 650 cows, 291 were found with no tags; 266 having wrong tags and 93 suspected of being tuberculous. One hundred and two, or 15.2 per cent, reacted.

The tuberculin test charts furnished the Board of Health from 95 dairies during 1916, representing 3,290 cows, showed 254 reactors on first test and 165 on the retest as ordered. These conditions have fully convinced me of the unscrupulous methods employed in the tuberculin testing of cows which had existed in our State in the past and the present time. This I attribute to the improper disposal of reactors, for there is no law providing for the positive identification or removal of same. It is a well established fact that in most cases, reactors are taken or sold from one dairy to another, and the only difference is a retest and a new tag.

These conditions could be overcome if there was some provision in our State laws either for their identification or removal. If a dairyman consents to have his cows tested by

the State he is reimbursed only $37.50, the maximum for any reactor. On the other hand, he may have his own veterinarian make the test, and in this case he can do as he pleases with the reactors; proof has been shown that in certain cases they sell them to a cow dealer, who, in turn, sells them to another dairyman. I have earnestly endeavored to secure the passage of an act by our Legislature to provide a means of identification of reactors which would, I believe, be best accomplished by a permanent brand of the letter "T" about two inches in height. This to be done by the veterinarian immediately after making the test.

"Tuberculosis is an economic problem which may be solved by every livestock owner."

CALCULATION OF THE NUTRITIVE VALUE OF MILK FROM ROUTINE TESTS

RUSSELL S. SMITH, *Market Milk Specialist,* U. S. Department of Agriculture, Washington, D. C.

It is a well known fact that in the laboratory routine examination of milk the analysis is usually limited to a Babcock butter-fat determination and a solids determination either by use of the lactometer reading and computing the solids by formula, or by the actual evaporation and weighing of a measured sample.

The determination of the proteid and sugar in the milk requires more time, expense and special equipment so that in some ways it is not applicable to a large number of samples.

The food value of milk, aside from its attractiveness, palatability and ease of digestion lies in its composition and the essential parts that can be assimilated by the human. Milner* states that the average coefficients of digestion for milk may run as high as 98 per cent for protein, 99 per cent for fat and 99 per cent for carbohydrates. The food value of milk has usually been based upon its fat, protein and carbohydrate content and in comparing the energy-producing constituents a milk of average composition has usually been taken.

It is the purpose of this paper to show a simple method of determining the fuel value of milk of varying compositions when the analysis is limited to the tests for butter-fat and for total solids as determined in routine practice. It will be necessary first to compute from the solids the protein and the sugar, so that energy values can be determined.

†Eckles and Shaw found that the total protein on the average represented 27 per cent of the total solids and that

*Farmers' Bulletin 363.

†B. A. I. Bulletin 155.

sugar represented on the average 37 per cent of the total solids. These figures are based on a complete analysis of milk from 11 animals of four dairy breeds through their lactation period.

*Lythgoe estimates that the relation between the solids and proteins is fairly constant at 25 per cent.

†Olson gives a formula for the approximate calculation of the protein from the solids as follows: $P = TS - \frac{TS}{1.34}$. This proves to be between 25 and 26 per cent protein when applied to the average analysis of 224 samples of known purity by Lythgoe. In view of these authorities agreeing to a fairly close degree it seems safe to use 27 per cent as determining the proteid content. This figure will then cover the seasonal and lactation period variation.

Accepting Shaw and Eckles' conclusion that sugar on the average is 37 per cent of the total solids, we can readily compute the approximate percentage of both protein and sugar.

According to Atwater‡ the energy furnished by:

Protein—	Fuel value	=	1,820	calories	per	pound.
Fats—	" "	=	4,040	"	"	"
Carbohydrates—	" "	=	1,820	"	"	"

Since the fuel value of protein and carbohydrates is the same and 27 per cent and 37 per cent of the total solids of milk apply respectively to these factors, we have a total of 64 per cent. The equation, 64 per cent of TS x 1,820 would then give the approximate fuel value found in both the carbohydrate and proteid content of milk.

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*Compositions of Milk of Known Purity.

†*Journal of Industrial and Engineering Chemistry.* 1-256.

‡Farmers' Bulletin No. 142.

Since fats have a fuel value of 4,040 calories per pound, the fuel value of the fat in milk can be computed by direct multiplication. The total fuel value of the three constituents in milk will then be as follows: 64 per cent of Total Solids x 1,820 plus the per cent of fat by 4,040.

By applying this equation to any analysis when fat and solids are given the approximate fuel value can be computed.

Milk of Known Composition			*27% Prot.*	*37% Sugar*	*Nutritive Ratio*	*Fuel Value, Calories*
Fat	*S. N. F.*	*Tot. Solids*				
3.0	8.50	11.50	3.10	4.25	1 : 3.5	255.0
3.2	8.04	11.26	3.04	4.17	1 : 3.6	260.5
3.4	8.33	11.73	3.17	4.34	1 : 3.8	273.9
3.6	8.47	12.07	3.26	4.47	1 : 3.9	286.1
3.8	8.31	12.11	3.27	4.48	1 : 4.0	294.6
4.0	8.30	12.30	3.32	4.55	1 : 4.8	304.8
4.2	8.84	13.04	3.52	4.82	1 : 4.5	322.6
4.4	8.65	13.15	3.55	4.87	1 : 4.1	316.4
4.6	8.82	13.42	3.62	4.96	1 : 4.2	341 9
4.8	8.71	13.51	3.65	5.00	1 : 4.3	354 1
5.0	8.55	13.55	3.66	5.01	1 : 4.4	358.1
5.2	8.99	14.19	3.83	5.25	1 : 4.5	375.2
Skim Milk						
0.3			3.40	5.10	1 : 1.5	165.0

The difference that will be noted in the fuel value may be slight in some instances, but when a wide variation in composition occurs it may be possible to effect a saving that is worth while by selecting the milk having the most fuel value. If there is a difference, no matter how slight, it must be remembered that such a difference may become large and the value increases with the amount of milk and frequency of use.

As an example, let us suppose that a customer is now buying one pint of milk having a fat test of 3.6 per cent

and a total solids of 12.07 per cent. Applying the equation as stated, we have:

Fat, 3.6% x 4,040 = 145.44 calories in fat.
64% of 12.07 = 7.73 sugar and proteid in solids.
7.73 x 1,820 = 140.7 calories in sugar and proteid.
145.4 calories in fat + 140.7 calories in sugar and proteid = 286.1 calories, total fuel value in 1 pint of milk.

In contrast to this let us suppose that a neighboring customer is buying milk at the same price from another milkman but this milk has a fat test of 4.6% and a solids of 13.42. Applying the same formula we have:

Fat, 4.6 x 4,040 = 185.8 calories in fat.
64% of 13.42 = 8.58 sugar and proteid in solids.
8.58 x 1,820 = 156.2 calories in sugar and proteid.
185.8 calories in fat + 156.2 calories in sugar and proteid = 342.0 calories, total fuel value in 1 pint of milk.

Here then we find a difference of 16.3 per cent or 56 calories in the fuel values of the milk which the second customer is receiving. This is nearly equal to 2 cents' worth of steak at 35 cents per pound or 1⅓ cents' worth of mutton at 20 cents a pound, or about 4 cents' worth of eggs at 40 cents a dozen, or about 5 cents' worth of chicken at 25 cents a pound.

Even with this slight difference it would be well for anyone to select the milk having the most fuel value. If we compare the fuel value of two different milks having, for example, a difference of 2 per cent in the butter-fat alone, we find an approximate difference of 104 calories, and this would be equal to about twice the value of the food equivalent just quoted.

These figures are for a pint of milk and when we bear in mind that the saving is multiplied according to the amount

of milk used, it can readily be seen that it is economy to select the milk containing the most fuel value.

The foregoing has to do with the actual composition only, but when the factors of cleanliness, low temperature and safety of the milk are considered, we enter into a field where values are of such importance that they cannot be easily and mathematically expressed.

"Truth is always present; it only needs to lift the iron lids of the mind's eye to read its oracles."

PUBLIC HEALTH STUDIES CONCERNING CHEESE

E. C. SCHROEDER, M.D.V., AND G. W. BRETT, D.V.M.,
United States Bureau of Animal Industry Experiment Station, Bethesda, Md.

The common meaning of the word cheese is an article of food of which the main ingredient is the more or less modified, coagulated casein of milk. From the sanitarian's point of view this definition could be amplified by adding that, among articles of food obtained from animals, cheese is one of the few which are customarily eaten uncooked.

Uncooked food from animals may contain, varying with its character, composition, mode of preparation, age, etc., many different kinds of organisms and the products of their growth and multiplication, and though most of the organisms and their products which occur in cheese may be swallowed with impunity, some with real or conjectured beneficial effects, a few have been proved injurious to health and even fatally dangerous. As, for example, fresh cheese may be contaminated with virulent typhoid and tubercle bacilli, and relative to bacteria, not strictly pathogenic, but dangerous because of their products, the following statement may prove both interesting and instructive: The Division of Pathology of the Federal Bureau of Animal Industry has a strain of the Bacillus Botulinus among its cultures of bacteria which produces a toxine of so much potency that a minute quantity, either swallowed with food or injected under the skin, is sufficient to kill a horse. This pernicious microorganism was originally isolated by Dr. Nevin at Albany, N. Y., from a sample of cheese which had killed a number of persons.

Nothing we know about the Bacillus Botulinus, with which we are better acquainted through its relation to sausage and meat poisoning, indicates that a combination of

extraordinary and rare conditions is necessary to enable it to multiply in cheese that has become contaminated with it. It multiplies in a great variety of nitrogenous substances, both animal and vegetable; it seems to have a fairly wide distribution, and it is now being studied as a possibly important, etiological factor in the disease among domestic animals known as forage poisoning. It is a spore-bearing saprophyte which grows best at ordinary, comfortable, room temperature, and seemingly does not multiply in the bodies of live animals because their temperature is too high. Its anaerobic character and the destruction of its toxine by degrees of heat not much greater than those required for the pasteurization of milk, and the fact that most strains produce a less potent toxine than the strain isolated by Dr. Nevin, probably have kept it from becoming a common and important danger in cheese.

Theoretically, all the contaminations which are to be feared in milk, plus those which enter subsequently in the course of manufacture, are dangerous in cheese. Practically this may be true of fresh, soft cheeses, which are eaten shortly after they are made, but not of the kinds which require some time to ripen, because pathogenic bacteria which retain their virulence in milk longer than it can be kept without decomposing, and which may live months in a bland, inert, stable substance like butter, die rapidly in cheese, and processes of decomposition, which may be associated with the formation of poisons in their earlier stages, usually reach final stages before cheese which requires some time to ripen is marketed, and it is generally recognized that the final or end products of decomposition, no matter how offensive they may be, are not dangerous. If this was not true we may be sure that those whose tongues and noses have been educated to enjoy cheese flavors which are far from pleasant to untrained organs of sense and smell would not have survived the education.

The primary and special purposes of our studies on cheese were to determine the frequency with which it is contaminated with virulent tubercle bacilli at the time it reaches the consumer; the type of the tubercle bacilli, human or bovine, with which it is contaminated, and the length of time tubercle bacilli remain alive and virulent in it.

The tubercle bacillus is an exceptionally satisfactory organism to use for observation when it is desired to gain a general idea about the fate of true, non-sporulating, pathogenic bacteria in a complex medium like cheese. Its peculiar staining qualities, its somewhat greater resistance than that of other, non-sporulating, pathogenic bacteria to germicidal agents; the characteristic lesions it causes in experiment animals, and the certainty with which the tuberculous character of the lesions it causes can be verified, collectively facilitate the ease with which we can detect it and remain on its trail, and these advantages over other bacteria are offset in their favor only by the fact that it does not multiply saprophytically, like the typhoid bacillus for example, in milk or the fluid from which cheese is made.

A study of the frequency with which cheese is infected with tubercle bacilli, to be sure, can throw no light on the frequency with which it is infected with other dangerous bacteria, but the fate of the tubercle bacillus in cheese may be accepted as an index of the fate of other, non-sporulating bacteria, and sporulating bacteria which actually serve as etiological factors of disease have not proved of sufficient importance in dairy products to make their consideration in this connection urgently necessary.

The number of samples of cheese in our investigation on which the tests are now complete is 256, and among these 19, or 7.42%, were found to be infected with virulent tubercle bacilli. The bacilli in all cases were of the bovine type.

The varieties of cheese tested and the number of samples of each, all purchased under ordinary market conditions from Washington, D. C., retail dealers, are as follows:

Cheddar	59	samples—	none	infected
Miscellaneous Varieties	3	"	"	"
Neufchatel	32	"	"	"
Cottage	31	"	1	"
Cream	131	"	18	"
Total	256	samples—	19	infected

If we divide the samples tested into two groups, the fresh and those which require some time to ripen, it becomes apparent at once that the infected condition is invariably chargeable to the fresh cheeses. That this is precisely what we should expect is proved by results obtained with cheese made from intentionally infected milk and periodically tested relative to the persistence of virulent tubercle bacilli in it, and also invariably negative results with second tests, about 60 days after the first tests, with the 19 samples of naturally infected cheese.

The cheese especially prepared to study how long tubercle bacilli remain virulent in cheese was made from whole milk, artificially infected in the following manner: A tuberculous lymph gland from a guinea-pig was crushed and ground in a sterile mortar with a small amount of sterile normal salt solution and the resulting, turbid fluid filtered through a single layer of ordinary filter paper. A small quantity of the filtrate, which had a slightly milky appearance, was added to the milk, which was then thoroughly stirred to distribute the infected material as evenly as possible. As far as we were able to determine the milk was about as heavily infected with tubercle bacilli as milk obtained from a tuberculous cow with barely discoverable tuberculous lesions of the udder.

The advantage of using a suspension made with tuberculous tissue instead of one made with tubercle bacilli from a pure culture, lies in the fact that the bacilli in tissue suspensions are evenly distributed and well separated from each other, or in the condition in which they occur in naturally infected milk, while in pure culture suspensions it is practically impossible to get them well separated, or to eliminate clumps composed of enormous numbers of bacilli glued firmly together.

Guinea-pigs were inoculated with portions of the infected cheese on the 1st, 8th, 15th, 23d, 39th, 50th, 72d, 99th and 114th days after it was made. The guinea-pigs inoculated on all days from the 1st to the 39th inclusive developed generalized tuberculosis; those inoculated on and after the 50th day remained well, showing conclusively that the tubercle bacilli in the cheese had lost their virulence sometime between the 39th and 50th days.

Regarding second tests with naturally infected samples of cheese, our method was as follows: As soon as a sample was received a portion was removed for the first test and the balance placed on ice. If the first test, which required from 50 to 60 days, was negative, the balance of the sample was discarded; but if the first test caused tuberculosis, a second test was at once made.

An interesting difference between the first and second tests with the 19 samples of infected cheese is revealed by comparing the morbidity and mortality among the guinea-pigs used, respectively, in the first and second tests, and dependent upon other causes than tubercle bacilli. But, before making this comparison, we wish to say a few words about cheese inoculation into guinea-pigs generally.

When we take small quantities of cheese and triturate them with sterile, distilled water and inject the consequent suspension or emulsion subcutaneously into a guinea-pig, the results may range in severity from a small, local lesion

to death in less than 24 hours. If the cheese is one of the kind which are eaten shortly after they are made, cream, cottage or Neufchatel, most of the inoculated guinea-pigs die very quickly of septic intoxication, septicæmia, malignant œdema or some similar cause. Those which do not die within a few days develop lesions which vary in size and character from minute pus pockets at the seat of inoculation to enormous abscesses which eventually break through the skin and discharge their often purulent and ill-smelling contents. If the cheese is one of the kind which requires some time to ripen, Cheddar for example, the death rate is relatively low and the inoculation lesions are relatively small and benign.

Now, the difference between the earlier and later, the first and second inoculations, made with the 19 samples of infected cheese, is similar to that between inoculations with fresh cheese and those which require some time to ripen.

Some of the samples of infected cream cheese which had been kept until they were converted into filthy-looking, gelatinous masses, no longer recognizable as cheese, on inoculation into guinea-pigs were practically harmless, which indicates that the prevailing belief, that the end products of decomposition are not dangerous, is trustworthy, and, in addition to this, strengthens the reasons we have for believing that the fate of septicæmia and pus-producing bacteria in cheese is similar to that of the tubercle bacillus; and this, in turn, supports our conviction that we are not going astray if we accept the fate of the tubercle bacillus in cheese as an index of the fate of other, non-sporulating, pathogenic bacteria in the same medium.

The best method with which we are acquainted to test dairy products for tubercle bacilli is guiena-pig inoculation, and the statements we have made, regarding the consequences when guinea-pigs are injected with suspensions of cheese in sterile water, show that it is essential, if we

desire to test a large number of samples of cheese for tubercle bacilli without sacrificing too many guinea-pigs or causing the little animals too much serious discomfort and pain, to use a special technique, which will suppress various microorganisms that are injurious when they enter the bodies of guinea-pigs through the skin though they may be swallowed by persons with practically no danger, and it is in this connection that the greater resistance of the tubercle bacillus to germicidal agents serves a good purpose.

After numerous tests regarding the effects of different agents on cheese, and on tubercle bacilli, and on tubercle bacilli in cheese, the following simple technique was adopted.

Thirty grams of cheese are thoroughly triturated with a freshly made, 2%, aqueous solution of sodium hydrate. Of the solution 170 c. c. are used for a soft and double the quantity for a hard cheese. The solution is added slowly while the cheese is being triturated in a beaker held partly immersed in warm water, so as to maintain a temperature of from 35 to 40° C. The warmth helps to dissolve the cheese and tends to melt and keep the fat it contains fluid. This process requires about 20 minutes and yields a homogeneous, turbid fluid, which is placed in centrifuge tubes and rotated 10 minutes at 2,500 revolutions per minute. The tubes are then taken from the centrifuge and all but the sediment discarded. If the amount of sediment is small it is simply suspended in a small quantity of sterile, distilled water and injected, subcutaneously, into two guinea-pigs. If it is large it is suspended in a larger quantity of sterile water, thoroughly shaken, and again centrifuged to get rid of the sodium hydrate it may contain in quantities too large to be safely injected into the subcutaneous tissues of guinea-pigs. The fluid from the second centrifuging is discarded and the sediment, as in the case where the amount is small, suspended in sterile, distilled water and injected into two guinea-pigs.

Among the other methods tried before we adopted this simple technique, one, in which antiformin was used instead of sodium hydrate, gave fairly good results, but was abandoned because of the degree to which antiformin varies in strength from time to time and the ease with which a fresh solution of sodium hydrate of definitely known strength can be made.

The danger from using a solution either of antiformin or sodium hydrate of unknown strength lies less in the direction of too much than too little strength. Though we decided to use a 2% solution of sodium hydrate, we know, from actual tests, on the one hand, that a 1% solution, which is permitted to act 30 minutes, is strong enough in many cases to make the sediment from samples of cheese safe, so far as other microorganisms than tubercle bacilli are concerned, for guinea-pig injection, and, on the other hand, that the exposure of tubercle bacilli in cheese to a 5% solution of sodium hydrate for 30 minutes is not sufficient to kill them. And we might add, we have also found some samples of cheese the sediment of which, after an hour's exposure to a 10% solution of sodium hydrate, kills guinea-pigs injected with it in 48 hours or less. Deaths in this case are due to malignant œdema, the microorganism of which is harmless when it enters the body through ingestion.

Our simple technique has been defined in some detail because it is eminently desirable that samples of cheese purchased elsewhere than on the market immediately within our reach should be tested for tubercle bacilli, and because it is hoped that some of those now present may have the will and facilities to make such tests.

The amount of sediment obtained from samples of hard cheese, or the kind which requires some time to ripen, as a rule, is doubly as voluminous as that from samples of soft, fresh cheese; hence, the fact that guinea-pigs injected with the more abundant sediment from carefully weighed masses

of hard cheese rarely die or have serious, local, injection lesions while those injected with the less abundant sediment from equally heavy masses of soft, fresh cheese show a fairly high mortality, is worth recording, as it gives us another proof that the wholesomeness of cheese, as far as this is affected by pathogenic bacteria, improves with age.

The sediment obtained from every sample of cheese included in our tests was examined both macroscopically and microscopically; the examinations revealed many different kinds of bacteria, fungi, mycelium, pollen grains, seeds, fragments of vegetable matter and more or less amorphous material. Nearly every sediment contained a greater or lesser amount of a black substance which had the appearance of lampblack or fine coal dust; in many cases fragments of wood and minute shreds of cloth were found; in a lesser number fragments of flies and other insects; in a few the wing cases of beetles, and in one case mouse feces. The practical conclusion to be drawn from these examinations is that greatly varying degrees of care and cleanliness are practiced in different cheese factories, and that great improvement in this respect is possible in some of them.

Bacteria, other than pathogenic organisms, and cheese, are inseparable; an occasional fragment of wood or shred of cotton cloth should reasonably be expected in cheese, but fragments of insects, wing cases of beetles and mouse feces are not pardonable or tolerable contaminations in any article of human food.

That official supervision of cheese factories may effect much good is casually indicated by our work. When it became known that cheese currently sold by retail dealers at Washington, D. C., was contaminated with virulent tubercle bacilli, the Federal Bureau of Animal Industry, through its Dairy Division, immediately undertook measures to correct the evil. The measures in question, together with the moral influence of the interest shown by a great Bureau

of the Government, as nearly as we could calculate, became effective about the first part of April of this year. The accuracy of our calculation as to the time was later confirmed through consultation with members of the Bureau's Dairy Division staff. Now, beginning April 3, 1917, we periodically purchased samples of cheese of the variety which had been found to be contaminated with tubercle bacilli. The total number of samples purchased on which our records are complete is 33, and from these 66 guinea-pigs were injected. Among the 66 guinea-pigs only 2 premature deaths followed the injections. In contrast to this, 20, or ten times as many, premature deaths occurred among the 66 guinea-pigs injected from the last 33 samples of the same variety of cheese purchased and tested prior to April 1, 1917.

We must not erroneously assume that the proportion of premature deaths among cheese-injected guinea-pigs is a reliable measure of the presence or absence of factors which perniciously affect human health, but we may reasonably assume that, as the proportion of premature deaths increases, the likelier it is that the cheese in question was manufactured under conditions which facilitate the introduction of contaminations of all kinds, including those which are injurious to health.

We must now return for a moment to the statement regarding the varieties of cheese tested and the number of samples of each found to be infected with tubercle bacilli, because there is one point which merits special attention.

Leaving the samples of cheese of the varieties that require some time to ripen before they are marketed out of consideration, none of which were found to be contaminated with tubercle bacilli, we have 194 samples of fresh cheese, which may be divided as follows:

One hundred and thirty-one samples of cream, 18 or 13¾%, infected with tubercle bacilli.

Thirty-one samples of cottage, 1 or 3¼%, infected with tubercle bacilli.

Thirty-two samples of Neufchatel, all free from infection.

The samples of cream cheese included 9 which were marked "Pasteurized," and among these not one was infected; hence, we may subtract them from the 131 samples, which leaves 122, of which 18, or 14¾%, were infected with virulent tubercle bacilli.

If we take the 32 samples of Neufchatel and 31 of cottage cheese and add them together, it gives us 63 samples of which only one, or 1½%, was infected.

The pertinent question suggested by these figures, and which we have already been asked to answer, is this: "If one variety of soft, fresh cheese is so frequently infected with virulent tubercle bacilli, why is it that other varieties, which are marketed just as early after they are made, are so rarely infected?"

We admit, as there are no reasons for believing that some varieties of cheese are currently made from cleaner and better milk, or under cleaner and better conditions, than other varieties, that the difference in the frequency with which different varieties of soft, fresh cheese are shown by our work to be contaminated with virulent tubercle bacilli is at first a little puzzling. But you will probably find the following explanation for the difference both simple and convincing:

Cream cheese, or the variety among which 14¾% of infected samples were found, to judge from the amount of butter-fat our tests showed it to contain, is made from whole milk with the addition of some cream.

Cottage and Neufchatel cheeses, on the contrary, with a few exceptions among our samples, are made of skim milk; and, to judge from the amount of fat obtained in our centrifuge tubes, it is a pretty thoroughly skimmed milk.

Now, when milk is centrifugalized, or only permitted to stand undisturbed until the cream has risen to its top, it separates into three distinct layers—cream, skim milk and sediment. If the milk is infected with tubercle bacilli and we make microscopic examinations of the three layers, we find that the bacilli have left the middle layer or the skim milk and have become concentrated in the cream and sediment. Hence, cream cheese contains all the tubercle bacilli which may be present in the whole milk from which it is made plus those which may have been concentrated in the added cream from other milk while cottage and Neufchatel cheeses, at most, contain only the greatly reduced number of tubercle bacilli which may, somehow, have been reintroduced from the cream and sediment into the skim milk of which they are made. The sediment here referred to is the equivalent of centrifugal slime in cream separators.

In the one case we have skim milk, cream, sediment and added cream, and in the other milk less the cream and sediment, which clearly justifies the conclusion that, while tubercle bacilli may be a common contamination in cream cheese, they should be of rare occurrence in cottage and Neufchatel cheeses, and this is precisely what our tests show to be the case. We may say regarding the one sample of infected cottage cheese included in our tests that it was evidently made with milk obtained from a dairy herd in which some cows are far advanced cases of tuberculosis, and, most likely, one or more have tuberculous udder lesions.

In a precautionary sense we wish to say, the tendency of tubercle bacilli in milk to rise with the cream and to sink with the sediment and to pass from the intermediate layer or the skim milk must not be taken too hastily as an argument to prove that skim milk is a germ-free fluid. The conduct of the tubercle bacillus in milk may be wholly unlike that of other bacteria, and this must be apparent at once to those who keep in mind that the movements of bacteria

in an emulsion or other fluid may be greatly influenced by their lack or possession of independent motility. It is questionable, even if it should prove possible to eliminate tubercle bacilli entirely from skim milk through centrifugal processes, whether the same could be done with more or less actively motile bacteria, such as the members of the so-called colon group, which includes typhoid, paratyphoid, enteritides and other dangerous bacilli, most of which, unlike the tubercle bacillus, multiply in milk.

But, though we would like to say much more on this subject, we do not wish to impose too much on your patience, and therefore will trouble you now only long enough to listen to several conclusions which our studies seem to warrant.

1st. We may safely say, and we say it with great satisfaction, that cheese of the kind which requires some time to ripen rarely if ever contains true, living, pathogenic bacteria when it is marketed, and it does not seem likely that such cheese is apt to contain dangerous products of bacterial origin.

2d. Cream cheese, which is an elegant, palatable, nutritious article, recommended by many physicians as excellent food for children and invalids, until quite recently was heavily contaminated with tubercle bacilli of the bovine type, or tubercle bacilli of the kind which have their origin in the bodies of tuberculous cattle.

That children are attacked by bovine tubercle bacilli is now an undisputed fact, which no one acquainted with the evidence on which it rests seeks to controvert. That invalids are more liable than healthy persons to be attacked by disease germs is a matter of common and reasonable belief. It would be a great pity if we should have to advocate the withdrawal of cream cheese from the list of foods particularly valuable for children and invalids; hence, we should strive to have all cream cheese made, either from pasteur-

ized milk and cream or from milk and cream obtained from cows which have been proved free from tuberculosis.

The proper pasteurization of the milk and cream used in making cream cheese would accomplish something more than the elimination of virulent tubercle bacilli; it would also destroy dangerous germs of the colon and septicæmia groups, which are not at all uncommon in milk, and the presence of which in food no sanitarian can view without alarm.

3d. Cottage and Neufchatel cheeses, which could reasonably be used much more commonly than is now the case, and the commoner use of which is now urgently desirable as a food conservative measure, are much less frequently infected with tubercle bacilli than cream cheese. But this should not be used as a reason for making them from raw milk. The facts that they are at times contaminated with tubercle bacilli and that the centrifuge or cream separator, which tends to eliminate tubercle bacilli from skim milk, cannot be taken, off hand, as doing the same thing with the dangerous germs of the colon group, or the bacteria which have independent motility, are sufficient reasons to make it desirable that all milk used in the manufacture of cottage and Neufchatel, and all other varieties of fresh cheese, should be pasteurized. One might ask here: Why temporize with disease germs in dairy products when we can pasteurize and kill them?

4th. The foreign matter discovered in some samples of cheese prove that more cleanly methods of production from the cow to the finished product are desirable. With this we do not wish to condemn all cheese factories as unclean, because this would be a serious and unjust mistake, as not all the samples of cheese we examined, or even a large proportion, revealed contaminations which are directly chargeable to carelessness and lack of proper cleanliness.

Official supervision of cheese factories probably would eliminate fragments of flies and various insects from cheese, as well as other equally unappetizing contaminations.

5th. It seems to us as a whole, that cheese, so far as disease germs are concerned, with the possible exception of cream cheese, is a fairly safe article of food; and, regarding cream cheese, it is our intention to make frequent, periodic tests, and to base such action on the conditions shown by these tests, that we will soon be able to say that this article of food, excellent alike for the weak and the strong, the healthy and the sick, and for children and adults, is safe.

"He who cures a disease may be the skilfullest, but he that prevents it is the safest physician."

THE ERADICATION OF TUBERCULOSIS FROM CATTLE AND SWINE

DR. J. A. KIERNAN, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

One of the most serious problems confronting the live-stock owners of America today is tuberculosis; and its seriousness is emphasized by the fact that it is transmitted to human beings.

This disease is on the increase not only among the herds of cattle and swine where it has prevailed for many years, but it is encroaching on territory where its presence heretofore has been known only to a comparatively slight degree.

It exists among cattle and swine in every State, but there is substantial evidence to indicate that the percentage of tuberculous cattle and swine in certain States is very large, whereas in others it is confined chiefly to the dairy herds within a short radius of cities, and to the beef herds which have been augmented by recent importations of cattle from other States.

From these localities it will spread, unless controlled, until practically all of our cattle and swine herds are diseased.

The data furnished by the Meat Inspection Division of the Bureau of Animal Industry should cause concern to live-stock producers as it will to the public at large.

At the 883 official establishments in 253 cities and towns where Federal inspection is maintained there were slaughtered during the year terminating June 30, 1917, 40,000,000 swine, and, of that number, 3,974,000 were on post-mortem examination found affected with tuberculosis. Practically ten per cent of the total killed were affected with the disease. The percentage of tuberculosis found at the same establishments the year before was about nine, and during the previous year it was less.

These figures are serious challenging facts that put the matter clearly up to the livestock producers. It is for them to decide whether the plague shall go on increasing, or whether it shall be placed under subjection.

During the 1917 fiscal year 203,193 cattle were on post-mortem examination found affected with tuberculosis.

These losses were sustained by the people on the farm.

The hay, corn, grass and other feeds given to these animals was not put to efficient use.

The producer and feeder who is aware of the presence of tuberculosis among his cattle is unjust to himself in cherishing the thought that it is unknown to others.

His stock is marked on every market; and his neighbors' stock, too. They suffer financially because their products are sold on the basis of a certain amount of waste.

Tuberculosis of cattle and tuberculosis of swine are usually found together where both classes of stock are kept on the same farm. If the cattle are free from the disease, the hogs are usually healthy.

In localities where hogs are fed skim milk from creameries the largest percentage of tuberculosis is found.

As a rich nation, we can stand the annual losses caused by tuberculosis, but the future generations will be taxed dearly for our neglect if we go blindly on, unmindful of our obligations to preserve without blemish the inheritances we are now enjoying. If this generation were to leave behind it tumbled-down schoolhouses, wrecked bridges, impassable roads, corrupt society and a bankrupt treasury our age would be marked as one of inefficiency.

Our livestock industry is an institution no less than our banks, schools, churches and homes, and we who despoil it are as wanton as the man who mines his farm, striving only for immediate gain, and unmindful of posterity. The aspiration of every sane, high-principled human being is to leave to posterity a mark of improvement upon his handi-

work. He would hang his head in shame who was accused of degenerating his race; but there are those who have been entrusted with the nation's livestock resources and who through stealth and deceit vitiate it for the moment's gain.

Tuberculosis is an economic problem which may be solved by every livestock owner. We cannot hide behind the cloak of misfortune and claim immunity on the ground of our inability to prevent the infliction of fate.

It does not pay to raise cattle and swine to be the prey of tuberculosis. It will not pay to turn over to the coming generations our herds reeking with disease.

Tuberculosis should be eradicated because it is a preventable disease. We tolerate it only because it is a habit some of us have acquired.

Twenty years from now a cow that cannot stand up under a tuberculin test will not be worth twenty cents on the dollar.

How Does Tuberculosis of Cattle Relate to Public Health?

Dr. A. Phillip Mitchell, Edinburgh, in his report pointed out that of 72 cases of tuberculosis of the cervical glands of children, in 65 instances, or 90 per cent, the bovine bacillus was present, and in seven cases, or ten per cent, the human bacillus. In children under five years, bovine bacilli were found in 36 cases, and human bacilli in three cases. In children between five and twelve years of age the bovine bacillus occurred in 30 cases and the human bacillus in four cases. Dr. Mitchell also states that in a series of cases under consideration 84 per cent of the children under two years of age were fed upon unsterilized cows' milk from birth, and that probably the drinking of tuberculous cows' milk was the source of infection.

The Commonwealth Committee of Australia reports that undoubtedly infection of human beings from animal sources

has been very common, and is still more prevalent than it should be.

Bovine animals infect through milk and imperfectly cooked beef, while pigs infect through imperfectly cooked pork.

These phases of the tuberculosis problem have been thoroughly discussed in many official reports, and the principal facts are now very well understood.

One of the important facts recorded by the British Royal Commission was that not only does a cow showing visible external lesions of the udder secrete tubercle bacilli in the milk, but a cow that is affected by generalized tuberculosis may also, and frequently does, secrete tubercle bacilli in the milk. The bovine type of the bacilli is especially responsible for tubercular affections of the glands, the bones and the joints. There can be no doubt concerning the damage done, especially to young children, by tubercular infection of the bovine type from milk, and these childhood infections are of the kind which renders them in their early life cripples or chronic invalids.

Relation to Milk Supply

Although milk is usually infected with tubercle bacilli when it is taken from the cows with tuberculous udders, it may, through contamination with feces and uterine discharges, be infected when drawn from cows with open lesions in the respiratory tract or organs of reproduction.

It is reported by Dr. C. J. Sandwith, Veterinary Inspector in the Bureau of Animal Industry, Seattle, Wash., that one of the reactors to the tuberculin test applied by him in the summer of 1917 at Kodiak, Alaska, showed generalized lesions of tuberculosis including lesions upon the nasal mucous membranes. This location of tuberculous lesions is unusual, and the cow would probably act as a dangerous

disseminator through the medium of infecting the water trough, or the feed trough, or the salt lick.

In addition to the direct elimination of tubercle bacilli from the udder, with the milk, cows with glandular or pulmonary tuberculosis in which the lesions are discharging into the bronchi, eliminate tubercle bacilli with saliva and the feces.

Dr. Schroeder, of the U. S. Bureau of Animal Industry, reports that 40 per cent of tuberculous cows expel tubercle bacilli from their bodies in a way that is dangerous to the health of other animals and persons.

Bang tested the milk of tuberculous cows whose udders were sound and found 16 per cent positive.

H. C. Ernst found by animal inoculation that 42.8 per cent of thirty-six cows examined were giving off tubercle bacilli in their milk. Five out of twelve calves, and two out of five pigs, fed with similar milk, became tuberculous.

In another experiment the milk of thirty-six tuberculous cows with healthy udders was found by animal inoculation to be tuberculous. Five out of ten pigs, and eight out of twenty-one calves became tuberculous when fed with this milk.

McFadyean and Woodhead found the milk and juice from fourteen out of nineteen tuberculous udders to contain tubercle bacilli. Two out of thirteen cases were positive when the udder was not visibly affected.

K. Obermuller found that 38 per cent of the animals he injected with cream and sediment of centrifuged milk died of tuberculosis.

The Presence of Tubercle Bacilli in Butter

Schroeder and Cotton, of the Bureau of Animal Industry, have shown that living tubercle bacilli will retain their infectious properties for at least 160 days in salted butter when kept without ice in a house cellar.

No dependence should be placed upon the action of the salt that is added to butter as an agent in the destruction of tubercle bacilli. It has been shown that the effect of salt, as commonly used in the manufacture of butter, is very slight at best.

The collective investigations of several Europeans show that of 498 samples of market butter tested, 76 samples or 15 per cent contained tubercle bacilli.

Cheese

It has been shown by many investigators that the tubercle bacillus not only retains its life, but also its virulence in cheese for a considerable period of time.

Tuberculous cattle are the principal source of tuberculosis in hogs, the disease being transmitted readily by feeding the hogs on unpasteurized dairy products, and by allowing hogs to follow such cattle in the feed lot, and to feed upon the undigested grain in the droppings.

That hogs which are fed on garbage may become tuberculous and in many cases unfit for food, or may be maintained free from tuberculosis, is well set forth in the following observations, which have come to the notice of the Bureau:

Charles Miller & Co., Establishment 517, in the year ending 1911 slaughtered 2,199 hogs which had been fed on garbage from New York hotels. This garbage had been sterilized at the establishment and all hogs thus fed were free from tuberculosis. No other feed was used excepting a short finish on stale bread.

During the same period 34,295 hogs were slaughtered at the same establishment, which were purchased from outside sources. Two hundred and fifty-three were affected with tuberculosis.

Bureau inspectors report 30 per cent of the hogs in a lot which had been fed upon city garbage in Philadelphia to be affected with tuberculosis. Cultures obtained from two spleens showed tuberculosis of human type.

In an investigation of hogs fed on garbage from the kitchen of the tuberculous section of an insane asylum, lesions of six tuberculous hogs were submitted to the laboratories. Two showed human type tubercle bacilli while four showed bovine type.

In Bureau letter of October 27, 1911, to Mr. M. N. Baker, Editor of *Engineering News*, New York City, it was stated that reports received by the Bureau concerning the feeding of unsterilized garbage showed from twenty to forty per cent of the hogs to be affected with tuberculosis. Some cases appeared to be of the human type.

The Chief of the Bureau in a letter to Dr. Henry Busman, Denver, Colo., dated November 24, 1911, said: "The position which I am assuming regarding the feeding of garbage to hogs is that selected and sterilized garbage is of considerable economic value in the feeding of hogs and if proper piggeries are provided, that it should be permitted fed under the above conditions."

Dr. Rishel, Los Angeles, Cal., submitted several reports to the Bureau of post-mortem examinations made at that station, as follows:

December, 1910, 80 garbage-fed hogs slaughtered; 16 tuberculous.
November, 1910, 287 garbage-fed hogs slaughtered; 69 tuberculous.
September and October, 1910, 252 garbage-fed hogs slaughtered; 86 tuberculous.
November 26, 1909, to July 18, 1910, 39,928 other than garbage-fed hogs slaughtered; 1,044 tuberculous. Per cent infected, 2.61.
November 26, 1909, to July 18, 1910, 1,960 hogs fed unsterilized garbage slaughtered; 210 tuberculous. Per cent infected 10.71.
Another report from Los Angeles, Cal., shows:
290 garbage-fed hogs slaughtered; 98 tuberculous. Per cent infected 33.79.

The question now is: "What are we going to do about it?"

Tuberculosis can be eradicated from all the cattle and all the swine in this Union. To support such a broad assertion there is an abundance of evidence, obtained

through the school of experience covering a period of several years. Tuberculosis has been eradicated from hundreds of herds in the District of Columbia, Virginia, Maryland and other States. It has been practically exterminated from comparatively large, circumscribed areas.

Furthermore wherever and whenever an effort has been made to eradicate the plague and the earnest cooperation of the livestock owners and officials has been obtained, success has never failed to crown the enterprise. Herds of cattle, which, at the inception of the campaign, contained 75 per cent of diseased animals, have been freed of the malady and remain as free herds. Herds which, on the first test, were found free of disease, have, by the prudent care of their owners, been kept free of tuberculosis.

The experience the Bureau has had, as outlined here, has been enjoyed by the officials of some States. The preponderance of successful experiments, if we may call them such, is convincing proof that when conditions are favorable, tuberculosis may be eradicated.

What Constitutes Favorable Conditions?

The same state of mind of the people that obtained in the early "nineties" when pleural pneumonia was eradicated; in 1902, 1908, 1914 and 1915 when foot-and-mouth disease was eradicated. The same spirit that pervaded the Western States during the cattle and sheep scabies eradication campaign—the same spirit that has aided in the eradication of hog cholera. The same state of mind, the same earnest, hearty, wholesome and substantial cooperation that has made Texas fever eradication the success it is. The American people can eradicate tuberculosis, or prevent its eradication, or increase its presence. Whenever the people of a county decide to get rid of all the tuberculosis among cattle and swine they can accomplish that work in a comparatively short time at a moderate cost, as is shown by the following

tables covering the work in the District of Columbia and the States of Maryland and Virginia:

VIRGINIA, PERCENTAGE OF TUBERCULOUS CATTLE

Year	*Original Herds*	*Annual Tests*
1910	18.27%	4.45%
1911	13.72%	3.79%
1912	17.29%	3.02%
1914	10.14%	3.49%
1915	16.91%	3.48%
1916	7.08%	3.57%
1917	6.39%	1.40%

MARYLAND, PERCENTAGE OF TUBERCULOUS CATTLE

Year	*Original Herds*	*Annual Tests*
1910	15.74%	2.58%
1911	20.02%	5.17%
1912	21.42%	3.64%
1914	11.21%	3.64%
1915	21.97%	3.15%
1916	9.90%	2.53%
1917	12.33%	2.58%

DISTRICT OF COLUMBIA, PERCENTAGE OF TUBERCULOUS CATTLE

Year	*Per Cent*
1910	18.87%
1911	3.20%
1912	1.29%
1915	1.75%
1916	1.10%
1917	.84%

In 1917 the number of cattle tested by the Bureau is as follows:

RESULTS OF COOPERATIVE TUBERCULIN TESTING OF CATTLE, FISCAL YEAR 1917

	Total	*Passed*	*Reacted*	*Percentage of Reactors*
Indian Schools	413	386	27	6.50%
Virginia:				
Original Tests	3.712	3.477	235	6.33%
Annual Retests	8.329	8.212	117	1.40%
Total	12.041	11.689	352	2.92%
District of Columbia	1.060	1.051	9	.84%
Interstate Entries	.388	.365	24	6.44%
Total	1.448	1.416	33	2.27%
Purebred Herds:				
Original Tests	2.452	2.351	101	4.11%
Annual Retests	2.034	1.978	56	2.75%
Total	4.486	4.329	157	3.50%
Grand Total	20.101	19.458	645	3.21%

STATISTICS RELATIVE TO THE ERADICATION OF TUBERCULOSIS FROM THE DISTRICT OF COLUMBIA FOR THE FISCAL YEARS 1910-1917

Fiscal Year	*Total Number Cattle Tested*	*Percentage* Reacted*
1910	1,701	18.87
1911	1,967	3.71
1912	1,390	2.30
1913	1,534	1.83
1914	1,628	2.03
1915	1,078	1.75
1916	1,184	1.10
1917	1,060	.84
	11,542	4.08%

Reactors Found

Fiscal Year	*Rule 1*	*Rule 2*	*Rule 3*	*Total*
1910	5	238	65	308
1911		20	1	21
1912		5		5
1913		17	3	20
1914		28		28
1915	1	6		7
1916	1	9	1	11
1917	1	2	2	5
	8	325	72	405

*Percentages based on total number reactors, some of which were not appraised.

Average Appraisal		$46.48
Average Butcher's Price	$21.08	
Average Indemnity	$13.41	
Average Amount Received for Each Animal		$34.49
Average Difference Between Appraised Value and Amount Received		$11.99

Fiscal Year	No. of Cows	Total Appraisal	Average Appraisal	Total Butcher's	Average Butcher's	Total Indemnity	Average Indemnity
1910	308	$14,167.50	$45.99	$6,018.33	$19.54	$4,276.32	$13.88
1911	21	985.00	46.90	321.50	15.26	446.50	21.26
1912	5	230.00	46.00	100.00	20.00	84.00	16.80
1913	20	945.00	47.25	491.29	24.56	194.71	9.73
1914	28	1,375.00	48.75	961.00	34.28	189.00	6.75
1915	7	350.00	50.00	165.00	23.57	125.00	17.85
1916	11	522.50	47.50	312.50	28.41	130.50	11.86
1917	5	250.00	50.00	169.20	33.84	25.80	5.16
	405	$18,825.00	$46.48	$8,538.82	$21.08	$5,471.83	$13.41

The campaign of eradicating tuberculosis has been taken up in three projects as follows:

Eradication from Purebred Herds of Cattle

Purebred cattle are shipped from State to State for breeding purposes and through them tuberculosis has been introduced into many herds previously healthy. It is proposed to tuberculin test purebred herds of cattle, and such herds as are found healthy may be classed as "Accredited Herds." It is proposed to publish a list at frequent intervals, containing the names of the owners of these herds. This will enable prospective purchasers to select animals for breeding purposes out of herds proven to be free from tuberculosis; and purebred herds not recorded on the "Accredited" list will be somewhat at a disadvantage, for the reason that prospective purchasers will prefer to invest

their money in animals proven to be healthy. At this time there are quite a number of purebred herds under Government supervision, which have been tuberculin tested, and found to be apparently free from the disease.

Eradication from Circumscribed Areas

It is proposed to take up systematic eradication work in a given area, probably consisting of one or two counties. The work will extend county by county until the entire State has been freed of the disease.

Eradication of Tuberculosis from Swine

It will be comparatively an easy task to eradicate tuberculosis of hogs by controlling tuberculosis among cattle; and by sterilizing all garbage or feed, containing milk products, fed to hogs.

In taking up tuberculosis eradication work in a circumscribed area it is the intention of the Bureau to carry on an educational campaign in that locality until every livestock owner is thoroughly acquainted with the subject, the possibility of eradicating the disease, the probable cost and every other feature connected with the campaign that can be foreseen. It is possible that the matter will then be submitted to the vote of the people of the county. If a majority of the voters of the county signify their willingness to have the campaign carried on steps will be taken to obtain from the county Board of Commissioners an appropriation to employ inspectors to cooperate with State and Federal forces. When all preparations have been made the inspectors will be assigned to duty, and the tuberculin test will be made of all the cattle over six months old in that county. Such animals as react to the tuberculin test will either be slaughtered or placed in quarantine, isolated from

the balance of the herds to which they belong. After disposing of the reacting animals, the premises where they were located will be cleaned and disinfected; that is, the barns, sheds, stalls and stanchions will be thoroughly disinfected. Herds which are found to have contained a considerable number of reactors will be retested at the expiration of six months. The balance of the herds will be tested annually thereafter until the disease has been entirely exterminated.

At the outset of the work a quarantine will be placed around the area and regulations issued by the State requiring that all cattle brought into such area, excepting such cattle as are brought in from "Accredited" herds, or for immediate slaughter or for feeding, shall be placed in quarantine and retested at the expiration of 90 days.

No plan has, as yet, been made to indemnify owners for cattle destroyed on account of tuberculosis, but it would seem that an equitable plan of adjusting the loss will be on a cooperative basis involving the owner of the cattle, the county in which they are located, the State and the Federal Government.

Perhaps it will be satisfactory to appraise diseased cattle at a maximum amount of $100 per head for grade animals and $200 per head for purebred animals. Of the amount of the appraisement each of the four cooperating forces should bear one-fourth of the loss. If the cow appraised at $100 is slaughtered, and the carcass is passed by the Meat Inspection Service for human consumption and the total amount received for the meat, hide, tallow and other parts amounts to $60, there would be a balance of $40 to be made up. Of that amount the owner of the cattle should bear a loss of $10 and the County, State and Federal Government each pay $10 to make up the total of the appraised amount.

Should the reacting animal be condemned as unfit for food and the only salvage obtained was the value of the hide

which, we will say, amounted to $8.00, there would be a balance to be made up of $92, one-fourth of which should be borne by the owner, and the balance made up by the County, State and Federal Government each paying one-fourth of the amount. The same plan of adjusting the loss in the case of purebred animals would apply.

The Tuberculin Test

The subcutaneous tuberculin test, when applied by an expert under favorable conditions, has been found by thorough autopsies and microscopic examinations to be extremely accurate. Statistics generally given are not reliable for the reason that tuberculin is charged with its own mistakes, the mistakes of veterinarians applying the test, and the mistakes of the veterinarian conducting the post-mortem examinations upon reacting animals. The test, as ordinarily applied, shows quite a number of inaccuracies; this in part due to the carelessness of those applying the test; but in the greater part due to an insufficient dosage of tuberculin. In general testing the failure is not so much in classing non-tuberculous cattle as reacting, but rather in classing tuberculous animals as non-reactors. These animals in certain instances do react under the application of a small dose of tuberculin. A partly arrested lesion of tuberculosis may respond at any time ranging from the 16th to the 72d hour following its injection. The efficacy as well as the reliability of the tuberculin test is in some measure dependent upon the herd owners and managers. These persons must not only be intelligent but honest as well. The subcutaneous tuberculin test is the only method recognized by the United States Department of Agriculture because it has been found the most reliable. Experiments are being carried on by the Bureau which may in time evolve other methods of applying the test.

"The birth of science was the death of superstition."

CONSERVATION OF LIVESTOCK BY CONTROLLING ANIMAL DISEASES

DR. JOHN R. MOHLER, *Asst. Chief,* Bureau of Animal Industry, U. S. Dept. of Agriculture, Washington, D. C.

Of the various problems now confronting the people of this country the problem of national preparedness stands paramount. To the lay mind such preparedness refers to the naval and military equipment and armament, but to the livestock sanitarian preparedness means the health and physical condition of our livestock and the healthfulness and wholesomeness of our animal food products. As guardians of the health of livestock and of the purity of their food products it is fitting for the members of this Association to receive at this time a brief statement regarding preparedness by the conservation of our livestock through the elimination of preventable losses from animal diseases. The international conflict in which our country is now engaged has made it necessary for us to increase our production of livestock in order that we and our allies may not be handicapped by an insufficiency of animal food products in our joint effort to establish a lasting peace. The world's decrease in cattle since the beginning of the war already totals over 28,000,000 head and as the war goes on there will ensue a continued reduction of the capital stock of food-producing animals. This involves not only the world's supply of meat and dairy products, but likewise animal fats, industrial fats, wool and hides. It, therefore, becomes essential for the future welfare of our country that our herds be increased not only that we may meet our present day problems, but that we may be in readiness to meet the enormous demands that are inevitable at the conclusion of the war.

The present campaign of increased animal production is closely interlocked with the control of animal diseases and the effect of such control upon increased production will be readily observed by a study of the benefits obtained by the eradication of contagious pleuro-pneumonia from the United States in 1892, the successful eradication of foot-and-mouth disease in 1902, 1908 and 1915, and by the control of such other expensive animal plagues as Texas fever, scabies of cattle and sheep, hog cholera, dourine, etc.

In the Annual Report of the Secretary of Agriculture for the fiscal year 1915 the direct losses from animal diseases were estimated at $212,000,000 for the previous year, subdivided as follows:

Hog cholera	$75,000,000
Texas fever and cattle ticks	40,000,000
Tuberculosis	25,000,000
Contagious abortion	20,000,000
Blackleg	6,000,000
Anthrax	1,500,000
Scabies of sheep and cattle	4,600,000
Glanders	5,000,000
Hemorrhagic septicemia and other diseases	22,000,000
Parasites	5,000,000
Poultry diseases	8,750,000

Disregarding glanders and making allowance for other diseases that may affect horses and mules it is evident that the annual losses of food animals may be placed at not less than $200,000,000. Most of these losses, probably to the extent of $175,000,000, are preventable. Some diseases may be prevented by the intelligent action of individual farmers, while others must be dealt with through systematic and organized campaigns under Government and State direction. Even in the latter class, however,

the cooperation of individual farmers is necessary. The systematic eradication of animal diseases calls for executive action such as quarantine, inspection, systematic treatment, etc., but there must be at the same time the dissemination of information among stock owners and the intelligent application of sanitary methods on the farm. Measures already taken have succeeded in the past several years in substantially reducing the loss from animal diseases, and there is good prospect that the continuation of such work will bring about further material reductions within the next few years.

The most striking example of what has been and may be accomplished in the systematic stamping out of animal diseases is the campaign for the eradication of the Southern cattle ticks. These parasites, by transmitting a disease known as splenetic or Texas fever, and by keeping the infested cattle in poor condition, are responsible for direct losses calculated at $40,000,000 and for far greater indirect losses. In a little more than ten years the area infested by these ticks has been reduced from 728,565 to 416,553 square miles, the area freed of ticks amounting to 312,012 square miles, or 43 per cent of the whole. The ticks are eradicated by the systematic and repeated dipping of the cattle in an arsenical solution. The cost of eradication has been found to be from 18 to 50 cents per head of cattle, while the increased value of each animal is greatly in excess of this, one inquiry having resulted in an estimated average increase of $9.76 per head. The work is now being prosecuted on a larger scale and with more vigor and general cooperation than ever before, and it is reasonable to expect that more rapid progress will be made within the next few years. The success of this work not only stops the losses caused by the ticks, but enables the country to increase and extend the cattle industry, with increased pro-

duction of meat and dairy products, and with great benefit to general agriculture.

The parasitic diseases known as scabies of sheep and cattle, caused by two species of similar mites, have also been successfully attacked by dipping infested stock in solutions that destroy the parasites but do not injure the animals. The work of eradicating these diseases is far advanced, and losses that formerly occurred have been largely eliminated. The diseases at one time prevailed throughout most of the region west of the Mississippi River, but have now been restricted to comparatively small areas, and it is likely that the eradication will be practically completed before long.

The disease known as blackleg destroys cattle in certain parts of the country, always attacking the animals that are the most thrifty and that have been making the most rapid growth. Purebred and high grade cattle are most often victims of its attacks. Organisms causing blackleg become established in low, swampy lands and may remain there in a virulent condition for several seasons. Lowlands subject to inundations may also be sources of danger to cattle for long periods of time. In certain States the losses of cattle from blackleg have exceeded those from all other causes combined in years past.

Since the disease is transmitted through contact with infected soil almost wholly, it can be understood readily what a serious problem confronts those who would eradicate the disease from any given section of country. No satisfactory cure is known for animals that have become affected with blackleg, but a most efficient preventive has been prepared and distributed to stock owners free of charge by the Department during many years. The number of doses furnished in this manner amounts to two or three million annually, and the number of valuable young cattle saved by this means reaches into the thousands each year. The equipment of the Department for the manufacture of black-

leg vaccine has been enlarged, and the use of measures for protecting cattle from blackleg infection is constantly increasing. More extended vaccination of cattle and the acquirement of greater skill by those who administer the vaccines will certainly do much to reduce present losses materially.

In spite of every precaution anthrax seems to be invading new areas of the United States from year to year. Anthrax virus may be retained in low swampy lands for several years. Inundated fields and those containing stagnant pools of water may become lasting seats of infection. All of the domestic animals are susceptible to anthrax, but the losses occur mostly among cattle, sheep, horses and mules. Not only may the disease be contracted through contact with infected areas of low land, but every portion of the carcass of an animal dying from anthrax, even to the hair or wool, offers a dangerous source of infection, and the extension of the disease in numerous instances may be traced to the failure of stockmen to bury or destroy animals that have died with anthrax. Medical treatment of anthrax in animals has not proved satisfactory, although surgical measures may in certain slight cases give relief. Preventive measures, however, furnish a valuable procedure for controlling the disease. Vaccines for immunizing stock against anthrax have been offered for sale through commercial channels at moderate cost for some years. The Department has recently improved the process of vaccinating against anthrax, making the operation successful, and protecting the treated animals in a greater proportion of cases than formerly. Another very valuable movement is found in the supervision by the Department of the vaccines for anthrax, as well as similar biological products, that are prepared and sold by commercial firms. This control of such products has taken many worthless and a few dangerous preparations from the market. The educational

work of the Department with reference to infectious diseases is giving stock owners a better knowledge of the proper way of handling an outbreak of anthrax, and this should gradually check the spread of the infection. Cooperation of the farmer is imperative in the suppression of anthrax, since the exposure of anthrax carcasses to the attacks of wandering scavengers, and the reckless selling of hides and pelts from animals dead of the disease can only lead to further disaster.

Hemorrhagic septicemia is an infectious disease, attended by a very high mortality, which attacks various species of animals, especially cattle, sheep and swine. Young animals are more susceptible to the disease than older ones, and those that are thin and poorly nourished are most likely to be affected.

The disease is a septicemia or poisoning of the blood, wherefore it often runs a short course and the patient quickly dies. In suddenness of attack and high mortality at the beginning of an outbreak there is a great resemblance to anthrax.

This disease has been recognized in this country for the past twenty years, but the losses have been unusually heavy in many sections of the United States during the last few years. In fact, the large number of outbreaks and the increased mortality in a number of States attracted so much attention that the sanitary authorities of these States were seriously considering the advisability of applying protective quarantine measures against cattle from public stockyards. This was due to the observation that the disease usually appeared first among shipments of stocker and feeder cattle that had recently been handled through public stockyards and it then spread to the native cattle.

As the disease is so acute and rapidly fatal, medicinal treatment is of little value and it is therefore necessary to resort to precautionary measures to avoid losses. Plenty

of good water, good feed and good care during shipping and yarding will help to maintain the strength and the resistance of the animals against disease and thus obviate losses. Since the publication of Mohler & Eichhorn on the immunization against this disease by the use of attenuated cultures of the organism which causes the infection, these products have been employed to a greater or less extent in the control of hemorrhagic septicemia. While in the past their use has been confined principally to herds in which the disease has already appeared, the beneficial results obtained in these cases warrant the general adoption of this prophylactic treatment in all cases of known exposure before the infected animals develop symptoms. By the use of such vaccines the losses from this disease will be held to the minimum.

Hog cholera has doubtless caused heavier losses than any other single disease. The annual loss varies greatly from year to year, but has been estimated to average $40,000,000. A few years ago, after many years of scientific research, the Department of Agriculture succeeded in preparing a serum which would protect hogs against this disease. Field experiments have demonstrated that this serum gives practically absolute protection to hogs that have not already contracted the malady, while it greatly reduces the losses in herds in which the disease has already appeared. Experimental field work was conducted in a number of typical hog-raising counties in various parts of the country, beginning in 1912. The number of hogs raised in these counties increased from 859,910 in 1912 to 1,334,644 in 1915, while at the same time there was a decline in the number of hogs that died from 152,296 to 30,668. This means an increase of 474,734 in the total number raised and a decrease of 121,628 in hogs lost, or an average net gain for each county of 42,596 hogs. In three counties in which the work has been carried on longest the loss per hundred was lowered

in three years from 28.4 to 1.7, while in the same period the production of hogs was increased by more than 75 per cent.

It would be a mistake, however, to suppose that these experiments herald the immediate extinction of hog cholera. The immensity of the problem is such that it can be attacked successfully only when the States and local organizations are in a position to cooperate with the Federal Government. The first and most important steps have been taken already, however, and the rest appears to be largely a matter of time and education. In the meantime the individual hog raiser can protect his animals at slight cost by the use of the serum, which is manufactured extensively by commercial firms.

Unlike most animal diseases, tuberculosis attacks not only the prosperity but the health of the country. The importance of its elimination, therefore, cannot be measured by the money losses that it causes, although this is estimated at $25,000,000 a year. Unfortunately no real success has as yet been attained in rendering cattle immune to the disease, and the only means that can be recommended for its suppression are sanitation, the segregation of all infected animals and the slaughter of advanced cases. The tuberculin test is a valuable means of detecting the disease in its early stages before it becomes apparent upon ordinary physical examination. Some progress has been made in the suppression of tuberculosis by the systematic use of tuberculin in testing dairy herds and by the elimination of the diseased animals. The Department is now putting into operation a plan for the testing of herds of purebred cattle when the owners request this, and the certification of those found free from tuberculosis or that are freed of the disease under the supervision of the Department. The object is to create a list of purebred herds from which persons may buy breeding stock with the assurance that it is free from

tuberculosis, and thus prevent the spread of infection which would otherwise occur. It is believed that the development of this plan and the application of other official measures in cooperation with State authorities and with individual cattle owners will in time succeed in diminishing the extent of bovine tuberculosis. Here again, however, the individual breeder can do much to protect himself by having his cattle tested with tuberculin, by disposing of any reacting animals in a proper manner, by sanitary methods as described in the Department's publications, and by bringing into his herd only such new animals as are known to be free from tuberculosis.

Tuberculosis also affects hogs to a considerable extent, those animals usually contracting it from cattle either by being fed upon milk containing the germs of tuberculosis or by following tuberculous cattle in the feed lot. Raw skim milk returned from creameries to patrons and fed to pigs is a prolific source of the disease in swine. The danger from milk may be overcome by pasteurization, which should be required at creameries. The farmer, however, can avoid danger by cooking all milk not known to have been pasteurized or to have come from healthy cattle before feeding it to hogs.

Contagious abortion of cattle, although it has existed in this country for a long period of time, has not until recent years been considered so destructive to the livestock interests as to demand the same amount of attention as has been devoted to some of the devastating diseases of a more acute infectious nature where death of the animal shortly following its infection could be looked upon with almost certainty. It is only since the stock owners of this country have realized the importance of producing higher grade and more profitable animals, necessitating a more general movement of breeding stock, that the disease has become of an alarming character.

Until recent years the affection appeared mainly to involve the dairy herds of the country. Various factors may have favored the spread of the disease in herds maintained under the conditions to which dairy herds are subject, the resistance of such animals being more or less impaired as a result of the constant drain upon their systems, the none too sanitary conditions under which such herds are in many instances handled and the frequent introduction of animals that necessarily takes place where a constant output must be maintained. More recently the disease has been often reported as affecting the cattle that are kept under range conditions. The disease here appears as an even more menacing problem, for the offspring is depended upon to furnish the entire income derived, and the treatment of individual animals is exceedingly difficult. The tendency of the disease to interfere with an animal's usefulness as a breeder only makes the problem more serious.

The great economic loss caused by contagious abortion has resulted in widespread efforts among investigators to obtain all the facts possible in regard to the various phases of the disease, in order to establish effective control measures, but the difficulties in connection with such investigations are very great with the result that, although a great amount of work has been done, further knowledge of the fundamentals of this disease is necessary.

Investigational work that has thus far been carried out in connection with abortion has indicated that its introduction into abortion-free herds can be prevented far more successfully than its dissemination controlled after once the infection has established itself. Publications have recently been issued by the Department that contain such information as is designed to impress upon stock owners the importance of building up their herds by a breeding process, rather than by purchase, if possible, and in the event of its being necessary to introduce animals from out-

side sources, to exercise the utmost care in selecting the stock from herds that are free from the disease. Where the disease already exists, control measures based upon sanitation are recommended as having been found most effective in reducing the losses caused by abortion.

Methods of immunization are at the present time being extensively investigated by the Department, with the object of obtaining a more effective means of dealing with the situation.

A very considerable portion of the losses in the meat food supply because of diseases which render the flesh of cattle, sheep and swine dangerous or otherwise unfit for food must be regarded as a waste, since the continuance of the losses is due to failure on the part of all interests concerned to unite in a proper effort to eradicate the diseases that cause them. The losses here referred to are not those which occur on the farms but those which occur through the condemnation of diseased food animals at the time of slaughter, in order that the meat-eating public may be protected against the dangers lurking in the meat of such animals.

An indication of these losses is found in the statistics of the meat inspection service of the Department. The figures given relate to the Federal service only and take no account of those in the reports of the several States and municipalities on the subject. In the fiscal year 1917 there was condemned under Federal inspection a total of approximately 110,000,000 pounds. This represents a little more than one per cent of the total weight of meat inspected, and includes the condemnation of over 48,000,000 pounds of beef and more than 39,000,000 pounds of pork. A review of the causes of condemnation leads to the conclusion that at least two-thirds were occasioned by preventable diseases.

The most important measure for reducing the losses caused by disease would be the inauguration of a concerted and persistent effort on the part of all interests concerned to locate the centers where disease exists, to prevent its spread and ultimately to effect its complete eradication from such centers. The part to be taken by the meat inspection service in this direction would lie in its discoveries of disease through its post-mortem examinations and its records of the same. These records coupled with data relating to the origin of the animals would enable the proper officials of the States concerned to locate definitely innumerable centers where the presence of disease is now only vaguely suspected. In fact, this very plan of action has been put in force by the Department for some years and has been applied where the States concerned have been anxious to utilize the information furnished. In many instances it has led the State or the individual affected to institute measures for disease eradication. The meat inspection service is prepared to supply information of this kind in much greater measure than various State authorities appear able to use in the way indicated.

Other important losses in the general meat food supply result from careless handling or the employment of inefficient methods for preserving good meats. They occur in varying degree in the packing plants and markets and during transportation, but in a larger relative measure in the meats prepared on the farms, especially in the southern portions of the United States where ice refrigeration is seldom provided. Not all these losses are preventable but they are susceptible of a very material reduction by the observance of a more careful handling and the more universal employment of methods known through experience to be entirely feasible and efficient.

The most important measures for reducing the losses resulting from the spoiling of good meats and products

are more careful handling and more efficient measures for preserving them. The enforcement of the meat inspection regulations at establishments where Federal inspection is maintained compels a more sanitary handling of meat than would otherwise be observed, and this has been instrumental in reducing the amount of product lost through deterioration, contamination or spoiling at such establishments. Reduction of the losses during transportation and on the farms is more difficult because it depends almost entirely upon the initiative of each of the innumerable individuals concerned. However, action has been taken by the Department to effect a reduction in these losses or wastes by disseminating general information on the subject, including information on how to provide ice refrigeration in sufficient measure to prevent spoiling of the meat in the interval between slaughter of the animal and the time the product is preserved by curing.

In conclusion, it should be emphasized that at this time the conservation of animal health is not only an economic necessity, but a patriotic duty as well, and each of us can do his share by helping to eliminate the tremendous wastage due to the various animal diseases above mentioned.

"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."