FOURTH ANNUAL REPORT

OF THE

International Association of Dairy and Milk Inspectors

INCLUDING PAPERS READ AT THE ANNUAL CONVENTION IN WASHINGTON, D. C. OCTOBER 27-28-29, 1915

" When one is shrewd enough to grant that his own activities of necessity are confined to a restricted area and begins to look to others for the qualities and skill which he lacks, one of the vital secrets of progress has been solved."

COMPILED BY

IVAN C. WELD, Secretary-Treasurer

1116 CONNECTICUT AVENUE

WASHINGTON, D. C.

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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 Meet-

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ing 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.

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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 30 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 90 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 sub-

*Adopted Oct. 29, 1915.

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INDEX TO ADVERTISERS.

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Our advertisers materially benefit the Association, and our members and readers should therefore correspond with them first when in need of supplies.

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International Association of Dairy and Milk Inspectors.

OFFICERS, 1915-1916.

President, CLAUDE F. BOSSIE.....Omaha
Vice-President, ALFRED W. LOMBARD.....Boston
Vice-President, DR. A. L. HAGGERTY.....Augusta
Vice-President, DR. H. L. STATES.....Detroit
Secretary-Treasurer, IVAN C. WELD.....Washington
Auditors—
DR. WM. S. GIMPER.....Harrisburg
WALLACE F. PURRINGTON.....Concord

COMMITTEES.

NATIONAL MILK DAY.

A. N. Henderson, Seattle, *Chairman.*

Dr. James O. Jordan, Boston; E. C. Krehl, Detroit; President and Secretary, *ex officio.*

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

Dr. Hulbert Young, Baltimore, *Chairman.*

Dr. C. W. Eddy, Cleveland; Dr. Thos. E. Maloney, Fall River.

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

Dr. Wm. H. Price, Detroit, *Chairman.*

Dr. Geo. E. Bolling, Brockton; Dr. O. P. Thompson, Waterloo.

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DAIRY FARM INSPECTION.

Prof. C. B. Lane, Philadelphia, *Chairman.*
J. A. Gamble, Washington; H. A. Harding, Urbana.

CITY MILK PLANT INSPECTION.

H. E. Bowman, Somerville, *Chairman.*
F. H. Bothell, Salt Lake City; Wm. P. Palmer, Baltimore.

LEGISLATION AND LEGAL LIMITS FOR THE CONTROL OF MILK AND CREAM.

J. S. Abbott, Washington, *Chairman.*
Dr. James O. Jordan, Boston; Geo. B. Taylor, Washington

METHODS OF APPOINTMENT OF DAIRY AND MILK INSPECTORS AND THEIR COMPENSATION.

Ernest Kelly, Washington, *Chairman.*
Dr. Wm. S. Gimper, Harrisburg; G. S. Hine, Manhattan, Kans.

METHODS OF BACTERIAL ANALYSIS OF MILK AND MILK PRODUCTS AND THE INTERPRETATION OF RESULTS.

Hermann C. Lythgoe, Boston, *Chairman.*
Dr. Stanton H. Barrett, Chattanooga; A. F. Stevenson, Washington.

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MEMBERS.

Abbott, J. S.	Chemist in Charge, State Co-operative Food and Drug Control, Bureau of Chemistry, U. S. Dept. of Agriculture	Washington, D. C
Albert, Lorenz	Milk Inspector	Milwaukee, Wis.
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.
Bolling, George E.	Inspector of Milk	Brockton, Mass.
Bossie, Claude F.	Chief Dairy Inspector	Omaha, Neb.
Bothell, F. H.	Asst. in Market Milk Investigations	Salt Lake City, Utah
Bowman, Herbert E.	Inspector of Milk	Somerville, Mass.
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, E. F.	Chief, Bureau of Dairy Products	Albany, N. Y.
Carroll, A. N.	Milk Inspector, Dept. of Health.	Pueblo, Colo.
Carroll, Thos. B.	Milk Inspector, Dept. of Health.	Wilmington, N. C.
Colton, Max J.	Health Officer	Cumberland, Md.
Cook, L. B.	Market Milk Specialist, Dairy Div., U. S. Dept. of Agriculture	Washington. D. C.
Coughlin, John J.	Dairy Inspector	Elizabeth, N. J.
Duval, Joseph X.	Assistant Milk Inspector	Manchester, N. H.
Eddy, C. W.	Chief of Food and Dairy Inspection	Cleveland, O.
Fasting, Geo. F.	Dairy Inspector, Louisiana State Board of Health	New Orleans, La.
Gamble, J. A.	Dairy Div., U. S. Dept. of Agriculture	Washington, D. C.
Gimper, Wm. S.	Director of Milk Hygiene	Harrisburg, Pa.
Gordon, R. I.	Chief, Pure Food Dept.	Tampa, Fla.
Guimont, C. O.	Director Municipal Laboratory.	Quebec, Canada
Haggerty, A. L.	Chief Food Inspector	Augusta, Ga.
Harding, H. A.	Head, Dairy Dept., University of Illinois	Urbana, Ill.
Henderson, A. N.	Chief Dairy Inspector	Seattle, Wash.
Hine, Geo. S.	State Dairy Commissioner	Manhattan, Kans.
Holt, Thomas	Deputy Dairy and Food Commissioner, State of Conn.	Hartford, Conn.
Hughes, T. B.	Inspector in Dept. of Food and Drugs, Tennessee	Afton, Tenn.
Jordan, James O.	Inspector of Milk	Boston, Mass.
Kelly, Ernest	Market Milk Specialist, U. S. Dept. of Agriculture	Washington, D. C.
Kennedy, F. J.	Meat and Milk Inspector	Dubuque, Iowa
Krehl, Edward C.	Chief Milk Inspector	Detroit, Mich.

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Lane, C. B	In charge Scientific Dept., Supplee Alderney Dairy	Philadelphia, Pa.
Lombard, A. W	Dairy Bureau Agent	Boston, Mass.
Lucas, Harry S	Food Inspector, Health Dept.	Washington, D. C.
Lyle, John H	Milk and Bread Inspector	Minneapolis, Minn.
Lythgoe, H. 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, Canada
Mesloh, Harry S	Chief Dairy Inspector, State Dairy and Food Div.	Columbus, O.
Moffitt, Geo. R	City Bacteriologist	Harrisburg, Pa.
Moore, Fred J	City Milk Inspector	Detroit, Mich.
McGrath, John J	Inspector of Milk	Salem, Mass.
Norris, A. C	Chemist and Food Inspector	Rockford, Ill.
Palmer, Wm. P	Chief Food and Dairy Inspector	Baltimore, Md.
Parker, H. N		Boston, Mass.
Potter, Geo. C		Detroit, Mich.
Price, Wm. H	Health Officer	Detroit, Mich.
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.
Rannick. John M	City Health Officer	Harrisburg, Pa.
Reuter, E	Supervising Milk and Dairy Inspector	Chicago, Ill.
Rive, Henry	Dairy Instructor	Victoria, B. C.
Rothery, W. H	Milk and Meat Inspector	Auburn, N. Y.
Rowe, Peyton	Deputy Commissioner Agriculture	Richmond, Va.
Rowles, L. W	City Milk Inspector	Topeka, Kans.
Sasseen, J. H		St. Louis, Mo.
Seaman, Carl O	Milk Inspector	Manchester, N. H.
Sharwell, Samuel G	Chief Dairy and Food Inspector	Newark, N. J.
Shea, F. B	Health Officer	Nashua, N. H.
Siegmund, Harry B	Supervising Inspector of Pasteurizing Dairies	Baltimore, Md.
Simpson, C. W	Dairy and Milk Inspector	Vancouver, B. C.
Smisek, M. J	Dairy Inspector for State of Minnesota	St. Paul, Minn.
Smith, Russell S	Market Milk Specialist, Dairy Div., U. S. Dept. of Agriculture	Washington, D. C.
Snellings, H. A	Milk Inspector	Norfolk, Va.
Stahel, P. J	Chief Dairy Inspector	Toogoolawah, Queensland, Australia
States, H. E	Veterinarian, Board of Health.	Detroit, Mich.
Steffen, C. J		Milwaukee, Wis.
Stevenson, A. F	Sanitary Chemist, U. S. Public Health Service	Washington, D. C.

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Sturgis, Russell.....188 Monroe St., Brooklyn, N. Y.
Thomson, James E... Asst. Chief, Div. Milk Inspection, Dept. of Health .....New York, N. Y.
Thompson, O. P.....State Dairy Inspector .....Waterloo, Iowa
Ward, Willard E.....Agent, Board of Health, for Milk and Food Inspection...Brookline, Mass.
Weld, Ivan C..... Investigator for Chestnut Farms Dairy .....Washington, D. C.
Widmayer, Fred J....Food and Milk Inspector.....Scranton, Pa.
Woolf, F. P.....Chief Meat and Milk Inspector .....Mobile, Ala.
Young, Hulbert..... Manager, Walker-Gordon Laboratory .....Baltimore, Md.

HONORARY MEMBERS.

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

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THE ABOVE MAP SHOWS PRESENT LOCATION OF MEMBERS OF THIS ASSOCIATION

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FOURTH ANNUAL CONVENTION.

WASHINGTON, D. C., OCTOBER 27, 1915.

The Fourth Annual Convention of the International Association of Dairy and Milk Inspectors convened at the Raleigh Hotel at 10:30 A. M. President P. T. Moran, of the Washington Chamber of Commerce, representing the commercial interests of Washington, and Dr. Wm. C. Woodward, Health Officer of the District of Columbia, representing the District government, welcomed the Association to Washington.

President A. N. Henderson, of Seattle, responded to the addresses of welcome, and delivered the presidential address.

Dr. Harvey W. Wiley, former Chief of the U. S. Bureau of Chemistry, and now a producer of milk and cream for the Washington market, addressed the Association on the subject of "Dairy and Milk Inspection from the Standpoint of the Milk and Cream Producer."

It was announced that the president, previous to the session, had appointed the following members residing in Washington to be members of a Reception Committee: Mr. Ivan C. Weld, Chairman; Mr. J. S. Abbott, Mr. L. B. Cook, Mr. J. A. Gamble, Mr. Ernest Kelly, Mr. Harry S. Lucas, Mr. R. S. Smith, Mr. A. F. Stevenson. The chairman announced that the members of this committee would assist in welcoming and seating members and visitors, and would be ready at any time to conduct parties or individuals to various places of interest, and to otherwise aid visiting members to make their time spent in Washington as pleasant and profitable as possible.

The Association then adjourned. About one hundred and twenty were present at the morning session.

WEDNESDAY AFTERNOON.

The afternoon session was called to order at 2 o'clock, when Dr. Hulbert Young, of Baltimore, Chairman of the Committee on Bovine Diseases—Their Relation to the Milk Supply

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and to the Public Health, read the committee report, which was adopted.

A committee on resolutions was appointed at this time, consisting of Dr. Wm. H. Price, Dr. James O. Jordan, and Mr. J. A. Gamble.

Dr. Wm. S. Gimper and Mr. C. F. Bossie were appointed an auditing committee.

Dr. Wm. H. Price, Chairman of the Committee on Human Diseases—Their Relation to the Milk Supply and to the Public Health, read the report of his committee, which was accepted.

Dr. James O. Jordan, Chairman of the Committee on Chemical Examination of Milk and Milk Products, read the report of the Committee on Chemical Analysis of Milk and its Products. The same was accepted, and the Association voted that the recommendations of the report be adopted.

Mr. E. C. Krehl, Chairman of the Committee on City Milk Plant Inspection, read the report of the committee. The report was accepted.

Mrs. Julian Heath, President of the National Housewives' League, of New York, spoke briefly regarding the desirability of inspection for milk products.

Mr. Wallace F. Purrington, Inspector for the New Hampshire State Board of Health, read a paper on the subject of "Milk Inspection in Small Communities." Following this paper the convention adjourned.

WEDNESDAY EVENING.

President Henderson called the convention to order at 8.15. Mr. Ernest Kelly, of the U. S. Department of Agriculture, presented a paper on the subject. "The Need of Medical Inspection of Employees Engaged in the Production and Handling of Milk."

Dr. J. W. Kerr, Assistant Surgeon General of the U. S. Public Health Bureau, read a paper on the subject, "The Control of Milk-Borne Diseases of Man," following which Dr. John F. Anderson, President of the American Public Health Association, presented a paper on the subject, "Why Standards for Milk are Necessary for the Welfare of the Dairy Industry." Several questions were answered by the speakers of the evening, and many valuable suggestions were made.

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THURSDAY MORNING, OCTOBER 28.

The members of the Association and their ladies, as the guests of Mr. Geo. M. Oyster, Jr., proceeded by special car to Mt. Vernon. The tomb of George Washington was first visited, after which all enjoyed an opportunity to look over the beautiful grounds at Washington's old home, and to view the interesting and historical buildings, furnishings and articles exhibited there. On the return trip from Mt. Vernon to Washington, a lunch, provided by Mr. Oyster, was enjoyed by all.

THURSDAY AFTERNOON.

The convention was called to order at 2.30 P. M. Prof. W. A. Stocking, of Cornell University, presented a paper on "The Work of the Agricultural Colleges and Experiment Stations in its Relation to a Better Milk Supply."

Dr. Carl L. Alsberg, Chief of the U. S. Bureau of Chemistry, then addressed the convention on "The Policy of the U. S. Bureau of Chemistry Regarding Dairy and Milk Inspection Under the Pure Food Law."

Mr. Alfred W. Lombard, of the Massachusetts State Dairy Bureau, read a paper on the subject, "Prize Contests; Their Value in Improving Our Milk Supply."

Mr. Benjamin L. Purcell, State Dairy and Food Commissioner, of Richmond, Va., read a paper on the subject, "Regulations for Milk and Cream for Manufacturing Purposes."

The afternoon session was closed with the report of Prof. C. B. Lane, Chairman of the Committee on Dairy Farm Inspection.

THURSDAY EVENING.

President Henderson called the convention to order at 8 P. M., and introduced Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, who read a paper on "Some Problems Involved in Controlling Tuberculosis in Dairy Cattle."

Dr. John R. Mohler, Assistant Chief of the Bureau of Animal Industry, presented a paper on the subject, "The Detection and Control of Foot-and-Mouth Disease."

The final paper of the evening was presented by Dr. E. C. Schroeder, Superintendent of the Experiment Station, U. S.

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Bureau of Animal Industry, on the subject, "The Cause and Occurrence of Contagious Abortion in Cattle."

These papers suggested various questions by members of the Association, and all were answered by the speakers of the evening. In addition to the members of the Association, there were present at this session the deans and faculties of the Veterinary Department of George Washington University and the United States Veterinary College. The students of each institution were also in attendance.

FRIDAY MORNING, OCTOBER 29.

The members boarded sight-seeing automobiles for a complimentary trip about the city. On this journey innumerable places of both historical and present interest and beauty were observed. Later many members improved an opportunity to visit the laboratories and offices of the United States Government.

FRIDAY AFTERNOON.

The convention was called to order at 2 o'clock. Mr. L. A. Rogers, Bacteriologist, Dairy Division, B. A. I., U. S. Department of Agriculture, presented a paper on the subject, "The Significance of Bacteria in Milk."

Mr. C. F. Bossie, representing the Committee on Appointment and Compensation for Dairy and Milk Inspectors, read the report of the committee. The report was accepted.

A paper prepared by Dr. R. G. Mayotte, Chief of Milk and Dairy Farm Inspection Service, Montreal, Canada, regarding methods employed in improving the milk supply in the City of Montreal, was read by title.

Dr. Herbert E. Bowman, Inspector of Milk, Somerville, Mass., presented a paper on some of the methods employed by the Department of Milk Inspection.

Mr. Max J. Colton, Health Officer, Cumberland, Md., read a paper on the subject, "The Fight for Dairy Inspection."

Mr. Carl O. Seaman, Milk Inspector, Manchester, N. H., read a paper on "Methods Employed in Securing a Milk Regulation in Manchester."

Dr. Wm. P. Palmer, Chief Food and Dairy Inspector, Baltimore, Md., read a paper on "The Supervision of Pasteurizing Dairies."

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Communications were also read from Mr. Harry A. Mesloh, Inspector, Office State Dairy and Food Division, Columbus, O.; former President C. J. Steffen, of Milwaukee, and Mr. Willard E. Ward, Agent, Board of Health, for Milk and Food Inspection, Brookline, Mass.

Mr. Fred J. Widmayer, Food and Milk Inspector, Scranton, Pa., contributed a paper, "Methods Employed to Improve the Milk Supply in the City of Scranton." Papers were also contributed by Mr. L. B. Cook and Mr. Russell S. Smith, of the Market Milk Section, Dairy Division, U. S. Department of Agriculture, and by Mr. Samuel G. Sharwell, Chief Dairy Inspector, Newark, N. J. A paper on the subject of "Detroit's Experience in Enforcing Compulsory Pasteurization of its Milk Supply" was contributed by Mr. E. C. Krehl, Chief Dairy Inspector, Detroit, Mich.

Following the presentation of papers, the Association took up the consideration of business matters. It was voted to dispense with the reading of the minutes of the last meeting. The President and Vice-Presidents had no reports to submit.

The Secretary-Treasurer reported the financial condition of the Association as follows: Balance on hand, October 28, 1914, and amount collected during the year, $659.39. Amount paid out during the year, $484.11. Balance on hand, $175.28. One uncollected bill of $25.00 is now due the Association. Dr. Gimper reported that the Auditing Committee had made an examination of the Secretary-Treasurer's accounts and had found them to be correct. It was then voted that the report of the Secretary-Treasurer be accepted, and that a vote of thanks be accorded to Mr. Weld for the work accomplished during the past year.

Dr. James O. Jordan, representing the Committee on Resolutions, reported resolutions for the consideration of the convention, and the resolutions were adopted, as follows:

1. The Committee on Resolutions recommends that the International Association of Dairy and Milk Inspectors endorse the work being carried on by the Dairy Division of the United States Department of Agriculture, and especially that work which pertains to Market Milk Investigations, and that the Secretary of this Association be requested to express to the Secretary of Agriculture the appreciation of this organization for efficient services rendered in the interests of a better milk supply.

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2. WHEREAS, Proper pasteurization does not in any way impair the quality of milk; and

WHEREAS, Proper pasteurization is an added, efficient safeguard against the spread of communicable disease; therefore, be it

Resolved, That this Association recommend, in addition to sanitary inspection, the pasteurization of milk, under efficient official supervision.

3. *Resolved,* That this Association recommend bacterial analyses of milk as one of the most efficient means of determining the healthfulness of the milk supply.

4. *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. P. T. Moran, Dr. Wm. C. Woodward, Dr. H. W. Wiley, Dr. J. W. Kerr, Dr. J. F. Anderson, Dr. C. L. Alsberg, Dr. A. D. Melvin, Dr. J. R. Mohler, Dr. E. C. Schroeder, Mr. L. A. Rogers, Prof. W. A. Stocking.

5. *Resolved,* That this Association desires to express to Mr. Geo. M. Oyster, Jr., its appreciation for the entertainment and courtesies extended to its members and guests during the Fourth Annual Meeting of the organization, held at Washington, D. C., October 27, 28, 29, 1915.

6. *Resolved,* That a committee be appointed by the incoming President for the purpose of outlining plans for the observance of a National Milk Day.

After discussion, it was voted that the Dairy Farm Inspection Committee of this Association, if continued, be instructed to cooperate with a similar committee of the Official Dairy Instructors' Association.

It was voted that the power of attorney be given to the Secretary-Treasurer of this Association.

The matter of an amendment to the By-Laws of the Association providing for honorary membership in the Association was brought up, and as all of the requirements for so amending the By-Laws had been complied with, the following amendment was adopted:

"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,

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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."

Upon recommendation of the Membership Committee, Dr. Wm. A. Evans, former Health Commissioner of Chicago, and Dr. Wm. C. Woodward, present Health Officer of the District of Columbia and originator of the dairy farm score card system of inspection, were elected to honorary membership.

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

President, C. F. Bossie, Omaha.
First Vice-President, Alfred W. Lombard, Boston.
Second Vice-President, A. L. Haggerty, Augusta.
Third Vice-President, H. L. States, Detroit.
Secretary-Treasurer, Ivan C. Weld, Washington.
Auditors, Wm. S. Gimper, Harrisburg;
Wallace F. Purrington, Concord.

The Secretary announced that the Association had received invitations to hold its next annual convention from the National Dairy Show Association; the Mayor and Chamber of Commerce of Buffalo, N. Y.; the Retail Merchants' Association of New York City; and from Mr. S. G. Sharwell, representing the Health Department of the City of Newark, N. J. These invitations were referred to the Executive Board.

The Secretary read a letter from a member of the Association residing in a country engaged in war, in which the writer of the letter for financial reasons presented his resignation as a member. The Association immediately voted to pay the dues of this member for the ensuing year.

Dr. Thos. B. Maloney, of Fall River, Mass., voiced the feelings of pleasure and gratification which the members had experienced during the convention. He referred to the happy selection of the national Capital as a place for meeting, and the valuable ideas and helpful suggestions which had been developed. In closing, he moved that the convention give a rising vote of thanks to the Executive Board, including the Secretary-Treasurer, for all their efforts in behalf of the Association. The motion was seconded by many present, and a rising vote of thanks was given. Following this, the convention adjourned.

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FRIDAY EVENING, OCTOBER 29.

The wives of the visiting members were entertained at the New National Theater.

FOURTH ANNUAL BANQUET.

The members of the Association were the guests of Mr. Geo. M. Oyster, Jr., of Washington, at a banquet given at the Shoreham Hotel. The special banquet room was beautifully decorated for the occasion, and the menu and service were all that could be desired. An orchestra contributed to the pleasure of the occasion. Mr. Geo. H. O'Connor entertained with vocal selections, and he was ably assisted by all present in the singing of popular songs. Brief addresses were made by Mr. E. C. Brandenburg, President of the Washington Board of Trade; Mr. P. T. Moran, President of the Washington Chamber of Commerce; and Dr. Wm. C. Woodward, Health Officer of the District of Columbia. This most pleasant occasion was brought to a close with remarks by Mr. A. N. Henderson, the retiring President of the Association, who gave expression to the appreciation felt by the members of the Association for the many pleasures of the evening which had been made possible by Mr. Oyster. At the conclusion of President Henderson's remarks, all further expressed their appreciation of Mr. Oyster's hospitality and entertainment by a rising vote of thanks.

"It would be hard to find a body of men whose work affects a wider group of people than the International Association of Dairy and Milk Inspectors."—Editorial, Washington Times, Oct. 27, 1915.

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ADDRESS OF WELCOME.

P. T. MORAN, President, Washington Chamber of Commerce.

My friends, in behalf of the Chamber of Commerce I tender you a sincere and hearty welcome to the nation's Capital. It is generally supposed that all big cities have keys to turn over to their visitors; but Washington is your city, as well as our city, hence you have a perfect right to come to Washington and see all that you can see, and at the same time to feel you are at home.

At the present time there is a discussion going on which shows you that the United States pays one-half the expense of supporting Washington. We want that to continue. We want Washington to be the most beautiful capital in the world. You gentlemen have a voice in the affairs of the nation, and we hope you will see to it that your own Congressmen will not be niggardly in dealing with Washington, but that the Congress of the United States will give Washington that support in the future that they have given it in the past.

I understand your mission to the nation's Capital. I recognize you are embarked in a great work. The country ought to appreciate your efforts, ought to applaud your work. You are engaged in a proposition that each and every citizen in the United States should be interested in. Milk is a food that must be taken care of properly. Every means, scientific and otherwise, should be used toward placing milk in the hands of the consumer as pure as possible. The future generation depends greatly on milk.

I also realize that you are men who would be broad-minded, that none of you would utilize your power or the position you occupy to hamper or retard the poor farmer or the poor dairyman, but that you will lead him and point out to him the various things necessary toward producing good milk. You recognize that he is a fellow citizen of our United States, and you are going to be helpful to him, instead of doing him harm. There have been in the past a great many farmers who believed that the inspector was their enemy, who was placed in this position for the purpose of handicapping them in making a living. You want to show them that you are their friend, rather than their enemy. Show them that your purpose is

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to point out the way to place their product on the market in a superior condition, and in so doing conduct yourselves in such a way and do your work in such a thorough manner that all the people will have confidence in you.

You have a great mission to perform in preventing the spread of disease and in safeguarding the purity of this wonderful God-given food.

I sincerely hope your convention will be productive of grand results. I hope you will be guided by the spirit of "Do good," by the idea that you want to help others, and that the papers that will be read here by men of superior intelligence and wide experience will be taken home, will be carefully digested, and that their efforts will be rewarded by the work you will do later on in life. The business men of the nation's Capital are happy that you came here. Come next year.

"I look mainly to increased and more efficient inspection for the improvement of our public milk supply. Not the old-fashioned inspection which aimed mainly at catching culprits, but the more efficient inspection which seeks the intelligent co-operation of the farmer, the inspection which lays most stress on education and least upon persecution."—Spargo.

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ADDRESS OF WELCOME.

DR. WILLIAM C. WOODWARD, Health Officer,
Washington, D. C.

There is one feature of Mr. Moran's address that appeals to me with very great weight. That is, that after all the city of Washington hardly needs to extend a welcome to you. The city of Washington is your home; it is your city; and the oftener you come here, not necessarily on occasions of this kind, but on more or less prolonged visits to avail yourselves of the opportunity that this city affords you, the better you will like it, the better we will like it, and the better it will be for the city of Washington.

Until one stops to think of the advantages which Washington affords for persons interested in sanitary work, those advantages are apt to be overlooked. When I suggest that you come here at times to avail yourselves of the city's opportunities, I mean primarily to learn what the Department of Agriculture can teach you with respect to the matter of milk and milk inspection. You know, of course, of the work of the Bureau of Animal Industry, that deals with the conditions under which animals are kept and the conditions under which milk is to be produced and marketed. You know of their Dairy Division and their laboratories; and while I hold no special brief for Dr. Melvin and the Bureau of Animal Industry, I can assure you of a most cordial welcome there.

We have the Bureau of Chemistry, under the leadership of Dr. Alsberg, dealing not so intimately with matters of the farm, but dealing rather with the finished product. There also you will find men who will cordially welcome you, and laboratories in which their problems and your problems are being solved.

The Department of Agriculture, through the Bureaus of Animal Industry and Chemistry, deals with the problems of milk production, distribution, adulteration, etc. There is another great department that deals with the milk problem from another standpoint. In the Treasury Department there is the U. S. Bureau of Public Health. It bears to the health of men the relation that the Bureau of Animal Industry does to the health of animals. It studies the effect of diseases of

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animals on human beings, and the effect of improper food; and I can assure you of an equally hearty welcome at the Bureau of Public Health.

There are other bureaus in the United States Government that deal with the problem more or less cursorily; for instance, in the Department of Labor there is a bureau that is profoundly interested in the milk problem; I refer to the Children's Bureau, under the leadership of Miss Lathrop. However debatable may be the effect of decomposed or bad milk on the health of adults, no one can deny its potent influence for harm on babies and young children, and for that reason the work of that bureau is related very closely to the work of Dairy and Milk Inspectors.

There are other bureaus interested in the matter of milk and milk products. The Navy Department deals with water largely, and yet I don't mean to infer that that is responsible for any interest the Navy Department may have in the milk supply. Those of us who are interested have but to look at the records of the Naval Academy at Annapolis and see the facilities they have for providing future admirals with a proper milk supply to learn a practical lesson of the value of milk to the fighting forces of the country. The men of the army, as well, must be supplied with good milk wherever they may be, and the laboratories of the Surgeon General's office are continually engaged in the study of this and of other problems for the protection of the health of their men, including problems of diet and everything else.

This represents the principal activities of the national Government in this, your own city. I want to impress the fact that this is your city. The reason for this I will explain a little later. The District of Columbia has an organization of its own that is distinct from any of the departments and bureaus that I have enumerated. We refer to it as the District Government. As the present Executive Officer of the Health Department of the District of Columbia, I want to say I am very proud of the record of this District with respect to milk inspection. In 1871 a Board of Health in the District of Columbia passed a milk ordinance along the lines commonly in vogue, which went possibly a little further, forbidding the adulteration of milk, but forbidding also the sale of milk known as swill milk, or milk from cows fed on garbage. The

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following year the records show our modern system of inspection was conceived. In 1872, a few inspectors in the Board of Health of the District of Columbia pointed out that the control of the milk supply could not be made effective except by some method of licensing dairies. This was very far in advance of anything that had been published at that time. Those three men went a step further. They pointed out that the control of the milk supply, in so far as it came from another jurisdiction, could be regulated only by such a permit system. It was not sufficient to say, "You must have a permit to sell milk"; but it was necessary to go over into Maryland and Virginia and say, "In order to bring milk into the District of Columbia, you must have a permit from the Board of Health and comply with our requirements."

That was in 1872. That old Board of Health—and a wonderful sanitary organization it was—was moving too far ahead of its time. It was one of the most promising and efficient sanitary organizations of the day, and I cannot speak too highly of the men who composed it. It met its fate simply of strangulation. It could not be met and fought with outright, but there was the gradual system of cutting off the money wherewith the Board could do its work, and in 1878 it went out of existence. The matter of the milk supply, however, was not lost sight of. We had a Health Officer who had his medical inspector, and in 1883 the question of the relation of milk to communicable diseases was presented. The medical inspector said it was impossible to determine the source of many cases of scarlet fever, etc., because the persons did not know from whom they got their milk. The inquiry at the house wherein the case had occurred revealed the information, usually, that "it came from some countryman." Following up what he pointed out at that time, the Health Officer of the District during this year actually made inspection of many of the dairies and the dairy farms in the neighborhood of the District of Columbia. So far as I know, it is the first record of anything like a systematic attempt at the investigation of dairy farms in their relation to the health of the people of the District of Columbia.

This faded away, however, and nothing was heard until a crisis occurred. In 1892 cholera was knocking at the doors of the port of New York. Some of you will perhaps recall

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that the entire nation was alarmed lest cholera should gain a foothold. That brought into action in the District of Columbia a private organization known as the Sanitary League, and among the results of the organization of that body was the demand for a new milk law. It was introduced into Congress and submitted to the Health Officer and reported upon. But through the foresight and wisdom of a layman, Col. George Truesdell, before the Commissioners acted it was referred to the Medical Society of the District, and it was through the Medical Society that the law was made to go beyond the ordinary examination of milk for detecting preservatives, the percentage of butter-fat, the adding of water, the use of coloring matter, etc., and a regular system of milk inspection was established. So far as I know, it was the first law conceived and the second enacted that provided for modern milk inspection, including a system of licensing the dairy farmer, the inspection of his farm, the licensing of the retail dealer and the control of his work. It is the existence of that system that is responsible for the existence of this Association, although the milk inspector of today is not the milk inspector of twenty-five years ago. I recall my first milk inspector, whose duty it was to stop a milk wagon here, buy a half-pint of milk, label it and take it to the laboratory. That is not the milk inspector represented by this body, for today milk inspection begins with the dairy cow and must be followed clear through to the consumer; so that it requires a man of much wider knowledge, of much greater technical skill, a man of no inconsiderable ability to be a competent milk inspector at the present time. The various questions continually being raised in connection with that work well justify your meeting together annually to discuss matters pertaining to your work.

The legislation of the District of Columbia is today far behind the legislation that exists in most of the communities from which you come. Our act of 1895 was followed by an act of 1897, and as errors, mistakes, inefficiencies occurred under that act, the next act was more effective. Today it is not difficult to find model acts, but we still have to work under this older system. I said I would tell you why I was eager to have you feel that this was *your* city. Mr. Moran has told you that Congress contributes half of the cost of maintaining

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the District of Columbia. He did not explain that Congress contributes half of the expense of maintaining the District of Columbia on a scale that is probably not in conformity with other national standards, and he did not tell you that while Congress contributes half of the cost of maintaining the District government, that Congress, and Congress alone, says what shall be done with the money that we who reside in the District of Columbia put into the Federal Treasury. And so it is with respect to the milk supply. Congress says exactly how the milk supply of the District shall be controlled. The Congress of the United States must pass our milk laws, and say whether milk shall be sold at a temperature of 50 or 70 degrees, whether milk shall be sold that has been pasteurized because it was at the souring point. Our relations, however, to this legislature are very different from your relations to your legislatures. The men who legislate for you are your own people; you, by your votes, determine who those men shall be. If those men do not pass whatever laws and regulations you may need, the chances are you will elect persons who will pass proper laws. Your legislators are your own people. They live with you, their families live with you, they are a part of the community. Most of them learn something of municipal public health. This is not true of our legislators. They are charged with the execution of great tasks, they have affairs of the nation to consider primarily; secondly, they have the affairs of the District of Columbia. The result is, of course, not that we are intentionally neglected, that we are ignorantly treated, but because in the press of business District of Columbia day goes over. When you go home and think of your own milk ordinances, just bear in mind that in your own city of Washington, D. C., many of your desirable conditions do not exist, and appeal to your own Congressman and to your Senator to see to it that when he goes to Washington, he and his family have as ample and efficient protection of the milk supply as they have at home.

We have heard much of "preparedness." The great inventors have been called together for the purpose of telling the nation how it can get the most destructive engines of war for the least possible money in the shortest possible time, and how such defense against engines of war manned by enemies might be thwarted. There is no factor in preparedness that

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is so necessary as men. You may have your cannon, your airships, your submarines, or other mechanical agencies of destruction, but they will not fight your battles for you by themselves. Somebody must do it, and while we are discussing preparedness, while we have a council called for the purpose of creating engines of destruction, it seems to me we must consider very seriously preparedness from the standpoint of human efficiency. We must call our council for the purpose of determining how we can create for use in time of need the greatest possible body of men, and men of physical and mental merit; not persons suffering from attacks of disease, but men of good red blood, men in fighting trim who can man these engines of war which our inventors are going to prepare; and in this connection the milk supply is going to play an important part.

No one who is familiar with the facts can deny that the improvement in the milk supply of this country has resulted in a wonderful saving in human life. No one can deny that it has resulted in the diminution of communicable diseases. In the interest of your community, your own home, your own nation, I beg of you, as you go to your homes, to go determined to do better work and more of it than ever before. I would not have you feel for a moment that anyone here is falling short of his duty, but rather that you will go home bent on impressing on your communities and those who represent you in your law-making bodies the need for the most wise and efficient milk legislation possible, and for facilities and means for enforcing that legislation in every section of our country.

"The biggest room in the world is the room for improvement."

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RESPONSE TO ADDRESSES OF WELCOME AND PRESIDENTIAL ADDRESS.

A. N. HENDERSON, Seattle.

On behalf of the International Association of Dairy and Milk Inspectors, assembled here in our fourth annual convention, permit me to thank you gentlemen, representing the commercial and civic interests of this city, for the most hearty welcome that you have extended to us.

The meeting of our Association in this city affords an opportunity to many of us to fulfil a long-cherished desire to see our National Capital and the many historic points of interest located here, and to those of you who have so kindly arranged for our entertainment I wish to extend the sincere thanks of this Association; and especially are thanks due to the non-members who have so graciously responded to the requests to appear upon our program.

A very advantageous aspect of our meeting in this city will be that our members will come into close personal contact with the men who are connected officially with the United States Government, to whom we must look for guidance in our various fields of endeavor. Representatives of the Federal Government are endeavoring to accomplish the same objects set forth by the constitution of this Association, namely, "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 the dairy industry."

The success that has attended us up to the present time in fulfilling these objects should assure and establish confidence within us. Our successful endeavors in the past proclaim that with conscientious and unfailing effort the future will see the objects of our Association accomplished.

A résumé of our past annual meetings shows that they have been of value from several viewpoints. In the first place, they have afforded rare opportunities for our members to discuss subjects of vital import. Papers dealing with special phases of dairy inspection have been read and digested, with the result that where practical solutions of important problems have

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been made, similar applications can be made with success by others.

In our eagerness to secure improved conditions of producing and handling milk and its products there is danger that we may become impractical and fail to realize the ineffectiveness of our procedure until subjected to discussion and criticism by our fellow members. This discussion and criticism necessarily broadens our viewpoint and tends to eliminate extraneous ideas.

The proceedings of our annual meetings are replete with practical sugestions that are proven conclusions of men who have made a recognized success in their special lines of endeavor. Their knowledge of the dairy industry has been obtained by long, faithful study and experience. Those of us who have come here to be taught ways and means of improving our local conditions cannot help but absorb the sound and reasonable advice offered by such men. The new thoughts that we carry home stimulate us to greater activity, and as we have all drunk of the same fountain of knowledge our work is not only becoming more efficient but is approaching a standard of uniformity.

The success which our Association has attained, while gratifying, is not free from adverse criticism.

The reports that have been submitted by the different committees in the past, while interesting and instructive, in my mind have not accomplished their full purpose. In reviewing the reports of our committees which have been appointed to study, investigate and report on specific problems connected with our work, we notice that the reports enumerate the factors and conditions influencing the problems, and specify needed improvements, but in some instances have failed to recommend a definite line of procedure to secure a definite result. This is undoubtedly true for two reasons: First, because our commitees have been requested to report on different phases of milk inspection that heretofore have not received sufficient investigation to permit of a comprehensive report, and, second, because of the difficulty of securing definite facts in the time these members have to give to such investigation.

Our Association has now reached a point in its development where we are expected to recommend definite policies relative to milk inspection. Our membership is a representative one,

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as it includes men of recognized ability in every branch of milk supervision. With such men on our committees, representing every section of the country, it seems reasonable that committee reports should contain recommendations that will better guide us in our work.

It is to be regretted that we are not to have a committee report on the bacteriological analysis of milk. I think it absolutely necessary for the future standing of our Association that we take a definite stand in regard to the importance of the bacterial count and its value in efficient milk inspection, and hope that you may see fit to pass a resolution approving the bacterial analysis, when intelligently used, as one of the most important means of determining milk quality.

Not only should we have a committee report on the bacteriological analysis of milk, but it would also be desirable to have such a report on the pasteurization of this product. Pasteurization has become so extensively practiced that there is danger of some of those using the process becoming indifferent regarding quality of milk pasteurized, the conditions under which the process is carried on and the possible danger of recontamination. There is no question but that the term "pasteurization" is appropriated by many dealers who disregard absolutely its intended function of providing safety, and heat milk only in order to add a few hours to the keeping quality. Contamination taking place during and after pasteurizing is evidence of such intention. In order that we may develop a uniform and efficient supervision over the process of pasteurization a committee should be appointed to report on ways and means of improving conditions under which milk is pasteurized, also the quality of milk to be pasteurized.

Market milk and its relation to public health has received practically all our attention up to the present time, and we have seemingly overlooked that portion of the object of our Association which deals with developing uniform and efficient inspection of milk products. It is my opinion that we are overlooking an important part of our work, and that we do not give enough attention to milk products. Especially is this true regarding condensed milk, as this product is too frequently the food of the infant and invalid. To be consistent, it seems necessary that if we require a clean milk for pasteurization, for the same reason we should demand clean milk for con-

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densing. As we have given this subject very little attention in our previous meetings, it would be well to appoint a committee to investigate conditions under which raw material is produced which enters into the manufacture of condensed milk. and if conditions are such as to warrant, to recommend methods to be employed in improving such production.

The amount of money appropriated for the maintenance of a system of dairy and milk inspection will necessarily limit the extent to which such a system can efficiently supervise not only the production and handling of milk, but milk products as well. The per capita expense necessary for a municipality to maintain an efficient system of milk and dairy inspection is a question that has received very little attention. The per capita cost for maintaining such a system should be approximately the same, regardless of the size of the city. A study and investigation that would result in ascertaining this cost should be of immense value in helping us to obtain a sufficient appropriation in our respective cities. This subject should be of enough importance for the appointment of a committee to investigate and report upon the cost of efficient milk inspection.

The principal object of milk inspection is to provide a substitute which approaches, as near as possible, breast milk for infant feeding. Through a realization of our responsibility, which promotes conscientious endeavor, we are assisting in the creation of conditions which permit of the fulfillment of the above object. Modern dairy investigation has proven, however, in a great many instances, that the consumer receiving a high grade of milk often allows it to deteriorate by careless handling in the home, due largely to ignorance. We may even go a step farther and assert that the milk supply has been accused of being responsible for diarrhea and enteritis in infants, when in reality mal-nutrition and improper feeding are the causes. The question arises in my mind as to what extent milk inspection should enter into the cause of child welfare. In the larger cities where there are comprehensive systems of infant-feeding stations, there is no question but that the responsibility of milk inspection should cease with the delivery of a wholesome milk to such stations, but in localities that are not favored with such an arrangement it would seem that the responsibility of the inspector should end only when the infant has been fed a safe milk. The visiting nurse in

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the home of the new-born babe is surely as essential in educating the consumer to the proper handling of milk as the educational work of the inspector in the production of this product. If our efforts are to be crowned with the highest possible success it is certain that milk inspection must cooperate to the fullest extent with the visiting nurse or else she should become an adjunct of the bureau of milk and dairy inspection. With this question in view, it seems plausible that an investigation should be made of the relation which exists between milk inspection and child welfare work as it pertains to the proper care of milk in the home.

The program that has been arranged for this meeting surpasses by far our endeavors of the past. The instructive papers that are to be presented by men who have achieved national reputation in their work are of such importance as not only to interest us, but to attract the attention of every person interested in the dairy industry.

In conclusion, permit me to say that the object of our Association is to advance the public welfare through the protection of public health. Such an object can be attained only through the combined efforts of our members. We have reached a point where the continued success of our annual meeting depends upon the enthusiasm, energy and intelligence displayed by each individual member. We should realize that the reputation of the Association depends upon the accomplishments of its individual members. We must devote time and study to formulating our committee reports, and investigate all new phases of milk inspection, in order that the published proceedings of our meetings may be recognized as a safe guide for efficient dairy and milk control.

"After all, it is the inspector, and the inspector only, who has knowledge of conditions at first hand and is able to suggest the practical and practicable procedure by which remedies are applied. The whole structure of milk legislation rests primarily upon his reports, and without him that legislation cannot be enforced."—Editorial, Newark Eagle.

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

DR. HULBERT YOUNG, Baltimore, *Chairman.*
DR. H. E. STATES, Detroit.
DR. F. J. KENNEDY, Dubuque.

Inasmuch as a report will probably be submitted from a committee of this name at each annual meeting of this Association, we feel that we should confine our remarks chiefly to such pertinent items of information or interest as have come to our attention since our last gathering.

Bovine diseases which have some relation to or bearing upon the public health may be considered in the order of their frequency of occurrence, of their spread, their relative menace to the public health or the relative importance they may have assumed during the period for which this report is submitted.

The quite widespread outbreak of foot-and-mouth disease which made its presence known in this country last year, and which has possibly not yet been entirely eradicated, undoubtedly has first claim upon our attention.

This is an acute febrile disease, transmissible to all cloven-footed animals, and is most remarkable for the ease and rapidity of its spread. Its most striking symptom is the appearance of vesicular eruptions about the membrane lining the mouth, between the toes and over the skin of the udder, particularly about the teats. These latter have been considered as the principal, if not the only source of the infection of the milk. Whatever the method or source of contamination, the fact remains that milk from a diseased cow usually contains the causative agent of the disease and may, therefore, be the medium of its transmission to man. In man, quite high temperatures and the appearance of vesicles and ulcers about the mouth are said to be followed by similar vesicles and ulcers elsewhere about the body. Gastro-intestinal inflammation may ensue, and fatal terminations have been known.

For our purposes, the location of any herd in which there appears an eruption about the mouth, feet or udder, of rapid spread from animal to animal or herd to herd, accompanied

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by high temperatures and a distinct drop in milk production should lead us to view the condition with alarm and take steps accordingly. In this connection it must be remembered that the infective agent may be easily carried on the shoes or about the clothing, and a traveling inspector may easily, therefore, be the means of its spread from herd to herd.

Heating of the milk product from an infected herd to 160° F. for 30 minutes is reported to destroy the at present unknown infective agent.

Several other eruptive and ulcerative conditions may simulate foot-and-mouth disease. Cowpox, a contagious eruption usually localized about the teats and udder, may spread quite rapidly in a herd and may even cause such an amount of discomfort as to lead to a considerable loss of milk flow. This, as is well known, may be considered a mild form of smallpox. Since the papules of this disease, as well as the vesicles of foot-and-mouth disease, tend to ulcerate, the presence of such ulcerations about the udder may lead to some confusion in diagnosis. Cowpox, however, rarely or never makes its appearance save on the udder and teats. Ulcerations about the teats due to the invasion of a broken skin with ordinary pus-producing organisms may produce lesions simulating either of the above.

The lesions of ulcerative or necrotic stomatitis may so nearly resemble the mouth lesions of foot-and-mouth disease as to lead to a confusion of the two. This trouble, too, frequently spreads in a herd and may even appear in several herds in the same neighborhood. To add to the confusion, the necro bacillus is frequently found in the ulcers of foot-and-mouth disease as soon as these have been established. The distinguishing features between the two seem to be the rapidity of the spread of foot-and-mouth disease in a herd or neighborhood and the spread of its lesions to the feet and udder.

The control of foot-and-mouth disease has always been assumed to be an economical problem. The opportunity to study its relations to the public health has not, therefore, been afforded except in those countries where it has been permitted to persist for some time or to spread over considerable areas.

Streptococcic mastitis is a disease that has been much in the public eye and prints during the past few years on account of its supposed relationship to streptococcic sore throat. Al-

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though the proof of this relationship has been practically completed, much remains to be done before we may know whether we may definitely locate all cases of mastitis capable of transmitting the infection. In such cases as present clinical evidences of mastitis upon physical examination we are undoubtedly justified in prohibiting the sale of milk from these animals for human consumption for so long a period as these symptoms are in evidence, whether subsequent bacteriological examinations reveal the causative agent to be a streptococcus or a bacillus of the coli-aerogenes-paratyphus paracolon groups. There seems to be some reason for doubt whether a physical examination will reveal the presence or the existence of all dangerous cases. There also seems to be equally as much doubt as to whether the type or types of streptococci most active or wholly responsible for epidemic sore throat of milk-borne origin may be definitely labeled and set aside from other and perhaps harmless groups or types. It would seem, therefore, that until further word is had from our laboratory associates, we submit that our efforts must be confined to the examination of udders for physical evidences of mastitis and to the examination of the milk macroscopically for evidence of pus and yellow sediment, and microscopically for the presence of cell detritus in unusual amounts and types of pus-producing streptococci.

Like the poor, tuberculosis we have with us always. Less and less do we hear echoes of the doctrine that bovine tuberculosis is not transmissible to man, yet more and more the problem of its eradication assumes an economical aspect. Not that we desire to create an impression that the public health worker should lay down the burden of his responsibility in the matter, but that he should secure the cooperation of those to whom has been intrusted the conservation of our live stock interests, they jointly to arrange and carry into effect a program for the control and eradication of this grave animal plague. Too frequently, we fear, have jealousies of authority or jurisdiction prevented any attempt to secure the cooperation absolutely essential to carry into effect this program.

Save for reports of a considerable amount of work with the intradermal and the ocular tuberculin tests, little has come to light with regard to this disease during the past year, from the standpoint of this committee report, not already known.

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We may be pardoned, therefore, if attention is called to the report presented at our last meeting advocating a greater amount of publicity to be given the work of the control of this disease and to a grave consideration of the suggestions of the International Committee on the study of methods for the control of bovine disease presented at the meeting of the American Veterinary Medical Association.

Much as we would welcome any method for the better location of the tuberculosis animals in a herd, or the perfection of a method that would shed some light on the extent of the disease in a case revealed as tubercular, we feel that the subcutaneous tuberculin test, with all its shortcomings, must still be given our preference, as least for all primary tests and all retests applied after the expiration of a suitable interval.

This Association is indeed fortunate in that it is to hear from such eminent members of the veterinary profession on the three bovine diseases at this time responsible for grave economic losses and, too, matters of grave concern to all who have the interests of the public health at heart. Much that your committee might undertake to report upon we feel will be set forth by these gentlemen, and, of course, in a much more authoritative manner.

"The ignorant man can learn only from his own experience. The intelligent man will profit from the experience of others."

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

DR. WM. H. PRICE, Detroit, *Chairman.*
DR. C. O. GUIMONT, Quebec.
DR. STANTON H. BARRETT, Chattanooga.

The Committee directed to report to this Association upon Human Diseases, their Relation to the Milk Supply and to the Public Health, desires to preface its remarks with a statement of the milk situation as it prevails as a whole, in order that a proper perspective may be obtained and that no undue or exaggerated value may be given to any one phase of the milk problem, particularly to the disadvantageous side, with which this Committee has to deal.

I. Milk contains all of the elements needed for human nutrition. It contains the proteid, carbohydrate, the fat and the mineral matter, and it contains them all in an easily digested form, with a minimum of waste.

II. Milk is one of the cheapest forms of animal products food.

III. Milk is liable to certain unnatural or abnormal conditions which may tend to adversely influence the health of its consumer, viz.:

First. By watering or skimming, its food values may be removed.

Second. It may be so contaminated by non-specific organisms or their products as to interfere with digestion or promote indigestion.

Third. Milk may be infected with, and transmit, specific communicable disease.

With this perspective, the Committee desires to report relative to that part of the milk problem, so-called, assigned to it, the following:

First. The practice of skimming and watering is likely to prevail in all places not subject to frequent inspection. Such a state of affairs may proceed largely from ruthless competition rather than entirely from a spirit of greed. Watering and skimming in part indicate undesirable dealers, likely to succumb to other temptations of omission and commission, unfit

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for positions of trust, such as that of milk purveyors. Such men should be eliminated from such a calling. This elimination is possible with the minimum inspection force and activity.

Second. Contamination by non-specific organisms is likely to result in untoward symptoms on the part of the consumer. The degree of contamination necessary to produce untoward symptoms is unfortunately not fixed, but varies with the nature of the organisms, and very largely with the susceptibility of the consumer. Generally speaking, milk containing less than one hundred thousand (100,000) bacteria to the cubic centimeter may be classed as good; milk containing one million (1,000,000) bacteria to the cubic centimeter may be expected to produce definite untoward symptoms in a certain percentage of infants fed thereon, which definite untoward symptoms would not develop in the same infants fed on a better grade of milk, such grade to be determined by the bacteria count.

In addition to untoward reactions to such contaminated milk, there is definite reason to question the digestibility of such a product by persons of any age on account of unpalatable flavor and odor and common knowledge of the source of such characteristics.

Third. The specific diseases most frequently transferred by milk as a medium are tuberculosis (bovine) and the acute contagious, typhoid fever, scarlet fever, diphtheria and septic sore throat. It is quite likely that the other so-called minor infectious diseases may be spread in the same way.

This Committee has conducted no extended investigations relative to the prevalence of milk-borne contagions. We can, however, submit as conclusive the findings of Park and Krumwiede regarding *"The relative importance of the bovine and human forms of Tubercle Bacilli in the different forms of human tuberculosis,"* and of Schroeder in discussing the relation of the Tubercular Cow to the Public Health; and the findings of Trask and Lumsden relative to transference by milk of the acute infections.

Park and Krumwiede conclude the following relative to bovine tuberculosis in the human:

"Bovine tuberculosis is practically a negligible factor in adults. It very rarely causes pulmonary tuberculosis or phthisis, which causes the vast majority of deaths from tuber-

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culosis in man and is the type of disease responsible for the spread of the virus from man to man.

"In children, however, the bovine type of tubercle bacillus causes a marked percentage of the cases of cervical adentis leading to operation, temporary disablement, discomfort, and disfigurement. It causes a large percentage of the rarer types of alimentary tuberculosis requiring operative interference or causing the death of the child directly, or as a contributing cause in other diseases.

"In young children it becomes a menace to life and causes from six and one-third to ten per cent of the total fatalities from this disease."

It seems reasonable to add to the above that, at present, a considerable body of opinion holds that a majority of the tuberculosis infections occur at a very early age, that they remain latent for years, and only develop actively under the predisposing influence of the stress and strain of later years. If this belief is well grounded, a problem worthy of investigation presents itself, viz.: May tubercle bacilli, originally of the bovine type, during years of culture in the human organism change their characteristics so as to become in fact identical with the human variety? The Committee is unable to answer this question. If it can be answered in the affirmative, it promises to revolutionize the methods of anti-tuberculosis campaigns.

Schroeder in Bulletin 56 of the Hygienic Laboratory, discussing the relation of the Tubercular Cow to Public Health, concludes:

"* * * That Tuberculosis is the most common disease of both persons and dairy cows and that persons and dairy cows are its most common victims. That dairy products are indispensable and that they are more commonly eaten in a raw state than other products from animals. That tubercular cows often expel tubercle bacilli long before they show signs of their diseased condition. That milk is almost invariably contaminated with the material in which tuberculous cows most commonly expel tubercle bacilli from their bodies. That tubercle bacilli in milk are transferred to the cream, butter, and cheese made from it, and may occur in these products in greater concentration than they had in the milk from which they were derived.

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"That tuberculosis among dairy cows is so common and widespread that it would be impossible to clean all dairy herds of the disease for some time to come, hence, for the immediate protection of the public health, it is necessary to resort to pasteurization, and that pasteurization should not be restricted to milk alone, but all milk, cream, etc., used in the manufacture of butter, cheese and other dairy products should be included.

"That the elimination of tuberculosis from the dairy herd is urgently recommended, not only because the protection of public health requires it, but also because tuberculosis among cattle is a serious cause of pecuniary loss, so serious, indeed, that from the strictly economic point of view it must be regarded as the most important problem those who are interested in animal husbandry can undertake to solve."

L. Lumsden in Bulletin 56 of the Hygienic Laboratory states:

"* * * That milk is a favorable culture medium for the Typhoid Bacillus. That milk may be infected with the Typhoid Bacillus in several different ways, namely: At the dairy farm where the disease may exist in the dairyman's family and no precautions are taken to keep the patient and those caring for the patient from handling the milk and utensils; from carriers who may have had typhoid at some previous period and had apparently recovered but were still discharging typhoid bacilli; that the water supply used to wash the milk utensils might be contaminated; that flies passing from infected excreta to the milk or milk pails and cans may readily carry the infection.

"At the city dairy milk is exposed again to the danger of becoming contaminated by persons handling it or by flies and dust, and by bottles returned from places where typhoid fever exists, and by washing bottles in an infected water supply; at stores where typhoid patients may be cared for in rooms above or to the rear, and the milk purveyed by the same hands that nursed the patient. In this way there is not only a likelihood of infection being sent out in the milk directly from the store, but much damage may be done in returning empty bottles to the dairy.

"At the home milk, after being delivered to the house, may become contaminated by the hands of those caring for the sick, or by flies, etc., and may be the medium of conveyance of infection to the other members of the household."

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Diphtheria, scarlet fever and other contagious diseases may be spread through milk in much the same manner as typhoid.

How to determine an outbreak of disease due to infected milk:

"In the epidemiological studies of contagious diseases in a city, a card or chart should be kept for each milk dealer and on this card should be noted all cases of contagious disease in persons who within thirty days previous to onset of illness have used milk supplied by that dealer. Thus, as soon as an unusual number of cases are reported along the route of any dairyman it is apparent on the card and attention may be given at once to the dairy and the farms supplying the dairy with milk.

"A number of conditions should be taken into consideration in determining what constitutes an unusual number of cases among the customers of a given dairyman. Of the conditions to be especially considered is the general prevalence of contagious disease in the community, the amount of milk sold, the method of handling milk at the dairy, the number of sources from which the milk comes and the way in which milk is served to customers."

George Newman sums up the characteristics of milk-borne epidemics as follows:

a. "There is a special incidence of disease upon the track of the implicated milk supply. It is localized to such area.

b. "Better-class houses and persons generally suffer most.

c. "Milk drinkers are chiefly affected and they suffer most who are large consumers of raw milk.

d. "Women and children suffer most, and frequently adults suffer proportionately more than children.

e. "Incubation periods are shortened.

f. "There is a sudden onset and rapid decline.

g. "Multiple cases in one house occur simultaneously.

h. "Clinically the attacks of the disease are often mild. Contact infectivity is reduced and the mortality rate is lower than usual."

Lumsden recommends the following steps to prevent the dissemination of the infection of contagious diseases in milk:

"(*a*) The prevention of the introduction of infection into milk.

"1. Location of the dairies in good surroundings.

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"2. Prevention of the handling of milk by persons who are in contact with patients infected with a contagious disease or who themselves are liable to be discharging contagious disease bacilli in their excreta. It does not seem unreasonable to require the owner of a store in which milk is sold and in which there is a patient with a contagious disease to either remove the patient to a hospital or some other house or to close up the business until the danger from that patient is passed.

"3. Exclusion of flies and other insects so far as possible, by screening, etc.

"4. Sterilization of bottles and cans returned from houses before being again filled with milk, or the use of paper bottles which would not need to be returned.

"5. The sealing of the bottles or cans of milk so that they may not be infected in the course of delivery.

"(*b*) The destruction of infection in milk can be accomplished best by an officially supervised pasteurization of the milk supply."

The compilation and statement of Dr. John W. Trask on "Milk as a Cause of Epidemics," published in Bulletin 56 of the U. S Hygienic Laboratory, completely and accurately covers the subject named. The facts disclosed by Dr. Trask are so common as to come within the personal observation of anyone engaged for a comparatively short time in supervising a large milk supply, and his discussion of the subject is recommended as authoritative.

In conclusion, the following brief recommendations are made:

First. Elimination of the milk-borne dangers to human health requires in the first instance preventive measures, such as close application of the principles of the various Government score cards to the production and handling of milk, tuberculosis tests, and exclusion of milk from farms on which contagious diseases exist. In the application of the score-card principles to Dairy Inspection, the inspector should pay particular attention to the avenues by which pathogenic bacteria may infect milk, *i. e.*, the condition and location of privies surrounding dairies, water supplies and health history of those handling milk.

Second. Potential danger not detectable, or not likely to be detected, may exist in milk produced and handled under the

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best possible conditions. Such danger may reside in carriers, persons harboring infectious germs, such as typhoid fever and diphtheria, to which they themselves are immune; danger in the incubation stage, before a diagnosis is possible; danger also in the product of cows not known to be tuberculous. Elimination of such dangers is only possible by proper pasteurization, and that process is recommended.

DISCUSSION.

PROFESSOR W. A. STOCKING, Ithaca. I was very much interested in Dr. Price's paper. It was an excellent paper. I want to call your attention to the fact that we must look at problems of this sort from two sides. The figures which he gave, as given in Bulletin 56, in regard to the number of cases caused by milk-borne epidemics, taken by themselves look large; but if you will take the trouble to take out of those tables the number of cases which have occurred in your own State during the period of 23 years covered by those reports, I think you will be astonished, as I was, to find what an infinitesimal showing they make.

MR. HENKLE, Philadelphia. We have had compulsory pasteurization in Philadelphia the last year. Ninety-five per cent of our milk is pasteurized. On the other hand, some of the dealers say they are pasteurizing, but we have reason to think they are not. In one instance we had eighteen or nineteen cases of typhoid fever.

DR. FISHER, Charlotte, N. C. Regarding the recommendation of his committee that the city of Detroit pasteurize all milk, I would inquire if that conclusion was arrived at before or after you had asked the cooperation of the general public in carrying out your health law? Had you made a campaign of education on the responsibility of the general public as to the question of the milk supply?

DR. PRICE. Without education we could get nowhere. We have done the very best we can to conduct such systems of education. I think in certain respects we have gone further and had more advantages than most any other city. For instance, the newspapers in Detroit happen to be particularly favorable to the present administration. They give full front pages at any time. For instance, when we want to combat

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typhoid fever, I do not hesitate to ask any paper to give at least a half full front page, and they are very glad to do it. Our little bulletin is gotten up deliberately with the purpose of getting the items in the newspaper. We do, of course, try to educate the people to the best of our ability in all ways, though we have no complaint about our appropriation in Detroit, as so many people have. I think with those appropriations we should bend our efforts towards the solution of our problems, so that the solutions can be presented in such a compact way that the people can apply it to their own use. What we can do for the people is infinitesimal compared with what can be accomplished if the people can have the information for themselves.

QUESTION. In the recommendations which you make in regard to milk receptacles being left at the home in which a communicable disease exists, I wonder if any steps are taken by the Health Department to inform the general public of their responsibilities in handling such receptacles previous to their return to the dairy.

DR. PRICE. I think as a general proposition in most cities when a communicable disease occurs, the house is placarded either by a representative of the Health Department or by the Police Department. Previous to July 1, 1913, we had three very good, faithful old gentlemen who went around and tacked these signs up, and at intervals went around to these houses, and were known as quarantine inspectors. On July 1, 1913, that system was done away with, and we had appointed ten contagious-disease nurses. The Police Department tacked up a card immediately a case was known. The next morning a nurse (all our nurses are registered nurses) goes to the house with a little booklet, for instance, on typhoid fever. (There is a booklet on almost all of these diseases.) That is taken by the nurse to the family that is quarantined. We do not think that literature amounts to very much if it is just left at the house. We do not think people read it. But we do think that if a nurse will get into the house and talk to the mother and the housewife and will have something of interest to say to her, and takes this little book and goes over it with the housewife and tells how to prevent the spread of the disease, that something substantial has been accomplished. People are willing to do lots of things if they are shown just how to do

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it. These nurses do that very thing. They give whoever is in charge of the house specific directions, and those milk bottles are not taken away from the house and are under the nurse's charge until the disease is terminated and then the nurse takes charge of them and sees that they are properly sterilized.

As far as Professor Stocking's reference to the number of cases is concerned, his point is that the number of contagious diseases given by Trask is very small. That has already been answered by the statement that that does not include all the epidemics. So far as I know, in Trasks's compilation of the known epidemics caused by the milk supply, Michigan does not appear, yet I have positive knowledge that each year we have had diseases carried by the milk supply. Few of the deaths that we had last year in Detroit were traced absolutely to the milk supply. I have a chart showing how we keep track of the epidemics as they occur. After we had reason to believe that something was wrong, we looked up the matter of Mr. E.'s milk supply. On the 13th of January a case of scarlet fever was reported on his route. The next day the nurses in bringing in their information reported three more cases. Automatically Mr. E.'s milk supply was shut off. The next day two of the inspectors in the city canvassed every one of its dealers. They told the people that whatever had been wrong was stopped. However, scarlet fever continued to appear for ten days, which is about the limit of the incubation period, and then stopped. In the meantime Mr. E.'s milk was being pasteurized. He had 69 cases of scarlet fever among his customers in Detroit, and yet he only sold a few hundred gallons of milk. This man, being shut off from the Detroit milk supply, sent his milk into the neighboring village of Royal Oak, where 140 cases developed and death resulted in several households.

MR. PURRINGTON, Concord. I had an epidemic of typhoid fever, which broke out on two different occasions. In the first instance there were 13, in the second instance, 20 cases, in a French settlement in the State of New Hampshire. Every case was on one man's route. All were French Canadians. All the milk was raised on one farm. It was distributed by another man. The first year we suspected two wells. Water analyses were made, but no colon discovered. Next year 20

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cases of typhoid developed. We then had Widals taken of everybody connected in any way with that milk business. There was a father and son. In the father's family the first year there were three people sick of typhoid fever. The next year the son came down with typhoid fever. All Widals were negative with the exception of the father, who showed a positive reaction. He had never been sick with typhoid fever in his life. The milk was sold in bottles. The bottles were washed in a dishpan, and all the water used to wash and heat those bottles came from a little, ordinary kettle. Sterilization was impossible. The evidence was conclusive that the contagion was spread by the father, by the use of bottles that were not properly cleaned and sterilized. Notwithstanding that, the man had never been ill from the disease.

MR. ROTHERY, Auburn, N. Y. We have just come through a siege of 45 cases of typhoid, which we have traced directly to the milk, within the last two months. On December 31, 1914, there was a case of typhoid fever that was not reported either to the State department or the local department. The man recovered. During July we had a few cases of typhoid, and they kept coming faster and faster. By the ninth day of August we had found the majority of cases to be people served by one man, and started the inspection of his farms to discover whether there was any typhoid or history of typhoid. We discovered on one farm a man aged seventy was sick. The doctors had not made a decision. On the eleventh day of August they made a decision that it was typhoid. On the eleventh day of August we shut off that supply and ordered all the rest of the milk pasteurized. There were 45 cases at the time; 39 were charged to that dairy. We have made a rule that we will not allow any person who has had typhoid to handle milk until he has proved positively that he is not a carrier of the disease.

PRESIDENT HENDERSON. There is one optimistic viewpoint, and that is as pasteurization becomes more universal, we are going to have fewer tales to tell about milk as a carrier of human disease.

"The first duty of a dairy inspector is to prevent disease."—Dr. J. W. Kerr.

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REPORT OF COMMITTEE ON THE CHEMICAL EXAMINATION OF MILK AND MILK PRODUCTS.

DR. JAMES O. JORDAN, Boston, *Chairman*.
H. N. PARKER, Boston.
THOS. A. BUCKLAND, St. Louis.

The Committee on Chemical and Bacteriological Methods for the Inspection of Milk is of the opinion that in the chemical and bacteriological examination of milk products the interests of all concerned would be best served, and possible confusion avoided, by the adoption by the International Association of Dairy and Milk Inspectors for chemical work of the Methods of Analysis of the Association of Official Agricultural Chemists, and for bacterial testing the Standard Methods for the Bacterial Examination of Milk issued by the Committee of the Laboratory Section of the American Public Health Association.

The Committee recommends the adoption of these methods.

DR. JORDAN (continuing:) The Committee has deemed it wise to suggest for your consideration approval of the present methods, rather than printing or publishing other schemes for the testing of milk.

"Stand with anyone who stands right; stand with him while he stands right; and part with him when he goes wrong."—Lincoln.

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REPORT OF COMMITTEE ON DAIRY FARM INSPECTION.

PROF. C. B. LANE, Philadelphia, *Chairman.*
PROF. H. A. HARDING, Urbana.
J. A. GAMBLE, Washington.

With the development of the dairy industry came many problems. One of the most difficult to control was the spread of disease through milk. Cities and towns began to look for men to control their milk supplies in order to assure the public a reasonably safe product. Few men of sufficient experience were available, and those few, even when offered positions, were seldom attracted by the meager salaries they carried. While the beginning was slow, great progress is now being made. It is generally agreed that the object of dairy inspection is to provide a milk supply which is free from impurities and disease. This calls for the closing of those avenues through which these find their way into milk. Obviously the real benefits to be received from dairy inspection are to a large extent determined by the capability of the dairy inspector himself.

In endeavoring to provide a safe milk supply, undoubtedly cows free from disease are the first requisite. Other important requirements are the cleansing of the flanks and udders, sterile utensils, covered pails, clean, healthy milkers and immediate cooling of the milk. A distinction should be made between the kinds of bacteria in milk. The inspector should especially guard against those germs which cause disease in the human family, and he should also make an effort to reduce the number of organisms which influence the acidity or keeping quality of the milk.

THE DAIRY FARM SCORE CARD.

In view of recent discussions relative to the Dairy Farm Score Card in various dairy papers and magazines and elsewhere, your Committee feels that this is an opportune time to endeavor to clear up some of the misunderstandings as to its real purpose.

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ORIGINAL OBJECT.

Before the Score Card came into existence, the work of the inspector was very indefinite. He had a long list of questions to fill out, which he answered with great care and which consumed a great deal of time, but when he was all through the material he gathered was in such form that to classify dairies or to make quick comparisons of the results of different inspections was almost impossible, and his notes were also in poor form for filing. One of the objects of the Score Card from the very first was to put the results of inspections in some concrete and convenient form, and it was thought this could best be accomplished by mathematical ratings. This method has now been in use some eleven years, and thousands have testified to its value. Another purpose of the Score Card, and of no less importance, was that it should serve as a guide in instructing producers in the cleanly handling of milk and in selecting such equipment in the stable and milk house as would tend to promote sanitary conditions, as, for example, cement floors, simple stanchions and mangers, abundance of light, etc. The health of the cows was also given a prominent place. It has proved simple and understandable and of untold value in throwing safeguards around the production of milk. It has brought the inspector close to the producer, and, as Mr. Kelly of the Dairy Division says, "it gets results." No one knows this better than he, because his reports show that it has been adopted in hundreds of cities and a score of the States, and is used at the rate of tens of thousands of cards a year, and is frequently pronounced the greatest single factor in improving the milk supply in many cities.

WHAT THE SCORE CARD DOES NOT DO.

We believe that where difficulties arise, the trouble is due largely to a misunderstanding of the object of the card and to trying to accomplish with it things that it was never intended to accomplish. For example: Exhaustive experiments have been made and much time spent trying to prove that there is a relationship or is not a relationship between the score of a dairy and the bacteria count. This has no bearing on the use of the card, as it never was a standard for closely estimating the quality of the milk produced on any particular farm and

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was never intended for that purpose. Nevertheless, results show that where a large number of dairies are scored regularly over a considerable period of time and bacteria counts taken regularly, low bacteria counts go with high scoring dairies and high bacteria counts with low scoring dairies. The following is a case in point.

Comparison of 1,392 bacteria counts from 484 dairies supplying an Eastern city with milk during 1910, 1911, 1912, 1913, 1914. City population about 100,000.

Average count of dairies scoring over 80, 25,000. No dairies represented, 47.

Average count of dairies scoring 70-80, 98,000. No. dairies represented, 46.

Average count of dairies scoring 61-70, 352,000. No. dairies represented, 334.

Average count of dairies scoring 50-61, 470,000. No. dairies represented, 711.

Average count of dairies scoring under 50, 566,000. No. dairies represented, 254.

In the city in question, whenever a producer demonstrated an interest in the production of a high grade of milk an effort was always made to assist him in securing a market which appreciated the better milk in a financial way. No doubt this helps to explain the above results, for with the added return came added interest and higher scoring dairies.

If the Score Card shows that a dairy has the proper equipment and methods and still has a high bacteria count, then the fault is not with the Score Card, as the Score Card has gone as far as it can, but rather the fault of the dairyman, and his work should be checked up not by the dairy farm Score Card, but by a score card which rates the quality of the milk produced, and which is distinct from the score card which rates the dairy. The dairy is one thing and the product is another.

There is the element of the efficiency of the dairyman himself which must come in here and which in many instances is responsible for 99 per cent of the bacteria count. It is possible for a farmer to produce milk with a low bacteria count the year around with a comparatively low scoring dairy. This has been frequently proven by offering a small premium at the creamery for a low bacteria count. Counts have sometimes

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run as low as two or three hundred per cubic centimeter from dairies scoring only 50 or 60. It is the man and his methods, not the score of the dairy as a whole, that has the most influence on bacteria counts. A clean dairyman can produce low bacteria milk in a comparatively low scoring dairy.

If we look upon the Score Card as giving us a picture of the physical condition of the dairy, this does not necessarily mean that it will show the number of bacteria in the milk any more than we would expect a physical examination of a cheesemaker's establishment to show the quality of the cheese he could make. The factory may be perfect but the man defective. We think too much of a point has been made of the question of bacteria in relation to the Score Card. It has a broader field than reducing bacteria, and treats of many things that have no bearing on bacteria. In this physical examination of the dairy we have spoken of the health of the cows, and the purity and healthfulness of the water supply. These have much to do with the wholesomeness of the milk, but have little to do with the bacteria count. Then there is the question of decency or respectability which the Score Card covers, but which has little to do with the bacteria count. For instance, provision is made for the manure to be removed a certain distance from the stable, for the whitewashing and general cleanliness of the walls and ceilings, and the cleanliness of the cows. It might be possible through the use of the small-top pail to get milk with a fairly low bacteria count from a filthy cow, but is this a wholesome condition, and are we satisfied to let it go at that? The manure heap fermenting just outside the stable and the dirty cobwebs hanging from the ceiling may not be proved to add bacteria to the milk, but shouldn't this be corrected for the sake of respectability, if nothing else? If clean surroundings are not important from the standpoint of affecting the bacteria count, shouldn't these conditions be taken into consideration from the standpoint of respectability and health and safety?

We have in our farm inspection work problems similar to those we have in our cities, where an effort is being made to bring about a general uplift in various kinds of business, not so much for its effect upon the product as upon the people engaged in the business. For example, the sweat shops are requested to clean up, ventilate, let in the light, shorten hours

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and employ sober men. Restaurants are required to clean up, handle food in a cleanly manner and use pure ingredients in cooking. These things are for the improvement of the moral tone of the business. So it is with the dairy farm; if the men who do the work have clean surroundings, good light, healthy animals to care for, this means an improvement of the general atmosphere about the producer's home, and this is what the Score Card does, but these things do not necessarily affect the product. No one is pleading for expensive equipment, but we believe that all will vote for cleanliness and wholesome surroundings and conditions, whether they have a direct effect upon the bacteria count or not. The milk dealers and all engaged in the handling of milk who recognize and pay a premium to high-scoring dairies are aiding respectability and moral improvement. It is a step in the right direction. We believe that if more attention were given to educating and helping the farmer, rather than making hair-splitting comparisons between the different score cards, all of which are working for the same object, that more would be accomplished. An effort should also be made both by the men in the milk business and by those who promulgate milk regulations in our cities to give recognition to the clean dairyman, not only because his milk is clean, but because he himself and his dairy are clean.

The Score Card will probably not undergo radical changes very frequently. Those who have the matter in charge, however, will be glad to receive suggestions for changes at all times, and these will be carefully considered from all standpoints. It is hoped that all interested, whether investigators, inspectors, or milk producers, will cooperate in this matter to the end that we may gradually develop the best and most helpful score card that it is possible to construct.

DISCUSSION.

MR. BENJ. L. PURCELL, Richmond. First, with reference to the dairy score card as it applies to barn construction: Do you mean to include in that card such things as divisions between stalls and cement floors? What do you mean by the health of the animals? Possibly affected with disease, or those that have not been subjected to the tuberculin test?

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PROFESSOR LANE. If the gentleman is familiar with the score card, he will remember that a certain number of points are given for construction, that is, for a floor that is impervious to moisture, is well constructed, easily cleaned, and is sanitary. On the other hand, if a floor is clean and well built, although it may be planked, and the conditions are good, he will get something for construction, but not as much as if he had a cement floor or a permanent construction.

In regard to the health of the cows, the present dairy farm score card provides, I think, for six points for the herd being tuberculin tested in the year. A certain number of points is given to the cows being examined and in a good physical condition. It is true that more points are given to the regular tuberculin test than to the mere physical examination, and I think that should be so, because the Government here in Washington will tell you that from 10 to 15 per cent of the cows in the United States are affected with tuberculosis, and on account of this disease those twenty million cows will probably give 20 per cent less milk, and the loss to the industry on account of tuberculosis is from twenty-five to thirty million dollars.

Personally, I think the tuberculin test is very important, and it is worth while for any farmer to keep his herd free from disease. He is going to be the loser in the end from a business standpoint; he can't afford to have tuberculous cows.

MR. PURCELL. I agree with you entirely so far as the advantage to the dairyman goes. It is imperative for his own protection. The score card is partly for the encouragement of the dairyman, as well as for the information of any who read his score. I doubt the propriety, however, of a State or city undertaking to reward the dairyman because he does something that does not help to safeguard the public health.

PROFESSOR LANE. Would it not help to safeguard the public health if a man's herd was free from disease?

MR. PURCELL. If he is pasteurizing, no.

PROFESSOR LANE. Of course, proper pasteurization would render the milk safe, but, on the other hand, if we were to have a choice between using milk from a herd that was absolutely healthy and milk from a herd diseased, but pasteurized, we would prefer the milk from healthy cows.

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DR. LOWE, New Jersey. Mr. President, I have been very much interested in your various papers, and I think all scientific men concur in the value of the tuberculin test. When Koch made the statement that bovine tuberculosis was not transmittable to the human family, we were rather shocked. Today we want to be rational. I believe thoroughly in the tuberculin test when scientifically and intelligently applied. It was said it was of value to the owner to have his cattle tuberculin tested. That does not apply in northern New Jersey. All our cattle are imported. We are very densely populated. The dairy cow leads a fast and strenuous life; her average is not more than six months. We all know there are lots of fine cattle that are tuberculous. The dairyman in our section would not give anything for the tuberculin test. He looks upon the tuberculin test when the Boards of Health require it as a sort of perfunctory performance. He simply looks at it commercially. I think it should be applied rationally rather than radically. Our herds should be divided into tubercular and non-tubercular herds. We should be very careful about dividing them. Milk from herds that have tubercular reactors should certainly be pasteurized. A great many cows with bad udders can be eliminated by a physical examination.

DR. T. E. MALONEY, Fall River. From my observation the score card has been one of the most important educational features introduced into the sanitary control and regulation of the milk supplies. I think it is of great educational value, not only to the health officer, but to the dairyman himself. It places before him a picture of how the other fellow views his business. It also is of educational value to the dairy inspector and the health officer, because it keeps him within well-defined limits, curbs his tendency to become impractical, and the result is cooperation.

MR. ROTHERY. What do you consider adequate protection from contamination for the utensils on a dairy farm—protection after washing is done? Three inspectors interpret that differently. The first contends all equipment must be kept in the milk room. Another says that by putting his equipment out in the sunlight he will get full rating. A third says he will not give a full rating unless the equipment is kept in the sterilizer until the next time for milking.

PROFESSOR LANE. Every inspector knows that every dairy

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is a separate problem. There is no standard that will tell inspectors absolutely what to do under every condition. It is expected that the inspector will use his common sense and good judgment. This point is a question regarding which inspectors would have some difference of opinion. The ideal condition would be to keep your cans, milk pails, etc., in the sterilizer away from dust and dirt, bacteria and flies. In the second place, you suggest the milk room, inside. Very good, if that is free from flies and dust, and is protected from everything that could contaminate the milk utensils. As to outside inverted utensils, the inspector will have to use his judgment. If they are placed next to a road where there is plenty of dust, and the cans sit there with the top up, that would not be a perfect condition. Under those conditions I would allow nothing for the protection of those cans from the standpoint of bacteria. If there is dust getting into the cans, it is not a perfect condition, or if there are flies and they have access to them; but if the cans are sterilized and put outside on a rack, and there was no dust or flies or anything that would contaminate, under those circumstances I think I would give a perfect score. Thorough protection of the utensils is the point to be insisted upon.

"No inspector's knowledge and experience is complete until that knowledge and experience is subjected to discussion and criticism by his fellows."—Price.

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REPORT OF COMMITTEE ON CITY MILK PLANT INSPECTION.

E. C. KREHL, Detroit, *Chairman.*
E. REUTER, Chicago.
F. H. BOTHELL, Salt Lake City.

We believe that City Milk Plant Inspection is second only in importance to Dairy Farm Inspection; that the system to be followed in inspecting city milk plants should be along the lines followed in dairy farm inspection; *i. e.*, the score card principle should be employed, rating the milk plant on equipment and methods in like manner as the dairy farm is rated. This report, then, will cover:

First. Use of score cards;

Second. Milk plant construction;

Third. Equipment;

Fourth. Methods of inspection and control of city milk plants.

USE OF SCORE CARDS.

To determine to what extent score cards were being used for the inspection of the city milk plants, letters were sent out to fifty-six cities throughout the United States and Canada asking for milk ordinances and score cards. Replies were received from forty-five cities, eleven not replying.

Twenty of the forty-five cities use no score cards.

Seven cities use the United States Dairy Division Score Card for city milk plants.

Eighteen use local score cards. Of these eighteen two use the same card; the other sixteen are using score cards of various types.

Two have cards which are divided into five divisions, allowing 100 points for each division.

Six cities have cards with no divisions, but score on a basis of 100 points.

Seven cities use cards divided into two divisions, allowing 100 points for equipment and 100 points for methods, multiplying the number of points allowed for methods by two, dividing the total sum allowed by three for the rating.

One city does just the opposite to get the rating of the milk plant. They divide the sum of the points allowed for equipment and for methods by two.

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Two cities have cards divided into divisions, allowing 50 points each for equipment and methods, taking the sum of the points allowed as the rating.

One city rates its city milk plants according to the score of the dairy farms and dairy cattle, the quality of the milk, city milk plant score and bacteria count. (Would refer anyone to the Health Department here in Washington for this method of rating.)

The committee would recommend that the United States Dairy Division score card for city milk plants be more generally used and the following with reference to construction, equipment and methods of inspection and control of city milk plants.

LOCATION.

The ideal location for a milk plant is in the country, in the center of its source of supply, where the milk can be put in the final containers soon after being delivered from the producer. However, for a large business this practice would necessitate several plants in different localities, thereby greatly increasing overhead expenses, and transportation costs would be doubled. The practical location is in the city where the business can be carried on in a central plant, thereby permitting of more economical handling of the milk and its products and a more proper supervision can be given by health authorities.

The site should, if possible, be on a well-paved street through which there is a minimum amount of traffic, in a neighborhood that is free from factories and other contaminating surroundings, yet convenient to the main arteries by which its supply enters the city and to the trade which it serves. When new plants are to be built in new locations the Health Department's approval should first be secured before building operations are begun.

CONSTRUCTION.

Before a milk plant is constructed the plans should be carefully thought out and blueprints made, the same to be submitted to the Health Department for approval.

The preferable construction is the latest type of reinforced concrete. All rooms in which milk is handled and in which apparatus and other utensils are washed should be provided

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with sufficient light and ventilation. (Minimum requirement for light should be 10 per cent of floor space; 20 per cent or more is recommended.)

FLOORS.

Floors should be constructed of concrete or some other equally non-absorbent material. In rooms where milk cans are emptied or rolled to any great extent boiler plate should be used, as the constant wear and tear of handling full cans would otherwise soon wear holes in the concrete, making cleaning difficult. The terasa finish to concrete floors seems to wear longer than the ordinary cement finish.

DRAINAGE.

Floors should be so constructed that all water and other waste will readily drain off. Drains should be suitably trapped and drainage where not discharged into city sewers should be disposed of into septic tanks.

WALLS AND CEILINGS.

When not constructed of concrete, smooth brick or tile, walls and ceilings should be sheathed, dust tight and well painted with a light-colored paint.

DOORS AND WINDOWS.

These should be so constructed that they may be readily screened and all doors provided with self-closing devices.

VENTILATION.

All milk plants should be properly ventilated either by forced-draft system or windows.

ARRANGEMENT.

Arrangement of milk plants will necessarily vary according to amount of milk handled. In small plants where small amounts of milk are handled, separate wash room, boiler room, handling room, and refrigerator are all that are necessary. Larger plants, however, require larger and more rooms, in-

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cluding boiler room or separate power plant, receiving room, wash rooms for bottles and cans, handling rooms, refrigerating room and sales room.

The rooms for receiving and handling milk and the refrigerators should be so arranged that a minimum of piping can be used.

STABLES; TOILET FACILITIES.

All horse stables should be entirely separated from milk plants.

Proper toilet facilities should be provided for the use of the employees and in no case should a water closet communicate directly with any room in which milk or its products are handled. Privies and earth closets, where necessary, should be at least 100 feet from the building and have fly-proof vaults.

No living rooms used for domestic purposes should directly connect with milk plants.

EQUIPMENT.

Equipment of a milk plant again will vary with amount and kind of milk sold—raw or pasteurized.

In general, proper equipment for a milk plant should consist of the following: Steam boiler, appliances for cleaning utensils and bottles, sterilizers for bottles and other apparatus, bottling and capping machines, proper piping, shafting pulleys, etc., for operating the plant; washbowl, soap and towel for the attendants in the handling rooms.

All weigh cans, storage vats and other apparatus should be constructed of suitable metal, preferably tinned copper.

Angles and joints should be smoothly soldered and provided with closely-fitting metal covers of similar material.

Pipes and pumps should be of sanitary construction and so arranged that they may be easily taken apart for cleaning. No tightly soldered elbow joints should be allowed.

Valves on bottling machines should be simple and so constructed that they may be easily taken apart and cleaned.

Every milk plant, large or small, should be equipped with a Babcock Tester, and large plants should have well-equipped laboratories for both chemical and bacteriological work. Water supplies should be adequate, clean and fresh.

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INSPECTION.

Attractive, well-equipped milk plants are no indication of the quality of milk which is being handled and sold. The inspector's work does not cease with securing a sanitary and well-equipped milk plant. It is his business to see that the milk going through the plant is of good quality to begin with, and that it is being handled properly. The inspector, then, to properly supervise the handling of milk for city consumption, must know and appreciate the responsibility which rests upon him. It is needless to say that none but trained inspectors should be employed.

It should be the city inspector's duty to examine all milk entering milk plants for temperature and cleanliness, and frequently take samples for chemical and bacteriological analysis; examine all apparatus, piping, pumps, etc., to see that they are being properly washed; that floors, walls and ceilings are kept clean; that all rooms are properly screened during the fly season; that the milk is being handled with a reasonable degree of rapidity; that it is not unduly exposed to air in the plant; that it is properly cooled and stored at a low temperature (not higher than 45 degrees, F.); that the attendants are personally clean, healthy, and are wearing clean, washable clothing; and that the delivery outfits are clean and that the milk is properly protected during delivery.

Only covered vehicles should be tolerated, and all milk should be well iced during hot weather. Temperatures should never be allowed to rise above 50 degrees, F. Bacteria samples should be taken at frequent intervals from wagons so that the inspector may have a check on the methods employed at the plant.

City milk plants should operate under a revokable license system.

RECORDS.

City milk plant inspection is not complete unless some good system of records is kept. Records should include applications for permits to operate, copies of all scores made and results of all samples taken, same to be open for public inspection.

No mention has been made in this report as to equipment for pasteurizing plants, it being the belief of this committee that this question is a subject by itself and should be reported on at our next meeting.

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DISCUSSION.

MRS. JULIAN HEATH, New York City. Mr. Chairman, I was quite pleased with that point of view, because in my work representing the Housewives' League—and I have been on two State milk commissions—I have found that great danger, even greater danger, lies in the way milk is handled in the city than on the farm. I started at the producer's end. You will find very unsanitary handling of milk in cities at the milk plants, and with the smaller dealers. I want to urge inspection in the cities as well as on the farm, and I want it to be extended to the inspection of butter. Our Housewives' League has extended an active campaign on milk products. Even if the butter could start perfectly clean and free from disease germs, there is just as much danger in the city handling as in the products. The consumer is going to ask for butter inspection as well as for milk inspection.

DR. MALONEY. There were two thoughts that came to my mind relating to Mr. Krehl's paper and Dr. Price's, both of which seem to touch upon very vital matters connected with the milk problem. The necessity of good dairy plant inspection of cities becomes quite apparent when the Health Boards attempt to trace the source of infectious disease and control it. The sterilization of milk vessels is just as important as the pasteurization of milk in the vessels, and unless the milk plant is equipped with proper facilities to sterilize the milk vessels used in the distribution of milk, it will hardly be worth while to pasteurize clean or infected milk.

Another point. The fact that milk-borne diseases are absolutely controllable by proper health supervision seems to suggest that the point should be brought out that, though they are a small percentage of the total causes of infectious diseases, they, being controllable, should have a very important part in our table of statistics and by proper supervision and inspection remove at least that source of infection.

PROFESSOR STOCKING. I had no desire or intention of insinuating that the milk-borne epidemics were not important. However, the cases of intestinal troubles in children far overshadow the milk-borne diseases. The fact that the milk should be clean and reasonably low in bacteria counts, so that it will not be responsible for intestinal troubles in children, is,

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I think, recognized as more important than specific diseases and more difficult to control.

PRESIDENT HENDERSON. About two months ago the city I represent passed an order by the Commissioner of Health requiring all persons working in the pasteurizing plants of the city to submit to a physical examination. They went through a very rigid examination, and out of about 180 employees we discovered three diphtheria carriers, and two men that reacted through the Widal test. They were dismissed from the milk plants in which they worked. It seems to me that the employees who come in contact with milk and milk utensils should submit themselves to a medical examination, and I think it will prove an additional safeguard.

"A thousand people are engaged in lopping off the branches of evil to one engaged in axing at its root."—St. Louis Health Dept.

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

DR. O. P. THOMPSON, Waterloo, *Chairman.*
C. F. BOSSIE, Omaha.
C. J. STEFFEN, Milwaukee.

Whether we, members of this Association, are competent to pass on this question might be doubted, as it involves a look within or a study of ourselves. It is a peculiarity of mankind that when he reads carefully and studies the symptoms of any particular disease, he is prone to imagine himself afflicted with this disease, but when he reads of moral perversion he sees this only in his neighbor. However, as the Chairman of your committee is an appointee and it has been his duty to recommend for appointment local milk inspectors in a score or more of cities in Iowa during the last five years, he has studied this question from both angles, and this has involved careful and considerate attention to the question.

Your committee believes that while we cannot hope to revolutionize the established methods of appointing milk and dairy inspectors, we can at least offer a few suggestions and impress upon the minds of the duly authorized authorities the importance of selecting capable and honest men to fill said positions. Your committee believes further that all appointments made should be from lists properly compiled after a competitive examination, or, in other words, through real and not a makeshift civil service.

Qualifications of a dairy or milk inspector should be measured not only by his age, education, honesty, previous experience and recommendations, but also by his executive ability—a man of affairs, if you please. He should be familiar with the latest improvements in dairy apparatus and appliances and the most recent findings of the scientific investigators along dairy and milk lines, and be able to impart the knowledge thus gained to producers and dealers, as well as to the consumers of milk. This knowledge can in part at least be obtained by attending meetings of this Association and by reading litera-

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ture relating to the dairy industry. We also believe that some knowledge of chemistry and bacteriology should be an important factor and qualification. Your committee cannot condemn too harshly the practice of appointing dairy and milk inspectors by a method where all of the qualifications of the applicant are measured by the number of votes he is able to deliver to the appointing power, or, if you choose, "political qualifications."

As to compensation: In the investigation we made last year, we found that the dairy and milk inspectors who devoted all their time to this work were receiving from $900 per year to $2,500 per year. In this, as in all other callings in life, if a man measure his compensation in dollars and cents only, he is poorly paid indeed, and if he does his work faithfully and well, his greatest compensation lies in the fact that he is doing a useful and necessary service for his fellowman, and in this particular work aiding in the prevention of disease.

Therefore, your committee recommends that the compensation should be commensurate with the amount of work done. Efficiency should be measured by the improvements in the milk supply, rather than by the number of prosecutions made.

We further recommend that competent inspectors should be retained in their official positions as long as may be possible.

"Be wary of tradition, custom, precept! If a thing was done so-and-so a hundred years ago, that alone is excellent ground for suspecting that so-and-so is the wrong way to do it."—Saturday Evening Post.

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DAIRY AND MILK INSPECTION FROM THE STANDPOINT OF THE MILK AND CREAM PRODUCER.

DR. HARVEY W. WILEY.

I have listened with great pleasure to the part of the address of Dr. Woodward which I was privileged to hear, and also to the address of your President, outlining the purposes and duties of your Association. I am glad to address a body of men who have come together for such noble purposes.

I come in a somewhat different attitude, because I am asked not to speak from the point of view of the consumer, which has been my usual point of view, but rather from the point of view of the producer. Nevertheless I can't quite get away from my usual point of view, and when I tell you that I am endeavoring to consume my own products in my own family, I think that my attitude toward the character of those products will be pretty well understood. (Applause.) I think that a man who produces dairy products and is afraid to use them in his own family had better get out of the business as soon as possible. If a producer's milk is not fit for his own children to consume, it is not fit to be brought into any market of the United States.

If the work of your organization is to be entirely successful, you must secure the sympathy and cooperation of the producer. I may say in advance that you have mine in full measure already. Dr. Woodward spoke of the history of milk legislation in the District. I might refer to the history of milk regulation throughout the country, and the control of dairy products throughout the various parts of the United States. I hate to say it as a farmer and dairyman, but it is true, that in those localities where the dairy interest is most dominant, you find the worst laws controlling the milk supply. Let me show you two or three instances. In the State of Illinois, the official standard of fat in milk is 3 per cent, which is almost one whole per cent below the average of production; and in other states where the dairy interests are very powerful it is almost impossible to get through the legislature an efficient milk control law.

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I do not sympathize with that part of my colaborers who desire to fix a low standard for dairy products. I rather stand with those who want to make the standard as high as is possible to be reached. That is the point on which the fight has usually been made, but your President has already outlined another standard of milk on which an equally strong fight will be made, I fear, by my colleagues, and that is to produce milk which has a reasonably low bacterial count; and when you and the people of this country together seek to enact this suggestion into the law, you will find a great many milk producers who will fight you. It is a most unfortunate attitude of the producer. If cloth is shoddy, if the manufacturer's output is not of a high character, sooner or later the low character of his goods will be discovered, and his trade will fall off. If the dairy industry is ever to be profitable—and I hope it will be—it must stand the test of time and criticism and the approval of the consumer. The true interest of the producer of dairy products is always in line with those who are seeking to elevate the standard of all dairy products. When the inspector comes to my place, he is met, not with antagonism, but with sympathy, and we are glad to use his suggestions.

The first thing for the producer is to have a healthy cow The responsibility rests on his shoulders. Can we do it? We can try. I have tried—and failed, sometimes. I have never bought a cow for my dairy that has not come with a certificate of inspection from a veterinarian. That is primary with me. But I have bought a lot that have reacted subsequently, for some reason. I bought ten cows from one person, all with a fresh certificate, and in eighteen months I have only one of those animals left; all the others have succumbed. Out of seventy-seven other cows that I have bought in the meantime, only two out of the whole number have reacted, as compared with nine out of ten of the other lot. Of course, I would not like to express my opinion, but I can't help keeping up "a devil of a thinking." I would like to get hold of that veterinarian who made the test of the first ten cows and make him pay back to me the money I have lost for those cows. I think he was either ignorant or negligent. You must go to work on the owner of the herds to induce him by argument or persuasion, by holding up to him the welfare of humanity, or, if necessary, by holding over him the club of the law, to get him to clean up his herds.

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For a long time I was a believer in Koch's theory that bovine tuberculosis was not imparted to the human family, but I have had evidence in late years which induces me to believe Koch was wrong, and that there is undoubtedly evidence of the transmittance of tuberculosis from the bovine to the human family.

While I stand firmly on this platform, and while I have made financial sacrifices to carry it into practice, I am of the opinion that the farmer should not be made to shoulder alone the burden of cleaning up his herds. He is cleaning up his herds for the purpose of benefiting the community, and therefore to place the burden on the owner of the animal alone is not just. As a rule there is some appropriation made to lighten the burden of the man who loses his cows through the tuberculin test, but offset against that is the fight which the owners are making to prevent the application of this test. In the State of New York, it is a notorious fact that tuberculosis is extremely prevalent, and in Ohio; so much so that I am not taking any cow from those states, whether it has a certificate or not. I would rather go out into the hills of Virginia and get a lower grade cow than to get one of the high grades from states where tuberculosis is so prevalent. The best thing that could happen in those states would be for the farmers to get together and say, "We are going to clean this thing up." The farmers of New York and Ohio and Illinois and other infected states, if they get together and pull together for the public weal, showing by their action that they are ready now to sacrifice a part of their belongings for the public benefit, can get the legislators to compensate them for at least two-thirds of the value of the cattle they lose. The State of Virginia has a law which is excellent in itself, but it has not as much money as the banks in New York City, and the total amount provided is ten thousand dollars. You have read the story of the pool that would give health, but only to the person who first got in it. The ten thousand dollars last only a few days, and only those who get in the troubled waters first get any of it. Virginia pays forty dollars for a grade cow and eighty dollars for a registered cow, but I can't get relief from them now. Their only answer is, "When the next appropriation comes, if you get in in time, we will do something."

Mr. Edison has suggested a grant of money, of five million

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dollars, to build the laboratory of research of the Navy Department. I hope it will be voted. But suppose the Congress of the United States would say to the states, "If you will go in to help, we will pay a portion of this; we will help you to clean up the curse of tuberculosis." What a wonderful impetus it would be towards getting rid of this terrible threat which is resting over the people of this country today—the threat against health and life through the great white plague coming in through the milk or cream or butter.

The second duty of the dairyman I need hardly mention; that is to have them—the cow and her product—clean. That is not so expensive as the other. It is not much more expensive to have a clean dairy than a dirty one. You have to hire people, and it is no harder work to clean up than it is to feed or prepare the feed, which you are forced to do. If you don't, your milk ceases to flow; but some apparently continue to sell dirty milk. It takes attention rather than expensive equipment to make clean milk. Most trouble is due to lack of education regarding the ways to properly handle the cows and dairy utensils. One sometimes has to get a new set of dairy hands, and that is usually expensive, because when you get a new man in, who has been taught to be cleanly, he expects his services to be more valuable. It takes more educational power to stop a man from doing what he has always been doing than to take a new man and train him up. We have to go slowly in this matter. I think I am getting every day a little cleaner milk than I have before, but I am not satisfied. I don't want to sell to the people of this town an infusion of manure and call it milk. I have no desire to do it. I am trying to get all the people who are working for me imbued with that idea, and they are beginning to see the reasonableness of it.

The next duty of the producer is to control, in so far as he can, the temperature of his product after these sanitary measures have been attended to, and in this way to preserve them as well as possible until their arrival at the point of consumption. I represent, to a certain extent, the southern part of this country, and there is a problem which is different in character from that of northern communities. In the North there is no trouble about securing and preserving ice, but in my locality perhaps three winters out of four are so mild that not sufficient ice is made. The importance of the problem

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of refrigeration, from my point of view, is accentuated by the fact that I must hold my evening's milk over until next morning and ship it about fifty miles to the city. Dr. Woodward asked if we are going to permit the sale of milk in this city at a temperature of 50 or 70 degrees. Those who attempt in the warmer season to produce milk at a temperature below 50 degrees for the milk dealer will be handicapped, unless he is willing to pay two or three cents more for cold milk than for warm milk. The South is now facing the problem of a system of refrigeration.

There we might imitate the Navy Department, where there is a body of experts, selected by the organizations to which they belong, as being particularly fitted to advise the Secretary of the Navy in regard to the efficiency of the navy, which has already been outlined as the very best means of killing people and the very best means of preventing our own people from being killed. We need an organization in this country to study the question of instilling those mechanical principles which are necessary to the production and refrigeration of milk in the most efficient way and at the lowest possible price. In a moderate-sized dairy of a hundred cows or less, there ought to be some system of cooling the milk or cream below 50 degrees which is efficient and cheap. I have sought in a great many localities and have had the estimates made for that kind of simple refrigeration. But I have not been able to get an estimate of such apparatus for less than about a thousand dollars, and that, of course, puts it out of the scope of the ordinary small dairy. If we could have a committee to study that problem of simple, efficient and economical refrigeration, you would be in the way of solving one of the great difficulties of delivering milk having low bacterial counts at a distance from the point of production. I want to drive that home to you; if you are going to do the greatest benefit for the milk supply, get it into market cold. Have it cooled as soon as it is drawn and keep it cold until it is delivered.

The last duty of the milk producer is to make money. That is the most difficult of all the duties I have to explain to you. It is all right enough if you have the means, with enthusiasm—because you have got to have both to make milk at a loss. But as a business, the producer must make a profit; don't you people forget that when you are putting burdens on him. He

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has a mighty hard time. Last year I bought cottonseed and paid $17 a ton; this year $38. Alfalfa hay cost $25 a ton. The price of bran has gone up with the war, and the price of wheat. Fortunately I have plenty of pasture, hay, corn and fodder which I grow on the place, but it costs something to grow these. You must help the producer make a living in every way possible. Improving his product is one of the best ways. You must work upon the hard heart of the milk broker in the city and get him to pay you more for your product. And hence I am looking to see established in every city a real gradation of dairy products, running from the so-called market products to the highest certified products, bringing with it and requiring with it a gradation in the price to the producer. That is essential. You cannot produce milk in the present conditions, with a herd free of disease, with the best of nourishment and the most modern sanitary appliances, and with the best shipping facilities—you cannot produce that kind of milk to market in a city in competition with the extract of manure I have already told you about.

I have tried to stand here for the first time in my life to plead the cause of the producer. I am doing it with a perfect conscience. I am not in any way encroaching upon the rights of the consumer, except that if he buys these best products he ought to expect to pay a little more for them than he did for those of inferior quality.

DISCUSSION.

MR. A. S. TRUNDLE, Washington. Mr. Chairman: Have the Doctor's views changed from what they were when he presided at the Bureau of Chemistry?

DR. WILEY. My views have not changed, but my viewpoint has changed.

MRS. HEATH. Mr. Chairman: Does not he (Dr. Wiley) think that more attention should be paid to butter, as an agency for the dissemination of tuberculosis?

DR. WILEY. I would include butter with milk and cream of course, and cheese. They should all be free from tuberculosis and all be handled in a sanitary manner.

DR. MALONEY. Mr. Chairman: Who examined the tuberculin testing of the seventy-seven cows?

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DR. WILEY. The same party that examined the others. They were all tested. I do not want to make a reflection on the profession in regard to the shortcomings of one.

DR. WM. S. GIMPER, Harrisburg, Pa. Dr. Wiley spoke of those ten cows he purchased, and he put the burden of the trouble on the veterinarian. In the purchase of those cattle probably he did not start at the beginning, and learn from whom he was purchasing. I have had lots of experience with cattle from New York State. The tuberculin test can be rendered null and void by manipulation of the owner of the cow by what is commonly called "plugging," and if Doctor Wiley is not sure regarding the honesty of the man from whom he purchased those cattle, he may find the cause of his trouble right there.

DR. WILEY. May these animals have been exposed to infection and the disease not progressed far enough to react?

DR. GIMPER. That is the theory which has been used to explain one of the occasional failures of the tuberculin test. When cattle are slaughtered under inspection, in some instances we find evidence that leads us to think that tuberculosis was in the incipient stage at the time of the original test. We believe that for from six to eight weeks after the infection occurred, no reaction will take place.

DR. YOUNG. The experience repeated here this morning by Dr. Wiley is undoubtedly all too common, and the fault is too truthfully to be laid at the door of the buyer, the seller, and the unscrupulous veterinarian. Not that I wish to malign my profession, but the twenty-five-cent certificate is unfortunately to be had, and is probably equivalent to a twenty-five-hundred-dollar liability. The tuberculin test when carefully applied is, we know, nearly, if not quite, infallible. For the addition of animals to the herd with which I have lately been connected, we require at least two tuberculin tests, both to be applied by ourselves. The animals are purchased, in so far as possible, from the herds in which we know there are or have been no tuberculous animals for a considerable time past. Sometimes, of course, it is impossible to secure animals with such a history back of them, in which cases we have to do the best we can with such short histories as are placed at our disposal. Following the first primary test the animal is quarantined in such a manner that we feel the infection cannot be

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carried by intermediaries between them and the free herd, and so that they do not come in contact with animals free of the disease. After the expiration of a certain period, the animal is retested. If the animal passes the primary and second test, she is admitted to the herd.

"In the present status of pasteurization the ideal to be achieved is to use the process not to make a dirty milk a clean milk, but to make a clean milk a safe milk."—S. Henry Ayers.

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THE NEED FOR MEDICAL INSPECTION OF EMPLOYEES WHO ARE ENGAGED IN THE PRODUCTION AND HANDLING OF MILK.

ERNEST KELLY, Dairy Division, B. A. I., U. S. Dept. of Agriculture.

It may perhaps appear unusual for a layman to discuss a subject which is so apparently within the province of physicians; but I have been able to secure through the Bureau of Animal Industry some data along this line which I am sure will prove of interest to those engaged in dairy and milk inspection.

Before beginning the discussion of the main subject, allow me to sketch briefly the progress of dairy inspection in this country. Our dairy inspection systems have developed gradually from nothing at all up to their present state of efficiency. From time to time new items have arisen which had to be taken into consideration, and new laws formulated to meet the new conditions. As scientific research has been carried on, additions have been made to our store of knowledge, and our systems of inspection have been changed to meet the new requirements.

BRIEF HISTORY OF DAIRY INSPECTION.

The first dairy laws of which I can find any record were passed in Massachusetts in 1856, and were directed against the adulteration of milk by adding water. Soon after this it was recognized that certain insanitary practices had an effect upon the milk supply, and in 1859 the same state passed a law prohibiting the feeding of brewery waste to cattle. In the same year Massachusetts enacted a statute calling for the appointment of inspectors, and defining their duties. Dr. Jordan, who has been kind enough to supply me with this information, also informs me that laws were enacted in 1880 fixing a minimum standard for the total solids in milk.

In December, 1898, the city of Boston enacted regulations governing the sanitary condition of dairies, and this, so far as I can ascertain, was the earliest date at which such laws were enacted. It is not surprising, then, that such a new system should still be undeveloped along certain lines. Another feature that has held back the development of dairy inspection is

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the fact that it has been extremely hard for boards of health to secure adequate appropriations to carry on their work in the most efficient manner.

The medical inspection of employees has been neglected in many communities, and it is certainly time that this branch of the inspection service should be developed to a high degree of perfection. To my mind there are two main reasons why medical inspection has been so long delayed. One reason is that its operation is attended with expense and difficulty which seem to place it out of the reach of the average board of health. Another reason is that many communities have been lulled into a false sense of security owing to their fortunate escape from outbreaks caused by infected milk supplies.

EPIDEMICS DUE TO MILK.

A full realization of the dangers from an infected milk supply can be obtained by a perusal of Bulletin 56 of the Hygienic Laboratory, published in 1909. At that time Trask noted 240 milk-borne epidemics reported up to 1895 by three investigators in England and the United States. Trask himself noted 260 additional epidemics, making 500 in all. The first reported milk-borne epidemic occurred in 1857.

Chief among these epidemics have been those of typhoid, scarlet fever, and diphtheria, and within the past few years outbreaks of septic sore throat, such as those in Boston, Baltimore, and Chicago. Tuberculosis among handlers of dairy products is also a menace, though its effects do not show in startling outbreaks such as those which accompany some of the other diseases. Hardly a month goes by without some report of a milk-borne epidemic. It is true that many newspaper reports of epidemics are not founded on data of sufficient scientific accuracy to attach these epidemics absolutely to the milk supply as the causative agency; but still enough reliable instances have been recorded to make this question one of vital importance to the average community.

SOURCES OF INFECTION.

Milk may be infected in the following ways:

1. By diseased persons who are suffering from a mild form of the malady, and who themselves come into intimate contact with the milk somewhere between the cow and the consumer.

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2. Carriers, who, while they may be free from the disease, harbor the organisms, which may be carried in the milk.

3. Transmission of pathogenic bacteria by persons who have been caring for the sick and who afterwards handle the milk.

4. Contaminated water supplies, in which the milk utensils are washed.

5. Fly contamination, either in the country or in the city.

6. The use of unsterilized milk bottles, collected from houses where disease exists.

PERSONS WHO MAY CONTAMINATE MILK.

In our modern system of milk distribution so many people come in contact with the milk before it is delivered to the consumer that there are many avenues by which milk may become infected. First of all come the milkers themselves, whose hands come in contact with the milk pails and strainers, and often with the milk itself. Next to them come those persons at the farm who handle the milk after it is drawn. Upon its arrival in the city the milk passes through another set of hands, and a new avenue of infection is open. In some of our modern plants milk is bottled and capped without being touched by the human hand; but in many city milk plants there is still more or less intimate contact between the man and the milk, especially in those places where the bottles are capped by hand.

Butter makers and cheese makers also have an important part in the handling of dairy products, and should be subjected to as careful supervision as milk handlers. Even after the milk is bottled, the unprotected tops of the bottles are often handled during delivery by the wagon drivers, and if their hands chance to harbor pathogenic bacteria these may be deposited upon the mouths of the bottles. Storekeepers, especially those who handle milk in bulk and dip it out for the consumer from an open receptacle, form another means of infection.

It is true that our modern system of pasteurization helps to minimize the danger from such infection, in that it destroys pathogenic bacteria which have entered the milk before the process of pasteurization; but there may still be some danger of reinfection, unless milk is pasteurized in the final container.

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MAGNITUDE OF THE QUESTION.

According to estimates, over one billion gallons of milk are used annually in cities having a population of 2,500 or over. It can readily be seen that with this quantity of milk there is a very considerable risk from milk-borne diseases, and I believe that the magnitude of the question will warrant a more decided stand on the part of health officials.

WHAT IS BEING DONE?

The chief of the Bureau of Animal Industry sent out this year 1,250 questionnaires to health officials of cities in this country having a population of 5,000 and over. From about one-half replies were received to this questionnaire, which dealt with the methods used in controlling and preventing infectious and contagious diseases among employees of places where dairy products are produced or handled. Answers to these questions have been tabulated as follows:

Question 1. What laws or regulations have you covering this subject?

a. Number of places having general sanitary laws.. 257
b. Number of places having special laws..... 13
c. Number of places enforcing the state law..... 138
d. Number of places at which no laws were reported enforced 115
e. Number of places giving no answer to this question 43

Question 2. Do you require any systematic medical inspection of persons employed in milk plants, creameries, cheese factories, ice-cream factories, and condenseries?

a. Yes 46
b. No 473
c. No answer 41

Question 3. Do you require a report from the manager on the health of employees and their families?

a. Yes 52
b. No 409
c. No answer 46
d. On occurrence of disease..... 53

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Question 4. If so, how often are such reports required?

a. Intervals given:

10	places,	once a month.
5	"	every three months.
1	"	every four months.
1	"	every six months.
6	"	once a year.
1	"	once a week.

b. No 117
c. No answer 342
d. Reported on occurrence 77

Question 5. What steps do you take upon the occurrence of infectious or contagious diseases among the employees or their families?

a. Quarantine the families 284
b. Stop the sale of milk 128
c. Allow milk to be sold if pasteurized 10
d. Allow milk to be sold if patient is isolated..... 111
e. No answer 47
f. Order the utensils sterilized 3
g. Have had no cases 39

Question 6. Have you been able to prevent epidemics from such sources?

a. Yes 295
b. Yes, very largely 20
c. Yes, as far as we know 14
d. Do not know 11
e. Reduced 26
f. No answer 43
g. Have had no epidemics 71
h. No 43

Question 7. Have you any means of detecting the presence of contagious or infectious diseases on dairy farms?

a. Report of attending physicians 168
b. Reported by milk dealer..... 12
c. Reported by dairy inspector 77
d. Compulsory report by dairymen 44
e. No 176
f. No answer 51

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g. On occurrence 15
h. Yes 56

Question 8. What steps are taken when such diseases occur?
a. Quarantine 346
b. Stop sale of milk 166
c. Milk allowed to be sold under restrictions..... 15
d. Have had no cases 29
e. No answer 52
f. Order the utensils sterilized 7
g. Order the milk pasteurized 11
h. None 10

From the above tabulation it is evident that the cities maintain a very incomplete supervision over the health of employees in places where dairy products are handled.

In answer to question number one, 158 cities reported that they enforced no laws on this subject, or gave no reports at all, in the large majority of places. It is evident from answers to other questions that while there may be regulations on the statute books in regard to the health of employees, there is no systematic or efficient method of enforcing such laws.

The chief difficulties, at the present time, may be summed up as follows:

1. Lack of legislation giving the health departments authority to exercise such supervision.
2. Lack of ordinances prescribing penalties for violation.
3. Lack of funds to carry on such work. It seems difficult to convince city councils of the necessity of supplying funds for carrying on work along these lines.
4. Lack of public sentiment to back up any efforts for regulations such as these.
5. The failure of some health officers themselves to take the initiative.
6. Lack of proper methods of reporting contagious diseases.

The following interesting quotations from some of the replies received throw light on the difficulties in the situation at the present time:

"This applies only to scarlet fever and diphtheria. Smallpox is not quarantined at all in this State, only the patient being detained at home. Other members of the family are allowed to go and come at their pleasure, as well as friends permitted to call."

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"Our health department is not enforced. My duties are to investigate offensive hogpens or other objectionable places and quarantine smallpox."

"The local board of health here has no power to do anything in this line; no provision for such conditions at all. We are away behind on all forms of preventive medicine, so much that way that I resigned because the office was a farce."

"I am new in this work, and find my predecessor kept no vital or other statistics, and had gained the favor of the city council for running the board of health without money; consequently, I have been unable to get any help from them. The position pays $25 per year, practically honorary."

"We have a population of about 15,000, and the health department is only allowed $900 per year for everything."

"This is a matter which we have had no occasion to investigate."

One of the more progressive cities makes this report: "We offer $5 to the producer if his report of case is sent into the office of the board of health before that of the attending physician."

This, then, is the thought that I would leave with you. The danger of milk-borne epidemics is ever present in the average city. It is a most surprising fact indeed that more outbreaks have not been noted. Pasteurization is a partial safeguard, but it must be accompanied with a rigid medical inspection—the discussion of which I shall leave to those better versed in such fields.

"He who influences the thought of his times influences all the times that follow."—Elbert Hubbard.

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THE BEARING OF DAIRY INSPECTION ON THE BETTER CONTROL OF MILK-BORNE DISEASES OF MAN.

DR. J. W. KERR, U. S. Public Health Service.

From time to time since 1821 laws and regulations have been adopted in the United States relating to the control of milk supplies. Notwithstanding the first of these was aimed at the prevention of milk sickness—a highly fatal disease affecting man—fifty years or more appear to have elapsed before further provisions were enacted aiming specifically at the prevention of milk-borne diseases, either of bovine or of human origin.

In the meantime, however, certain laws had been enacted to improve the sanitation of dairies and cow barns and to prevent the sophistication of milk supplies. In order to enforce these provisions dairy inspections were here and there authorized.

Dairy inspection was thus at first of economic import only. In fact, in some states these laws were brought about as a result of agitation by dairymen themselves to prevent fraudulent practices by competitors. Examination of annual reports of boards of health will show that for many years the control of milk supplies related to maintaining the richness of milk and the prevention of fraud.

During all this time, however, the impression had prevailed that the high infant mortality in cities was due in part to impoverished milk supplies. Gradually, therefore, the later and greater object of dairy inspection came to be the sanitary safeguarding of public milk supplies.

Although the methods adopted must of necessity have been almost wholly empirical, they were aimed secondarily at least at the reduction of the summer diarrhoeas of infants; indeed, arguments for more thorough supervision were based as long ago as 1878 on the need of preventing these diseases. That such supervision was to supplement chemical analyses of milk samples, which by that time had become an essential legal requirement, is shown by the following exclamation of a Philadelphia physician in the year mentioned:

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"Three inspectors to preserve the life, vitality, and nourishment of 150,000 children! Why, it will take a dozen capable inspectors to guard against the adulteration of milk—one of the greatest outrages of the day against our mild-mannered, long-suffering public."

"Adulteration of milk" as a cause of summer complaints of infants had evidently thus early been impressed on the medical profession. Much literature of the period reveals this belief. It is probable also that the nutritional diseases of children were indirectly attributed to this cause.

The recognition of the greatest danger of milk as a source of disease had its practical beginning, however, when it was first shown in Scotland in 1857 that typhoid fever had been spread by this food product, and in 1871 when evidence was presented in Massachusetts to show also that foot-and-mouth disease might be milk-borne from infected cows to susceptible human beings.

Following the observations mentioned it was but a step, as the epidemiology of typhoid fever, diphtheria and scarlet fever began to be studied, to trace outbreaks of these diseases in the United States to milk supplies. Outbreaks of typhoid fever were so traced in 1882, diphtheria in 1879, and scarlet fever in 1881. Moreover, with the discovery of the tubercle bacillus in 1882, a long step was taken toward incriminating milk supplies as sources of tuberculous infection. The subsequent multiplication of records of outbreaks of milk-borne epidemics quickly caused the public health aspects of milk inspection to surmount the economic ones.

Of the more common milk-borne diseases of man, only typhoid fever, diphtheria and scarlet fever will now be considered. It is the province of others here to outline the measures applicable to the prevention of tuberculosis and foot-and-mouth disease. That such prevention is a difficult task and one requiring frequent inspections, not only in the interest of animal husbandry, but of health protection, is shown by the fact that 594 out of 7,099 samples of milk examined by various investigators in recent years were found to contain tubercle bacilli. Furthermore, in those herds which are tested from time to time with tuberculin, reactors are occasionally found.

In my opinion, the prevention of the spread of the diseases mentioned should be the fundamental object of all official con-

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trol of milk supplies. In the years 1910-1913 typhoid fever, diphtheria, scarlet fever and tuberculosis caused over 430,000 in the registration area of the United States out of a total of 3,375,000 deaths from all causes in that area. In other words, about twelve per cent of all deaths in this area were due to these diseases. While they are spread in other ways besides milk, it must be remembered that many hands have to do with the constantly wide flowing streams of this product, and in some places, as Washington, in the past, as many as one out of every three hundred of the population have been estimated to be carriers of typhoid bacilli. Add to the total estimated number of typhoid carriers the carriers of diphtheria bacilli and of the infection of scarlet fever in a community, and a more definite idea of the danger is obtained.

Two questions accordingly arise: 1. What bearing has dairy inspection in the past had on the control of typhoid fever, diphtheria and scarlet fever? and 2. What bearing may it be expected to have in future on the incidence of these diseases?

Since all of these diseases when spread by milk are due to accidental infections which frequently come from healthy "bacillus carriers," it is evident that dairy inspection, as ordinarily comprehended, could not have had much effect in the elimination of the danger of their spread. No amount of dairy inspection as ordinarily practiced would have detected these carriers.

In other words, as stated on a previous occasion, the days of the simple inspection of herds, and chemical analyses and bacteriologic examination of milk samples, have passed, until finally, safe raw milk represents a four-fold effort, namely, chemical analyses and bacteriological examinations of samples of the milk, inspections and tuberculin testing of herds, and regular medical examinations of dairy employees, including cultural tests to detect disease carriers.

The observance of all these requirements so far as relate to market supplies generally has thus far proved impracticable from an economic standpoint. In order to insure safe, wholesome supplies, therefore, dependence must be placed for the time being on efforts of dairy inspectors and dairymen themselves to produce reasonably clean milk for pasteurization under official supervision.

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From the foregoing, it must be apparent that dairy inspectors have not only had their duties increased but changed. They must take all reasonable measures to detect diseases of man and animals on dairy farms, must encourage clean dairy methods, and, in addition, supervise the proper pasteurization of the milk. And the last is the most important. While I obtain milk from my dairyman with the understanding that it is from tuberculin-tested cows and that the dairies are regularly inspected, I do so mainly because it is understood that the milk is properly pasteurized. A guarantee from the health department to this effect would be one of the greatest services the department could render in the interest of the health of my family and myself.

From an ideal point of view, the safeguarding of the public against communicable diseases conveyed through milk should ultimately depend on intelligent sanitary dairying. Practically, however, we are far from realizing this ideal, partly because the amount of dairy inspection is not adequate and the need of medical inspections of employees who are engaged in the production and the handling of milk has never been satisfactorily met.

The last statement is abundantly proven by the replies to the questionnaire referred to by the preceding speaker. Less than half of the 560 cities which furnished these replies claim to have general or special laws concerning the control of communicable diseases among the employees of places where dairy products were produced; only eight per cent stated that they required any systematic medical inspection of these persons; only nine per cent required reports from milk producers on the health of their families and their employees, and only 10 per cent in the event of the occurrence of disease. Under such circumstances it must be apparent that many cities have not as yet made available to their citizens "inspected milk," in the modern acceptation of this term, for it is reasonable to believe that conditions were at least as favorable in the 560 cities that replied as the 690 that did not reply.

Under the recent accepted classification of milk, one of the specifications for "inspected milk" is as follows:

"All persons who come in contact with the milk must exercise scrupulous cleanliness and must not harbor the germs of typhoid fever, tuberculosis, diphtheria, or other infectious diseases liable to be conveyed by milk."

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It remains to determine what reasonable means can be taken by health inspectors to assure themselves of the freedom of dairy employees from these germs. Among these means may be mentioned: 1. Immediate reports by milk producers of cases of communicable diseases in their families or among their employees; 2. Regular reports by dairymen as to health of persons coming in contact with the places where milk is produced; 3. Medical examination of all such employees in the event of the suspected prevalence of disease.

In no instance is the immediate reporting of communicable diseases of greater importance to the public than those occurring among dairy personnel. Physicians in attendance on cases should be invariably required to make such reports and be heavily penalized for not doing so. In the absence of a physician at the beginning of the illness, milk producers themselves should be required to immediately report cases, and they should also be required to submit regularly reports as to the health of their families and employees. When the milk is to be used raw, in my opinion, such reports should be based on systematic examinations by physicians and cultural tests approved by the health department.

Such a provision was adopted by Montclair, N. J., December 8, 1914. That city requires a certificate from a physician, approved by the board of health, once in three months, from every person selling milk or cream, the certificate showing that such person has been examined within 30 days and shows no evidence of any communicable disease. These certificates are not required for those persons who handle milk and cream that is to be pasteurized.

Only by some such system adequately enforced can prompt action be taken by health agencies to confirm diagnoses, care for cases and protect the interests of the dairyman and the public.

By means of card index records and spot maps, these reports may be made immediately to serve their greatest purpose. Not only may prompt action be taken in the presence of illness, but those persons who have recently had typhoid fever, diphtheria or scarlet fever may conceivably be kept track of and prevented from being employed in any capacity about milk-producing places.

In Mississippi, it is specified that no person who has recently

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had typhoid fever may be so employed; and in the State of Washington, no person proved to be a typhoid or diphtheria carrier may be allowed to work in any occupation connected with the handling of milk.

The most difficult problem is to detect the carriers, but once they are known, they should be kept track of and not be allowed to handle food products.

It is the detection of these healthy carriers, however, which constitutes the weakest link in the chain of dairy supervision and the failure to do so, the strongest argument for the pasteurization of all market milk.

In order to lessen the chances of cases and carriers of typhoid fever, and to control them once they are known, the following are among the means that may be employed:

1. Cleanliness in milk production;
2. Vaccination of dairy employees against typhoid fever;
3. Isolation of infected persons;
4. Official supervision of dairies during the presence of illness;
5. Official supervision of the pasteurization of all milk.

In recent years much attention has been devoted to dairy sanitation, and cleanliness has been much enhanced by systems of scoring and educational measures. A vast amount of municipal legislation has also been enacted to insure cleanliness, much of it being of a detail character. Newport News, Va., and other cities, for instance, require that before milking all manure and other dirt shall be removed from the side, belly, and tail of each cow; and New York City has, among others, the following regulation: "The hands and teats must be kept dry during milking. The first stream from each teat shall be rejected."

In the absence of complete official supervision to enforce this legislation, however, it must be regarded largely as educational in character. It is safe to say that in most cities of the country, complete official supervision is not being maintained on account of lack of adequate funds and personnel. In Washington, for instance, during the fiscal year ended June 30, 1915, the milk supply was drawn from 1,161 farms located in the District of Columbia, Maryland, Virginia, West Virginia, Pennsylvania, and New York. For the inspection of these farms and presumably the milk plants to which the milk

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is distributed, a total of six inspectors was provided, which is inadequate considering the important work to be performed.

The amount of dairy inspection and assistance rendered to milk producers by health departments should accordingly be increased. The eradication of typhoid fever, for instance, must depend practically on improved sanitation, and in the country it should reach its highest standard first on dairy farms. Coincidently, other diseases besides typhoid fever would be reduced.

The vaccination of all dairy employees for the prevention of typhoid fever is to be recommended and urged. Although there is no proof that such vaccination will prevent the "common carrier" from transmitting the disease, it will prevent dairy employees from contracting it, and thereby in large measure prevent them from becoming carriers, for it is a well-known fact that from two per cent to four per cent of all convalescents from typhoid fever become for a time chronic carriers of infection.

When cases of typhoid fever, diphtheria, or scarlet fever actually do occur on dairy farms, or in milk establishments, immediate isolation of the patient is, of course, necessary. But after this is done, the real test of efficiency is the ability of the health department to supervise the dairy and properly pasteurize the milk so as to safeguard the public against disease, and the dairyman against undue loss.

In no state law does provision appear to be made for pasteurization of milk during the period of infection of dairy premises. Furthermore, answers reported by the preceding speaker showed that only one per cent of 560 cities from which replies were received had provision for allowing the milk to be sold if pasteurized, although this is of fundamental importance. It not only prevents disease and guards against loss but against surreptitious sales of milk elsewhere when the usual market is cut off.

In order better to control milk-borne infections, there is need of greater reciprocity between communities. The largest powers in respect to supervision of milk supplies rest with local authorities. By pooling their interests, frequency of inspections should be increased, and duplication avoided.

If municipalities were to require certificates of inspection from the health authorities of counties from which their milk

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supplies came, and regular reports of the health of all dairy employees within these counties, a powerful impetus also would be given to the development of full-time county health agencies. With efficient county health organization effected, and with the information thus gained, not only could the aid of state but federal statutes be invoked. In other words, through co-operation, the effort should be to secure uniformity of methods and standards in the production of milk and the enforcement of these methods.

DISCUSSION.

QUESTION. How long would Dr. Kerr keep a typhoid patient after he has apparently recovered before allowing him to return to his dairy duties?

DR. KERR. Until we have improved sanitation sufficiently to reduce the incidence of typhoid fever, we must keep track of them until they cease to be carriers. In our hospitals, we do not discharge a typhoid case until bacteriological examination shows he is free from typhoid.

PRESIDENT HENDERSON. Three weeks ago, in the enforcement of a new law, the Commissioner of Health of Seattle instructed our inspection department to take Widal tests of every person employed in shipping milk to the city. The dairy inspector must go out in the country and take three drops of blood from every employee's ear. We have also to take swabs of their throats. Practically every employee in our pasteurizing plants has undergone an examination.

DR. KERR. I realize in all public health work, and especially where dairy inspection is carried on, a great deal of tact is necessary, but I believe if the matter is plainly explained to the dairymen and their families, and farmers, they will enter in and cooperate in this work. We this summer have had inspectors out in the country, and we have succeeded in getting thousands and thousands of specimens of blood of people for malarial fever. We did it because we promised them that if their blood specimens were positive we would let them know it, in order that they might take treatment and be free from it through the winter.

QUESTION. I would like to ask Dr. Kerr what he calls an efficient medical examination, how frequently it should be repeated, and also if any experimental work has been done to

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show whether or not typhoid vaccination has any influence on the typhoid bacillus carrier?

DR. KERR. Efficient inspection of employees will perhaps depend on the kind of inspection. The efficient inspection of employees in order to guarantee to a whole city's population the use of raw milk means that we must examine all employees and determine if they are free from carriers. I doubt the practicability of that. I did not recommend it. But what is impracticable today may become so tomorrow. Under present circumstances I think when we make inspections of dairy farms we should see the people and determine whether the people on the farm are well, in order that we may produce reasonably clean milk for pasteurization.

We have no evidence that anti-typhoid vaccination has an effect on carriers themselves, but by using anti-typhoid vaccination and thus lessening the amount of typhoid fever, the number of carriers can be reduced. Just improved sanitation will reduce the incidence of typhoid and the incidence of carriers.

QUESTION. Does vaccination protect persons from becoming carriers?

DR. KERR. I do not think we have any evidence that it does.

QUESTION. I believe that the Widal reaction does not indicate the person's typhoid character. The city bacteriologist found a great many positive Widal reactions several years after the person had a case of typhoid, but there is reason to believe he was cured. How can we find out when cured cases are typhoid carriers?

DR. KERR. I feel that the Widal test must be a help in detecting the people who may be possible carriers. The number of carriers in a community must be proportionate to the number of cases of typhoid they have in that community. If we can detect carriers it gives us an opportunity to lessen the danger.

"Money spent for the public health is an investment, not an expenditure. It costs less to keep people well than to get them well."—Louisville Department of Health.

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WHY STANDARDS FOR MILK ARE NECESSARY TO THE WELFARE OF THE DAIRY INDUSTRY.

DR. JOHN F. ANDERSON, *President,* American Public Health Association.

I have chosen for the subject of my paper before the International Association of Dairy and Milk Inspectors a discussion of why standards for milk are necessary to the welfare of the milk industry, and in the beginning I wish you to have a clear idea of what kind of standards I mean.

Milk is one of the few articles of food to which two kinds of standards are applicable and for which two kinds of standards are essential. One of these standards is the chemical standard by which to judge the food value of milk and has for its prime purposes the prevention of fraud by the dealer and to insure that the purchaser receives the number of food units for which he pays. This standard is of but slight sanitary importance.

The other, and the more important standard, is the standard by which to measure the sanitary quality of the milk, or the standard of decency and health of the dairymen and cows producing it. While the methods used for its application are not as yet as exact as those for the chemical standard, they are nevertheless sufficiently so to serve our purpose.

When a farmer has an apple orchard he expects to sell his apples on grade—a higher price for the best, a lower for the others; he never expects to sell all for the same price. It is the same when eggs are sold; they are sold strictly on grade; the freshest and those delivered to the consumer most quickly after being laid command the highest price, those not so fresh a lower price, and so on; and when the best are mixed with the others the price is that of an inferior grade.

When the farmer comes to sell his milk to the dealer and the dealer to sell it to the consumer, what do we find is the usual practice? As a rule, the good milk is mixed with the bad and sold for one price, and that price is generally less than the price the good milk should bring. The bad milk should not be sold at all.

Now let us consider in detail some of the various phases of this one-quality, one-price practice of selling milk and the

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effect it has upon the improvement of the sanitary quality of the milk supply and upon the future of the milk industry. For purposes of discussion it is convenient to consider this under several headings:

1. In every community the market milk contains milk of several degrees of excellence. Some of it is very clean and of good sanitary quality; some (and often most of it) is very dirty and therefore of poor sanitary quality. In other words, some of it is safe and some of it dangerous to the health of the consumer, but all of it may be selling under one label and at one price.

I need not tell you that this is so, for each of you can recall, from your own experience, communities in which there are dairy farms producing milk under the intelligent supervision of decent, careful and honest farmers, and you know that such milk is clean and is safe. You can also recall dairy farms on which milk is produced from ill-kept and perhaps diseased cows, handled in a slipshod manner, not refrigerated, and dirty. Such milk is dangerous to the consumer. But the milk from the good farm is sold to the same dealer as the milk from the bad farm, the two are mixed, and the good milk is made bad. The result of this one-quality, one-price method of selling milk is that the good milk is sold for less than it is worth, the bad milk is permitted to be sold (when it should not be sold, at least not for food purposes) and the sanitary quality of the entire milk supply is lowered to the level of the worst entering into its makeup.

2. In every community some dairy farms and dairy farmers are better than others—cleaner, more decent, and produce cleaner milk; but usually the milk of the clean dairymen is dumped into the same tank with the milk of their dirty neighbors, and the clean farmer gets no higher price for his clean and safe milk than the dirty farmer gets for his dirty and unsafe milk.

Again, the "one-quality, one-price" puts a premium on slipshod methods and slipshod farmers, and fails to reward the decent and careful farmer who uses intelligence in the production of his milk and wants to produce and sell a clean, safe milk, a milk that can be consumed by babies and children with safety. The result is that the decent farmer loses his incentive to improve his herd and his barns and to introduce

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modern methods. Unless such men are supported by the decent dealers they gradually drop to the level of their more shiftless neighbors.

3. In every community some milk dealers are more decent and more honest than others. They desire to sell the best kind of milk, but are confronted by the fact that the bad milk sold by indecent and dishonest dealers brings the same price and carries the same label as good milk.

Again we see the working of the "one-quality, one-price" system. These decent and honest dealers strive to keep their plant in a sanitary condition, refrigerate their milk, thoroughly clean and sterilize their utensils and bottles, and endeavor to make contracts with the decent and honest farmers who produce a clean and safe milk; but on account of the competition of the indecent and dishonest dealers, fostered and protected by the "one-quality, one-price" system, are put to an obvious disadvantage. The indecent and dishonest dealer is protected in his sale of dirty and dangerous milk, while the decent and honest dealer is hindered in his efforts to provide for his customers a clean, safe milk.

This condition is such a familiar one that we all can recall communities in which the conditions are as those recited. We even know municipalities where the poor milk is sold to hospitals and asylums because under the one-label, one-price system one kind of milk appears to be as good as another.

4. In every community there are some milk consumers who value decency and safety more than others, and are prepared and want to buy the best milk, but are unable to locate it because all milk offered for sale is labeled the same and is sold for the same price.

It is certainly a fact that there are persons who, either through ignorance or for other reasons, do not care whether the milk they buy is clean and safe, or whether it is not clean and safe. To them all milk is the same. The majority of milk consumers, however, want clean, safe milk. They want a milk that is free from disease germs and that they can give to their children and can themselves use. They want the best milk, but on account of the operation of the "one-quality, one-price" system they cannot distinguish between the clean, safe milk and the dirty, unsafe milk. They have no difficulty, however, in getting the best quality of eggs when such are

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wanted, as eggs are not sold under the "one-quality, one-price" system, but are sold on grade. When those of the community who value decency and safety become sufficiently aroused to demand that a distinction be made between the good and the bad milk, it sometimes happens that the decent dealers are enabled to provide a safe milk at an increased price.

5. This deadlock of "one-quality, one-price" is tacitly fostered by some boards of health and milk inspectors who have followed the false theory that "the entire milk supply must be elevated at the same time."

In most communities this is not possible; it is much easier to lift one end of a big board than to lift the whole board. In many places the authorities who have under their jurisdiction the control of the milk supply seem to think that the only way to improve the milk supply is to raise the level of the entire supply at the same time. They do not seem to grasp the fact that by breaking away from the "one-quality, one-price" system and by fostering the efforts of those dealers who want to sell a clean, safe milk at a higher price the elevation of the entire supply is made possible in a reasonable time. As soon as the people find that they can buy a clean and safe milk and the dealers find that they can get a higher price for such milk, we at once begin to establish grades of milk. When this is done it will be found that it will not be difficult to convince the dealers of the advantage of providing for safe milk selling at a higher price than the bulk of the milk sold. There can be no question that the production of so-called certified milk has been one of the biggest factors in the improvement of the general milk supply. This in spite of the fact that certified milk is less than one per cent of the total milk supply; but wherever certified milk is sold, that place at once has forced upon it grades of milk, and grades of milk mean that the milk supply is composed of milk of varying degrees of excellence and sold for prices varying with its sanitary quality.

After having briefly discussed some of the causes that have to do with the present unsatisfactory condition of the milk supply in many of our cities and towns I shall now consider how, in my opinion, these causes can be removed and how the welfare of the dairy industry can be promoted.

As I have endeavored to point out, the greatest single obstacle to the improvement of the milk supply is the "one-

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quality, one price" system of selling milk; or, in other words, the lack of grades of milk, the best grade bringing the highest price, the lower grades a lower price. Therefore, the remedy is milk grades based upon milk standards.

The grading of milk and the establishment and enforcement of standards enables us at once to distinguish clean milk from dirty milk, the clean farmer from the dirty farmer, the clean dealer from the dirty dealer, the consumer of clean milk from the consumer of dirty milk. This system puts a label on each grade, so that the buyer may choose; it breaks up the "one-quality, one-price" system and creates several qualities at several prices; it stimulates the production and sale of better milk by establishing a better price.

It has always been one of the things I could never understand why the idea seems so deeply rooted in many of those who have to do with the milk industry—producers, inspectors and consumers—that the farmer and the dealer who sell a clean milk and therefore a safe milk should not receive a higher price than their neighbors receive for a dirty, unsafe milk. The establishment of grades and standards for milk will cause this idea to disappear.

In December, 1910, there was held in New York City a meeting participated in by the various groups interested in the welfare of the milk industry. There were present at the meeting and took part in the program dairy farmers, milk dealers, health authorities, and consumers. As a result of the discussions at this meeting, it was apparent that the time had come for an organized effort to be made to establish and enforce grades and classes of milk. The New York Milk Committee, which is a voluntary organization working in the interests of improving the milk supply of New York City, decided in the following spring to appoint and finance a commission on milk standards. This decision was the direct result of the observation of the New York Milk Committee, emphasized by the meeting of the fall before, that there was great incompleteness and lack of uniformity in the milk standards, milk ordinances, and rules and regulations of public health authorities throughout the country for the control of public milk supplies. There was a need that health officers be furnished ordinances drawn from large experience and mature judgment and that ordinances should be as free from erroneous positions

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and as uniform for the different sections of the country as possible.

From a list of over 200 names of men of prominence in medicine, sanitation, and public health, of laboratory workers and those recognized as authorities on the milk question, twenty names were finally selected and those twenty men were asked to accept appointment on the Commission on Milk Standards. The first report of the commission was not published until after its third meeting, one year after the organization of the commission; the second and amended report was published a year later. Both these reports were published by the United States Public Health Service.

In its report the commission stated: "Proper milk standards, while they are essential to efficient milk control by public health authorities and have as their object the protection of the milk consumer, are also necessary for the ultimate well-being of the industry itself. Public confidence is an asset of the highest value in the milk business. The milk producer is interested in proper standards for milk, since those contribute to the control of bovine tuberculosis and other cattle diseases and distinguish between the good producer and the bad producer. The milk dealer is immediately classified by milk standards, either into a seller of first-class milk or a seller of second-class milk, and such distinction gives to the seller of first-class milk the commercial rewards which he deserves, while it inflicts just penalties on the seller of second-class milk. For milk consumers, the setting of definite standards accompanied by proper labeling makes it possible to know the character of the milk which is purchased and to distinguish good milk from bad milk. In the matter of public health administration, standards are absolutely necessary to furnish definitions around which the rules and regulations of city health departments can be drawn, and the milk supply efficiently controlled."

Throughout all of the deliberations of the commission it was recognized that bacterial testing, using for the purpose the "bacterial count," was the most important single factor in grading milk. It was clearly understood that the bacterial count should be used only with a full understanding of its limitations, but those limitations all put together fail to shake or impair the consistency of the bacterial count when properly applied to the grading of milk. Isolated instances of wide

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discrepancies disappear when laboratories use uniform methods and make a sufficient number of examinations. The parallel between clean dairy farmers, proper refrigeration, efficient pasteurization and the bacterial count is constant and convincing.

The grades decided upon by the Commission on Milk Standards are only three. It is, of course, obvious that there may be many degrees of excellence in milk between the highest and the lowest, but three grades are ample to properly classify the milk supply of any community. The standards must of necessity be decided upon somewhat arbitrarily, but experience has shown us certain limits within which milks of known sanitary quality may be defined. We must in each grade indicate only the minimum, for in each grade there may be milk much better than the minimum. It happens that some communities, because of more favorable conditions, may have more rigorous standards than others. Thus grade "A" milk in New York City may have a limit of 200,000 bacteria per c. c., while grade "A" milk in Syracuse may have a limit of 10,000 per c. c.

The grading of milk and the establishment of standards has justified itself in New York City, where I am informed over 20 per cent of the milk supply of that great city is "Grade A, Pasteurized" and sells for 10 cents a quart. Many other cities throughout the country are establishing grades, while New York State has established grades for all cities and villages.

I shall not discuss what the grades for milk should be, as the grading of milk within certain limits is governed by local conditions, but I do want to emphasize that it is my belief that no raw milk should be allowed in any grade except the better classes of "Grade A."

Any community so minded can experience the rapid growth of a clean and safe milk supply as a result of the establishment of grades and the enforcement of milk standards. This because the clean and honest farmers, by reason of the increased financial return, are encouraged to produce and to sell clean milk to the clean and honest dealer. These latter, by reason of the use of the label signifying a higher quality of milk, can sell this better milk at an increase to those customers who value cleanliness and safety. The production of clean milk generally throughout the communities is stimulated and

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encouraged through the identification of the label of a better quality and by the inducement of a larger financial return. I do not mean the production of a special limited class of milk like "Certified Milk," but a much broader growth of that part of the regular market milk already clean or capable of being clean, but now obscured and discouraged.

"Let us henceforth follow reason instead of tradition."—Journal Amer. Public Health Asso.

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PRIZE CONTESTS: THEIR VALUE IN IMPROVING OUR MILK SUPPLIES.

ALFRED W. LOMBARD, *Agent Massachusetts State Dairy Bureau*, Boston, Mass.

As "clean milk production" in the generally-accepted use of the term means the reducing to a minimum the amount of visible dirt which gets into milk during the process of milking, it can be readily seen how important the "Clean Milk Contests" held in Massachusetts during the past three years under the direction of the State Board of Agriculture really are in helping to bring about the production of a cleaner milk.

In addition to "Clean Milk Contests," "Milk Shows" are the only other form of prize contests which I shall mention in this paper, these being the only two, so far as I know, which have been eminently successful. Other forms of contests which have been tried have only met with very slight success in my own state, and I presume the same is true in other localities.

Owing to the very efficient work of Mr. Ernest Kelly of the U. S. Department of Agriculture, Dairy Division, and his corps of able assistants, it will not be necessary for me to take up your time explaining the methods employed in carrying on a "Milk Show," but thinking that perhaps some of you might not be as well acquainted with the working out of the details in connection with a "Clean Milk Contest," I am going to explain very briefly the way in which we did this work in Massachusetts.

Massachusetts, as you all know, is a small state territorially, although containing a large population; not in any sense a dairy state, as are Illinois, Wisconsin, Iowa, and many of the other central and western states. So it was possible for us to divide our state into four sections, each district containing nearly the same number of cows, as well as dairy farms. In each of the sections an equal number of cash prizes were offered, and all practical dairymen superintending their own dairies were eligible. The samples were taken in each district during a given month, and the advertising for the contests was done in ample time for each section to fill out and return entry blanks, also to make inquiries and receive informa-

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tion as to the method of conducting the work. All samples were taken at night, at or near the regular milking time, by an agent of the Board, each and every sample being taken in the same way and under exactly the same conditions. The prizes were offered for the cleanest hand-drawn unstrained mixed milk of five cows, based upon the cleanliness of the cottons made by straining one pint of this milk after it was thoroughly agitated through the Lorenz Model Company's sediment tester, the cottons being arranged, graded and judged under a magnifying lens, by an expert thoroughly competent to perform such work.

A few words in regard to the technique may not be amiss. The type of dipper we used was an original one, designed by myself with the sole idea in mind of combining an agitator with a sample taker. One side being flat, rested upon the bottom of the container, and, as the handle was above, one could mix and then draw the dipper across the bottom of the mixing tank and fill. This dipper discharged just a pint. To preserve our samples we used an impervious, ventilated, silver poplar ointment box. After the cotton from the sediment tester was mounted upon the disk of filter paper it was immediately placed in one of these boxes and sealed, and I am very glad to say that we have never had a sample mold or in any way change from its original condition, and we now have cottons in our possession over three years old. In taking the samples, our agents wore a long dust coat of mercerized goods which did not easily catch or retain dust, this by reason of the necessity of extending the arm into the mixing tank during the process of agitating and taking the sample.

We also had each dairyman, who did not have a steam plant, furnish a kettle of boiling water with which the sediment tester was rinsed before the sample was taken, this in addition to the washing and cleansing which the testers received at the conclusion of each day's work.

Our collectors also had instructions to give the dairymen a little talk which went something like this: If you will milk your cows in a cleanly manner, then immediately cool the milk so drawn, and store at a low temperature, you will not have to worry about bacterial counts, as prompt and efficient cooling, coupled with storage at a low temperature, usually means few bugs.

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Some of the conclusions to be drawn from three years' experience in conducting these contests may prove of value.

The use of milking pails with small openings seems to prove their worth and all that has been said in favor of them, but in order to accomplish the best results the pail must be held tipped at the proper angle, and not flat with the opening parallel to the floor. The Osborne pail, a type used by some few producers in my own state, would seem to be a pail that would exclude all the dirt, but such is not the case, as our first prizes have never been won by the use of a pail of this make.

As an aid to producing clean milk, the nature of the bedding used in the cow stable seems to play quite an important part. We have found that shavings or straw seem to be the best things to use, next the litter which comes from the roughage fed, and last sand or floor sweepings. Sawdust seems to be very hard to remove entirely from flanks and udders likewise. The sprinkling of floors and stands, just previous to milking, also seems to help materially to reduce the dust in the air.

Washing or wiping the flanks and udders with a damp cloth just previous to milking seems to be generally considered a necessity, and most of our producers do that anyway.

The last point which I shall touch upon is, to my mind, the greatest enemy to pure milk production, and that is garget. It is absolutely astounding the amount of garget present in our dairy herds almost all the time. and this, to me, seems to be the cause of many of the cases of sickness laid to milk, and which the medical fraternity too often attribute to unsanitary conditions. Clarification and pasteurization seem to offer the only means of overcoming this condition.

Having very briefly outlined the method employed in carrying on this contest, I want to say a few words as to the practicability of similar work being undertaken in other states. In the states of larger area where transportation facilities are not of the best, perhaps a state contest might not be feasible, in which case, however, city contests arranged for the dairies from which a given city's supply comes could be held and fine results obtained. I simply mention this in passing, as hardly any two states have identical conditions to meet in their efforts to improve the quality of their milk.

Prize contests are only a part of the tremendous amount of educational work which is being done along dairy lines, so we

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cannot, of course, expect the millennium, but I do believe that by this means a wonderful amount of good can be done through thus interesting, encouraging, and teaching our dairy farmers how to produce a better and more sanitary product.

We have also been very fortunate in Massachusetts in leading in the size and number of our "Milk Shows." Here again the dairyman takes great pains in preparing samples for the show, and each time he enters his milk learns something new which is valuable in helping him to produce a product of higher grade. This, again, is a part of the great educational propaganda and is bound to produce good results from the sanitarian's standpoint. Massachusetts milk producers to the number of three hundred and fifty have received during the past three years in cash prizes $11,500.00, in addition to the medals, certificates, and thorough-bred bull calves which have been awarded as prizes in our Milk Shows. The distribution of all this prize money has helped to establish just that friendly relationship and spirit of cooperation between the producer and inspector whereby results are obtained which far surpass any which would be possible where police and penalization methods have been employed.

The hearty, spontaneous and tireless efforts of our local milk inspectors in Massachusetts have made our prize contests the big successes which they have been, we having held two of the largest milk shows ever held in this country, and our Clean Milk Contests having had an entry list of nearly a thousand dairies during the three years in which the work has been carried on. This seems to me to be a class of work in which all milk and dairy inspectors may very properly take an active and lively interest, with correspondingly good results accruing from their efforts along this line.

The real value of prize contests, it seems to me, however, lies in the fact that by this means a lively interest and spirit of friendly rivalry is engendered in the minds of dairy farmers, and the work of the inspector thus becomes much easier, as he then has to deal with a wide-awake, interested class of men, instead of a discouraged, down-at-the-heel type of disgruntled milk producer.

DISCUSSION.

MR. KELLY. While I appreciate very much the kind expression of Mr. Lombard, I would like to say that in any work

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we have been able to do we have simply followed up the work mapped out by Professor Lane.

PROFESSOR LANE. Mr. President: You might be interested to know it was about 1905 we took up the matter of the possibility of the milk contest, when I was in the U. S. Agricultural Department. At that time they had butter contests and cheese contests and score cards for all these things, and there seemed to be no reason why we could not have a score card for milk and have a milk contest. At first it was pretty discouraging, because many thought it would be impossible to have such a contest, but basing it on the proposition that the milk for competition should be produced the same day it worked out very nicely. The first contest was in 1906, in Chicago, and since we have had many contests. There has just been held a great contest in San Francisco at the Exposition. The credit is not all due to me in starting this contest work. When we really came to judging milk, I called on Professor Weld and Professor Stocking and together we judged the milk at the National Dairy Shows for five years in succession, and the cooperation of these men was very helpful.

QUESTION. Mr. President: Is there any correspondence between the filtration method and the bacterial counts of the milk?

MR. LOMBARD. I can't say that there is. In Massachusetts we have a certain amount of money available, and we decided to make the contests there as simple as possible, and we awarded the prizes purely from a cleanliness standpoint, in order that the dairy farms might receive the largest possible proportion of this appropriation. We believed we were establishing the fundamental principle of all milk production, cleanliness.

DR. MALONEY. What effect have the prize contests had upon the improvement of community milk areas? For instance, a city like Boston has a milk area.

MR. LOMBARD. The only information we have available is what we get through local inspectors, and we get very satisfactory reports from all local milk inspection areas.

DR. MALONEY. Does the improvement come as a result of the prize contests or the activity of the municipal authorities?

MR. LOMBARD. The contests have been carried on with the aid and assistance of the local milk inspectors. It is only through effort that the contests have had the good results they have had.

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DR. MALONEY. Personally I am opposed to prize contests There should be no premium placed on a man doing his duty. He should not be given a premium for doing that which he ought to do.

PROFESSOR LANE. I wonder if that is the experience of cities and places that have had contests. Our president has had contests in his own city of Seattle. Were the results favorable or unfavorable?

PRESIDENT HENDERSON. The milk contest, to my mind, is the greatest thing an inspector can hold. We have accomplished more with them than with any other thing we have done. We finally cleaned up every prize at the National Dairy Show in Chicago. Our dairymen took a lot of interest in it. In the San Francisco show we did not do as well. But in Portland, Oregon, the inspector got 136 producers to send milk to San Francisco, and he did not have a sample score under 90. He brought it about by holding these milk contests in the city.

Mr. Lombard, in my opinion, does not go far enough. Let him score the milk on the Government milk score card, and a dirty, filthy place cannot win a prize. We made special efforts to get samples from the farmers. The contests are an education. You can't go to a man's place and work with him until he produces a sample of milk with two or three hundred bacteria per c. c. without teaching that man something. Make your contests surprise contests, if you desire. Don't make your awards on one sample. Judge it exactly as it is judged in the national contests.

PROFESSOR STOCKING. In our exhibit at the State Fair in New York, the producer selects his product and sends it in. The first year a man very rarely gets a prize. He learns something, however, and comes back for a year or two and finally gets a prize. It sometimes takes several years to educate him to the point of getting a prize. It is not the man with an expensive outfit that always gets the prize. The man with a clean outfit and clean methods gets the higher scores.

"If a man has an inborn capacity or instinct to be clean, a little instruction will enable him to do satisfactory work; but if he is lacking in this quality it is very difficult to change his methods by any amount of instruction or police regulation."—E. H. Webster.

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REGULATIONS FOR MILK AND CREAM FOR MANUFACTURING PURPOSES.

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

That some of the cities of the country enforce requirements for milk and cream intended for manufacturing purposes which differ from the requirements enforced for the regular family milk supply indicates that there exists in the minds of some officials charged with the supervision of the milk supplies the recognition of a sufficient reason for the establishment of different standards.

My observation is that when different treatment is accorded the same product, intended for the two purposes indicated, that under certain conditions the product intended for commercial purposes can be safely guarded by less rigid restrictions than those applied to the family supply. I know that the public has not the same degree of fear for the dangers from milk when the product is turned into ice cream and other milk products as it entertains for raw milk bought for drinking purposes. Again, the public is often prone to limit their demand for purity in food products to the price they are asked to pay, and milk for commercial purposes will not command the price, nor stand the fixed overhead charge that milk for family use can secure or sustain.

At the risk of being charged by this distinguished body with uttering a heresy, but without the purpose to abate any necessary precaution in safeguarding the milk supply, I feel that some of the demands entailing expensive barn construction and that herds should be tuberculin tested are often requirements that are not only burdensome and unnecessary, but that they have a distinct tendency to discourage this most important industry. I am satisfied that requirements going beyond a demand for cleanliness and the observance of reasonable sanitary precautions in the care of the herd and the product, and especially the proper sterilization of the milking utensils, pails and shipping cans, seriously hamper the dairy industry as it applies to commercial milk, and the effect will be that this most important branch of the gen-

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eral agriculture of the country will fall into the hands of the so-called "interests" and the public will be the real sufferers in the end. Experiments conducted over a period sufficiently long to give us positive results show that the sanitary conditions of the utensils in which the milk was handled, from the cow to the consumer, had a greater influence on the bacteria content of the milk than the surroundings or the construction of the barn. I believe that we should add to the requirements for cleanliness and care, compulsory pasteurization. Then I am sure that a modified standard would give us not only reasonable safety, but that it would go a very long way in eliminating a large part of the friction and distrust existing between producers and officials charged with the supervision of the various milk supplies. The restrictions which some of the municipal health officers imperfectly enforce must eventuate in transferring the control of the dairy industry to a few large corporations who will have the power to put the price of milk beyond the reach of the average citizen. I further believe that unless some modification of many of the present rigid requirements is brought about, there will of necessity come a reaction, backed by strong public sentiment, that will take away from this most important article of the daily diet some of the essentials for its proper protection. I would not have it thought that I in any way favor substituting pasteurization for cleanliness, or that I deem it of minor importance to safeguard milk intended for manufacturing purposes, or that it should be permitted to be produced in insanitary or filthy surroundings, but I am strongly of the opinion that the dairy industry would be benefited as a whole and the consuming public protected if some of the restrictive requirements now enforced were materially modified.

The economic side of this matter cannot be entirely subordinated. Officials should keep in mind that every added requirement has the distinct tendency to increase the cost of production and ultimately to lessen the consumption of milk, and to encourage the introduction of undesirable substitutes.

Dairy farming is one of the most important branches of the general agriculture of the country, its intelligent practice offers the surest and most economic method of conserving soil fertility, along with which marches increased production and prosperity.

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If you needlessly burden one of the principal arteries, you may find that in averting the lesser evil you have brought disaster to the main structure.

"There is an important moral side to the milk question which must not be ignored. We may have the right—a very doubtful right, to be exact—to neglect the dangers to which we as adults, capable of judging and acting for ourselves, are exposed; but we have absolutely no right to neglect the conditions that cause suffering and death among children."

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THE POLICY OF THE U. S. BUREAU OF CHEMISTRY REGARDING DAIRY AND MILK INSPECTION UNDER THE PURE FOOD LAW.

DR. CARL L. ALSBERG, *Chief*, U. S. Bureau of Chemistry

We feel in the Bureau of Chemistry that milk inspection work, even under the Food and Drugs Act, is purely a local job. It is a municipal job, a state job. We think it is about the most important job that confronts the official who has to deal with public health matters and food and drug matters. We feel that the ideal condition would be a condition in which each municipality, each market, took care of its own milk supply. But we know from practical experience that we are far from having attained that ideal condition when each local milk market sees that the milk received in that market is both normal in composition and wholesome in quality. And as long as conditions have not even measurably approached that ideal for every section of the country, we feel in the Bureau of Chemistry that the Bureau is capable of doing a valuable piece of work which will help the local organizations to reach nearer to those ideal conditions.

We realize, I think, that it frequently happens that with the best intentions in the world the local officers cannot do the things they would like to do for local reasons. It is not necessary to specify, to go into detail. A local official is always under local pressure. A federal official is not under local pressure; he can often do things which the local official could do if he had an entirely free hand. I say it is often possible for the Department of Agriculture to deal with the situation which the local man would like to deal with, but is not strong enough to deal with.

Now the Department has been working on the basis, at least in recent years, that its function with reference to the milk situation is purely the function of what the chemist calls a "catalyser." A catalyser is a substance which encourages reactions, and we feel in the Department of Agriculture that the most valuable thing we can do is to cooperate with, help and assist the local health officers and milk inspection officers to enable them, as far as we can, to carry into effect those things which they would often like to carry into effect of their own

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accord. We feel that the mere prosecution of violators of the law is not adequate in dealing with the milk situation. The result of federal prosecution is very apt to be the discontinuance of the production of a certain amount of milk, and by increased and general and widespread prosecution under the federal Food and Drugs Act we would bring about, at least in sections of the country, those conditions which another part of the Department of Agriculture, the Bureau of Animal Industry, is aiming to avoid. We would discourage the production of milk in the Bureau of Chemistry where the Bureau of Animal Industry was engaged in encouraging the production of milk, and what the Department as a whole is encouraging—the introduction of milk stock on the farm. This antagonism must take place in every department which has for its functions the restrictive law and the constructive aiding of production. It is a dilemma with which the Department of Agriculture is unfortunately constantly faced. The problem faces us to devise ways and means by which we could safeguard the health and also prevent fraud against the people, without at the same time seriously interfering with the production of milk, or at least interfering with the production of milk to the least possible degree that was consistent with the safeguarding of the public.

In consequence of that, we have for the last year or two had parties in the field, consisting usually of a chemist or two, and a bacteriologist or two, and an inspector or two, and a clerk to take care of the red tape which unfortunately has to go with every organization; and we have had such parties cooperating with the local officials of cities and towns that are located at state lines. It is needless, perhaps, for me to say to an audience such as this that the Department of Agriculture, excepting in the District of Columbia and the territories, Porto Rico and Hawaii, has no direct jurisdiction over any food or drug product excepting in so far as it is imported or shipped in interstate commerce, or offered for shipment in interstate commerce. We have had to confine our work to those localities offering their products for interstate shipment of milk. If we were to limit our work to the milk brought into a town on an interstate line, the result would be a discrimination between the two places. Take St. Louis or Kansas City, for example These places receive milk from Missouri and Illinois. We

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have jurisdiction over the milk that comes from Illinois and none over the milk that comes from Missouri. We find it necessary in a locality like that to work with the state people, we taking care of the situation with reference to the interstate shipments.

Now we have in this type of work enjoyed the cooperation of a third party, the Bureau of Animal Industry, which has sent along with such parties dairy inspectors, men trained in educating dairymen in all lines of the dairy business. Our method has been, having established relations with the local official—in many cases having been invited by the local officials—to establish a laboratory in the particular locality under investigation, and cooperating with the state officials examine the milk as it came in both bacteriologically and chemically, and where we found a certain milk chemically or bacteriologically wrong, to make an inspection of the dairy, the inspector giving the dairyman instructions in improving the methods, and in case of watering or skimming making an analysis of the herd, frequently of every animal in the herd, tell the man what we think is the matter with his output and how to improve. Then we move to the next selected locality and go through the same plan in that locality, coming back later to the first locality and doing the work again to see what the effect of our partly educational and partly threatening work has been.

In most cases we have found a vast improvement, but where we have not found such improvement and milk is coming in interstate commerce, we have not hesitated to prosecute, believing that certain people can only be clubbed into improving their methods. It is pretty hard for anybody like myself to know how successful that work has been, but if I may judge from the reports that have come to me from our own people in the field and from such officials who have cooperated with us, the results have been very considerable, and the most valuable part of the work has been perhaps the stimulation of the production of milk.

Unless we are shown that this method can be improved upon, it is the general plan of the Bureau to continue on these lines, gradually working over the country and coming back again and again to the same localities as often as we can get around, to assist and cooperate with the local officials and keep up the interest in the proper production of dairy products.

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Our force and appropriations are small, and the country is big, but as fast as means will permit, the work will go on.

I realize that what I have said has not been very technical or perhaps particularly new. It is only a recital of the plan along which we have worked, and the guiding principle of that plan has been to protect the health of the consumer and, so far as possible, to encourage the dairyman to do better work, and not prosecute if it is possible to get him to do better work by any other means.

DISCUSSION.

MR. HINE, Kansas. I should like to ask whether there are any cases where prosecution should not be started.

DR. ALSBERG. I do not think there is any mitigating circumstance with regard to skimming or watering. I think the only mitigating circumstances are those conditions in which through ignorance, carelessness, or lack of knowledge the dairyman is producing a filthy or dirty product. There is, however, a certain type of unintentional skimming that goes on, and that is to say where there is a large tank containing milk, or a can, in which the cream is poured off the top and the milk that goes into the next can will be part skimmed. The man is not skimming intentionally. We came near doing an injustice to one or two men who were doing just that.

PRESIDENT HENDERSON. Has the Bureau of Chemistry ever investigated the production of the raw material that enters into condensed milk that enters into interstate shipment?

DR. ALSBERG. We have not paid any attention to the raw material that goes into condensed milk, our reason being that it was more important to investigate, study, and control as far as we were able, the shipments of milk used for ordinary domestic purposes.

"The man of science has learned to believe not by faith, but by verification."—Huxley.

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SOME PROBLEMS INVOLVED IN CONTROLLING TUBERCULOUS CATTLE.

DR. A. D. MELVIN, *Chief*, Bureau of Animal Industry, U. S. Dept. of Agriculture.

It is now generally conceded that tuberculosis of cattle is conveyed to a considerable extent to human beings, especially children. Assuming this to be true, it then becomes the duty of the health authorities to remove this danger. This may be accomplished in two ways: By maintaining cattle free of tuberculosis; and, second, by heating the milk. At this time, we will concern ourselves only with reference to the first proposition. The second can be employed as a necessary expedient in the absence of healthy cows, and also for the purpose of preventing spread of other infection with which the milk might become contaminated.

In the year 1907 the Bureau of Animal Industry began its first systematic cooperation with cattle owners looking toward the eradication of bovine tuberculosis. This work was started from the Pathological Division and shortly thereafter transferred to the Washington office of the Quarantine Division, and in its first year, the interest in the District of Columbia, Virginia, and Maryland was such that 2,468 cattle were voluntarily submitted to the tuberculin test, and of this number 15.68 per cent reacted. In considering the future growth of tuberculin testing in this vicinity, it is of interest to note that reactions to the tuberculin test in the first year were confirmed by post-mortem examinations in 99.21 per cent of the cases.

This work was started along the lines of an educational campaign, no cattle owner at that time being required to submit his animals to the tuberculin test. Those desiring to have their herds tested entered into an agreement with this Bureau, which I will quote (Q. D. Form 32):

Q. D. Form 32.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ANIMAL INDUSTRY

Agreement.

In consideration of the testing of my herd of cattle by the Bureau of Animal Industry of the United States Department of Agriculture, and the assistance of said Bureau in enabling

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me to produce a herd of cattle free from the contamination of tuberculosis, I, ...of.....
(Name of owner.)
.....owner of said herd of
(Post-office address.)
cattle, comprising.....
(Number and kinds over six months old)
do hereby agree as follows:

1. I will cause all animals which react to the tuberculin test, and which also show other marked symptoms of tuberculosis, to be slaughtered within a reasonable time under the United States meat-inspection regulations, and I will cause the carcasses of said animals to be disposed of according to the meat-inspection regulations of the Bureau of Animal Industry, based upon the lesions found upon inspection.

2. I will cause all animals which react to the tuberculin test, but which show no other evidence of tuberculosis, either to be slaughtered and disposed of as herein provided for animals which show also other evidence of tuberculosis, or I will cause such animals to be removed from the herd and portion of the farm upon which the healthy animals of the herd are maintained, *to a location approved by the Bureau of Animal Industry,* and I will cause the diseased animals to be segregated from the healthy animals, and thereafter they shall remain so segregated.

3. In all cases where the milk from such segregated reacting cows is to be used for any purpose whatever I will cause the said milk to be sterilized.*

4. Segregated reacting bulls may be used for breeding, provided they are held on leash and are not permitted to leave the premises reserved for their use, and provided the healthy cows bred to such bulls are not unduly exposed to infected premises or to other diseased cattle.

5. I will cause the young from segregated reacting animals to be removed from their mothers at birth, and will not permit the said young to suck their mothers.

6. Any of my premises contaminated by reacting animals

*An Act to regulate the sale of milk in the District of Columbia states that it shall not be lawful for any person or persons to sell or offer for sale, within the District of Columbia, milk taken from any cow which is known to be suffering from tuberculosis.

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will be submitted by me to a thorough disinfection under the direction or supervision of the Bureau of Animal Industry.

7. All cattle owned by me, both healthy and tuberculous, I will mark, or allow to be marked, in such manner as to enable their identity to be retained, and I will not change the location of or slaughter any tuberculous cattle except after due and timely notification to the Bureau of Animal Industry, stating the exact nature of the change of location, or the exact date, name, and address of the official establishment at which the animal or animals are to be slaughtered, *and receiving the approval of the Bureau of Animal Industry.*

8. I will add no cattle to the said herd which have not passed a tuberculin test with the tuberculin prepared by the Bureau of Animal Industry, administered by a licensed veterinarian of the State, an authorized public agent qualified to perform such test, or by an inspector of the Bureau of Animal Industry: *Provided,* That I may purchase cattle to be added to my herd if the said cattle are kept effectually separated from the rest of my tuberculin-tested cattle until the same can be tuberculin-tested, and I will immediately notify the Bureau of Animal Industry and the local Board of Health that these cattle are on my premises subject to test.

9. I will not present any cattle for the test which have been injected with tuberculin within two months immediately preceding or which have at any time reacted to a tuberculin test.

10. I will permit any cattle of my herd or my entire herd to be retested at such times as are considered necessary by the Bureau of Animal Industry.

11. I will comply with all reasonable sanitary measures which are indicated by the proper officials of the state or territory wherein my herd is located, or by the local board of health under whose permit I am disposing of my dairy products, or by the Bureau of Animal Industry.

In witness whereof I have signed this agreement this.....
.....day of ....., one thousand nine hundred and .....

.....,
(Owner of the.....herd.)

Address .....
.....

Witness:

.....

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U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF ANIMAL INDUSTRY

Summary of Directions for Making the Tuberculin Test.

1. Stable cattle under usual conditions and among usual surroundings, feeding and watering in the customary manner.

2. Make a physical examination of each animal, and give to each one some designation by which it will be known throughout the test.

3. Take each animal's temperature at least three times at two or three-hour intervals on the day of injection; for instance, at 2, 5, and 8 p. m. When the last preliminary temperature (which would immediately precede the injection) registers above 103° F., the injection of the tuberculin should not be made; the test of such animal should be postponed.

4. At 10 p. m. inject a dose of tuberculin under the skin in the region of the shoulder, using a sterile hypodermic syringe after disinfecting the skin at the seat of injection with a 5 per cent solution of carbolic acid or a similar antiseptic solution.

5. The dose of the tuberculin made by the Bureau of Animal Industry is 2 c. c. for an adult animal weighing about 750 pounds. Yearlings and 2-year-olds, according to size, should receive from 1 to 1½ c. c., while bulls and very large animals may receive 3 c. c. Double or even triple doses should be given to cattle recently injected with tuberculin; also in the case of animals which, on physical examination, are suspected of being tuberculous.

6. At 6 a. m. on the day following the injection of tuberculin commence taking temperatures, and continue every two or three hours until the twentieth hour after injection, at which time if there is no tendency for the temperature to rise the test may cease.

7. A rise of 2° F. or more above the maximum temperature observed on the previous day, or one which goes above 103.8° F., should be regarded as an indication of tuberculosis, provided the temperature reaction shows the characteristic rainbow curve.

8. Animals which, after injection, show a rise in temperature of 2° F., with a maximum between 103° and 103.8° F., as well as those which show a rise of less than 2° F., with a

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maximum temperature of 103.8° F. or more, are to be regarded as suspicious. These suspicious cases should be held for a retest six weeks later, giving double the original dose.

Disinfection of Premises.

In the eradication of tuberculosis or other communicable disease the thorough disinfection of premises is essential. This may be satisfactorily accomplished by carrying out the following directions:

1. Sweep ceilings, side walls, stall partitions, floors, and other surfaces until free from cobwebs and dust.

2. Remove all accumulations of filth by scraping, and if woodwork has become decayed, porous, or absorbent, it should be removed, burned, and replaced with new material.

3. If floor is of earth, remove four inches from the surface. and in place where it shows staining with urine a sufficient depth should be replaced to expose fresh earth. All earth removed should be replaced with earth from an uncontaminated source, or a new floor of concrete may be laid, which is very durable and easily cleaned.

4. All refuse and material from stable and barnyard should be removed to a place not accessible to cattle or hogs. The manure should be spread on fields and turned under, while the wood should be burned.

5. The entire interior of the stable, especially the feeding troughs and drains, should be saturated with a disinfectant, as liquor cresolis compositus (U. S. P.), or carbolic acid, 6 ounces to every gallon of water in each case. After this has dried, the stalls, walls, and ceilings may be covered with whitewash (lime wash), to each gallon of which should be added 4 ounces of chlorid of lime.

The best method of applying the disinfectant and the lime wash is by means of a strong spray pump, such as those used by orchardists.

This method is efficient in disinfection against most of the contagious and infectious diseases of animals, and should be applied immediately following any outbreak, and, as a matter of precaution, it may be used once or twice yearly.

6. It is important that arrangements be made to admit a plentiful supply of sunlight and fresh air by providing an

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ample number of windows, thereby eliminating dampness, stiffness, bad odors, and other insanitary conditions. Good drainage is also very necessary.

If the use of liquor cresolis compositus, carbolic acid, or other coal-tar products is inadmissible because of the readiness with which their odor is imparted to milk and other dairy products, bichlorid of mercury may be used in the proportion of 1 to 800, or 1 pound of bichlorid to 100 gallons of water. However, all portions of the stable soiled with manure should first be thoroughly scraped and cleaned, as the albumin contained in manure would otherwise greatly diminish the disinfecting power of the bichlorid. Disinfection with this material should be supervised by a veterinarian or other person trained in the handling of poisonous drugs and chemicals, as the bichlorid of mercury is a powerful corrosive poison. The mangers and feed boxes, after drying following spraying with this material, should be washed out with hot water, as cattle are especially susceptible to mercurial poisoning. The bichlorid solution should be applied by means of a spray pump, as recommended for the liquor cresolis compositus.

In the second year of the work, a healthy growth in the interest was apparent and this was sustained by a reduction in the percentage of tuberculosis from 15.68 per cent as obtained upon the original tests in the first year to 9.27 per cent as shown upon the retesting of these herds.

In the fiscal year 1910, reports from tests applied in the States of Virginia and Maryland, which included a number of dairy herds close to the City of Washington, showed an increase in the percentage of tuberculous cattle upon the first or original testing of these herds to 17.67 per cent. The retesting of the herds from previous years and of the badly infected herds of that year indicated the reduction of tuberculosis in those herds to four per cent. In this same year (1910), in answer to many calls for assistance from states and municipalities and from shippers of cattle, the Bureau extended its tuberculosis investigations in the following 17 additional states: Utah, Kentucky, Arkansas, New Mexico, Iowa, South Dakota, Minnesota, North Dakota, Oregon, Nebraska, Kansas, Montana, Colorado, Idaho, Illinois, Michigan, and California; and toward the end of the year, decided to establish tuberculin-testing stations at some of the large stock yards through which

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cattle pass in interstate shipment. The extension of this work resulted in 45,620 cattle being submitted to the tuberculin test by inspectors of the Bureau of Animal Industry. Of this number, 42,361 were apparently free from tuberculosis, while 3,259 were classified as reactors. These figures, covering tests applied in 19 states and the District of Columbia, may be regarded as giving a fair viewpoint concerning the percentage of tuberculosis among the dairy cattle in the United States, which was then noted as 7.14 per cent. Allowing for the unusual prevalence of tuberculosis among cattle of certain states or sections of states, it would seem that the general estimate of 10 per cent, which has been repeatedly suggested, could be regarded as reasonable. This estimate is further supported as the result of a compilation of tuberculin tests applied by state and federal officers with Bureau tuberculin between the years 1893 and 1908, covering a total of 400,000 cattle, which showed a percentage of 9.25 reactors. (The Economic Importance of Tuberculosis of Food-Producing Animals. Dr. A. D. Melvin. Twenty-fifth Annual Report, Bureau of Animal Industry. 1908.)

Returning to the progress of the tuberculin testing of cattle in the States of Virginia and Maryland, this work grew until, in the fiscal year 1912, tests were applied upon the voluntary agreements of owners to 7,043 cattle. Of this number, 18 per cent reacted to original tests, while the percentage of tuberculosis in herds which had been previously tested showed an average of 3.17 per cent.

A consideration of the results in connection with tests in 1913 reveals interesting facts, in that out of 203 herds of cattle under continuous Bureau supervision in Virginia and Maryland, it was found that 69 formerly tuberculous herds were free from tuberculosis, and that in 56 herds where cooperation had been effective during the period of five years, no case of tuberculosis had been found during that period.

This work, up to the present time, has continued to receive the support of cattle owners.

Considering the interest displayed in the tuberculin testing of cattle in the vicinity of Washington and the educational work which was being accomplished, it was deemed that the point had been reached where a compulsory tuberculin test should be applied to all cattle within the District of Columbia.

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This work was accordingly inaugurated in response to an order of the Commissioners of the District of Columbia, approved by the Secretary of Agriculture November 27, 1909. The principal features of the order were as follows:

Owners of cattle were required to obtain a permit for the entry of cattle into the District of Columbia. When not accompanied by a satisfactory official tuberculin test certificate, the cattle were to be quarantined until tested within the District. All cattle entering the District for slaughter were required to be tagged for identification, the tag to remain attached to the hide until removed by a Bureau employee, the only exception to this being in the case of veal calves, steers, and carload shipments of cattle to official establishments where U. S. meat inspection is maintained. All cattle over six months old already within the District were required to be inspected and tested with tuberculin and the reacting animals slaughtered. Provision was made for the appraisement for reacting cattle and for partial reimbursement upon a percentage basis, depending upon whether or not tuberculous lesions found upon post-mortem examination were such as to require condemnation of the carcass, the amount received from the butcher being deducted from the proper percentage of the appraised value and the remainder, if any, being paid to the owner. All premises upon which any tuberculous animals were found were required to be disinfected promptly. Provision was likewise made to prevent evasion of these provisions and for the punishment of any violations.

It was found that 1,701 dairy and breeding cattle were being maintained in the District of Columbia and that of these practically 18.87 per cent were tuberculous. These tuberculous cattle were found upon approximately 18 per cent of the premises where cattle were maintained in the District of Columbia. The results of the following year showed a reduction in the prevalence of tuberculosis to 3.2 per cent, and in the infected premises to 5.31 per cent. Since that time, the percentage of tuberculosis in the District of Columbia has approximated 2 per cent. In the fiscal year ending June 30, 1915, the record indicated 1.75 per cent.

With the great growth of tuberculin testing throughout the United States, the lack of appropriations sufficient to continue an extension of the work under federal supervision and

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the finding that tuberculosis was frequently introduced into herds and communities through the purchase of tuberculous pure-bred cattle, it was believed that a far-reaching benefit to both the cattle and dairy industries could be attained by establishing a system of cooperation between the Bureau of Animal Industry and the breeders of pure-bred cattle. This decision was also founded on the many requests which have been received by the Bureau in recent years from breeders that they be given assistance in the establishment of their herds as known healthy herds. The Bureau is therefore contemplating extending its aid along these lines in so far as appropriations will permit and satisfactory cooperation is received from the state live stock sanitary authorities and breed record associations and owners of pure-bred cattle.

Information in regard to this plan which was transmitted to the various states has, without exception, in answers received, shown a favorable interest displayed by state officials.

It is proposed to maintain an official public record for all pure-bred herds which can be certified as safe herds from which tuberculosis-free cattle may be purchased. To insure publicity regarding associations and breeders cooperating with this Bureau there will be published at quarterly intervals, or as frequently as may be necessary, a record showing the names and addresses of the breeders whose herds are included in the classification just mentioned.

Publicity at live-stock expositions, state and county fairs, may be given to recorded tuberculin-tested herds, by placards to be placed upon the pens. This action, it is expected, will lead to the establishment of separate exhibition classes for these recorded tuberculin-tested herds. Disinfection requirements in regard to pens and cars in connection with such exhibition cattle will also be enforced.

The breed record associations will be requested to include upon their pedigree records information concerning the tuberculin testing of the animals which appear thereon, as the showing of healthy ancestry would add materially to the commercial value of the progeny.

The first proposal was that herds would be classified in two divisions, to be known as Classes "A" and "B." Class "A" would include all herds in which no reactors to the tuberculin test were found. Herds in Class "A" for three con-

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secutive years would receive special mention in publications. Class "B" would include herds in which there were not more than 10 per cent of tuberculin reactors, which showed no evidence of tuberculosis of the udder, or superficial glands, progressive loss of condition, or emaciation, reactors being immediately removed from the herd. This class would permit the owner of a small herd, say 10 pure-bred cattle, in which one localized case of tuberculosis were found, and removed, to have the advantage of Government recognition, and would not bar recognition from the larger herds of 100, 200, or even more cattle, in which possibly but one or two localized cases of tuberculosis were found in the entire herd. Class "B" herds would be eligible for promotion into Class "A" as soon as a tuberculin test showed them to be free from reactors.

The recording of herds will only be granted after the breeder or owner has properly fulfilled all measures which may be indicated for the control of tuberculosis, particularly those pertaining to the disposition of reacting cattle, the disinfection of premises, and the addition of new animals. If a breeder or owner fails to comply with these provisions, and acts in any manner so as to impair the confidence of the public in regard to the value of the official record of tuberculin test, the Bureau will withdraw its cooperation, and publicly note that fact.

There has been some criticism of this plan, inasmuch as it has been pointed out that dealers in diseased animals would point out to prospective buyers the fact that tuberculosis had existed among the herds in the "B" class. It may be that this plan will necessarily have to be modified so as to provide but one class which shall consist only of those herds which are known to be free from tuberculosis.

It is desirable in the campaign of tuberculosis eradication to provide owners with some compensation for animals destroyed. It seems to me that the plan adopted by the Commissioners of the District is an equitable one, and in practice there was very little complaint against this system. A great many reacting animals are but slightly infected with tuberculosis. It is unfortunate that the reaction does not indicate the stage and extent of the disease. Only by post-mortem examination can this be determined. As the extent of the disease cannot be definitely determined in the live animal, and as the reacting animal may become a source of danger at any time, it is neces-

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ary that they be removed from the herd. Post-mortem examination frequently reveals that many of these animals, while unsafe in a herd of living animals, may be passed with perfect safety for food. This is a big economic factor not only in the eradication of the disease, but in the conservation of the food supply of the country.

"We already know enough to double the crops and eradicate the infectious diseases of this entire state. What is most needed now is wider and practical education of the entire public, so they will take advantage of the knowledge we already possess."—Van Hise.

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THE CONTROL OF FOOT-AND-MOUTH DISEASE.

DR. JOHN R. MOHLER, *Asst. Chief,* B. A. I., U. S. Dept of Agriculture.

INTRODUCTION.

During the past year a widespread outbreak of foot-and-mouth disease has passed over the United States, the most serious and extensive that has ever occurred in this country. The disease has been found in twenty-two states and the District of Columbia, at places ranging from the Atlantic to the Pacific Coast. Previous outbreaks in this country have been limited to comparatively small areas. The latest invasion was discovered in the vicinity of Niles, Michigan, in October, 1914, after it had evidently been under way since August of the same year. Unfortunately the mild form and typical appearance of the first cases permitted the disease to spread without recognition to a considerable number of herds of cattle and hogs. Some of the latter reached and presumably infected the stock yards at Chicago, from which place it was disseminated to other stock yards and to points north, east, south and west, by shipments of live stock, especially stockers and feeders.

SOURCE OF INFECTION.

Many theories of the manner in which the infection was introduced into the United States have been advanced and all those which permit of investigation have been diligently studied and disproved. Among those theories which have been thoroughly investigated with negative results are the introduction of the virus with smallpox vaccine from vaccine establishments in Michigan and Massachusetts, with calf dysentery serum imported from Europe, by intentional dissemination of the disease by men equipped with hypodermic syringes, by imported hides, Belgian refugees, Russian immigrants, etc. There still remain two plausible theories which can neither be proved or disproved. First, the farmer, Mr. X, on whose premises foot-and-mouth disease first made its appearance, purchased from a Chicago firm certain merchandise including two pairs of lisle gloves imported from Germany. The paper

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used in packing and wrapping these gloves was thrown into a hog lot about ten days before the hogs began to show a disease which subsequently proved to be foot-and-mouth disease. These hogs were the first animals to develop the disease in the 1914 outbreak. Second, the infection may have been brought to Niles, Michigan, by burlap or matting from tannery materials imported from Argentine and Japan. These wrappings are frequently taken by tannery employees for household and farm use and their homes are located in the vicinity of the farm of Mr. X.

It may be of interest to know that as a result of this outbreak of foot-and-mouth disease a total of 3,021 infected herds have been slaughtered up to August, 1915. Every effort has been made to secure an accurate knowledge of the means by which infection was introduced into each of these herds. It was observed that the four most important factors in the spread of the infection were human beings, public stock yards, infected animals and creameries. The transmission by the last three methods may be readily controlled by regulations, but the spread of infection by people offers many serious difficulties. Out of the total infected herds, 509 were infected through the virus being carried upon the shoes, clothing or bodies of persons, making more than one out of every six cases infected as a result of this method of transmission. No stronger argument could be presented for the necessity of maintaining guards on quarantined premises. There were 707 herds infected through exposure in public stockyards. In a considerable number of cases animals shipped from stockyards, apparently healthy when shipped and unloaded, but afterwards developing the disease, may have received the infection from the cars while en route, instead of at the stockyards from which they were shipped. As soon as the outbreak was discovered, however, the disinfection of stock cars was ordered, and it is not probable that many such cases happened after that date. A total of 631 herds were found to have become infected through direct contact with neighboring infected herds, by pastures, mating breeding animals, or stray animals, or through animals brought from infected stables or lots of local dealers. There were 269 herds infected from creameries, the infection being carried to these creameries chiefly by milk from infected cows, and disseminated by the

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feeding of skim milk to other animals. It was found that about one-half of the cases of infection in Michigan were connected with infected creameries. As foot-and-mouth disease is not the only epizootic which is spread in this manner, need is shown for legislation requiring creameries to pasteurize any skim milk sent out for animal feeding. Other possible sources of infection are dogs, poultry, birds, infected public highways, hog cholera vaccination, infected stock cars, contaminated streams or drinking water, and infected feed or garbage. There remain a total of 603 herds which became infected from unknown sources. In these cases the virus was probably carried in almost every known way and if these sources were added to the number under the proper item, they would scarcely change the ratio of the various modes of infection.

METHODS OF ERADICATION.

That this disease must be controlled admits of no argument; therefore differences of opinion hinge solely upon the method or methods to be adopted.

The methods of eradication applicable to foot-and-mouth disease include: (1) Immunization; (2) Quarantine and Disinfection; (3) Slaughter and Disinfection. Each will be discussed separately in the order named.

(1) *Immunization.*—Immunization in the present outbreak was out of the question as the only serum thus far produced gives but a passing immunity of only several weeks duration, unstable at best, and impossible to obtain in this country, or in sufficient quantities in any country. To Professor Loeffler more than to any other we owe our present knowledge relative to the effects of serum immunization for foot-and-mouth disease. Ever since he was placed in charge of the laboratories for the investigation of foot-and-mouth disease the Bureau of Animal Industry has carefully followed his work. His publications on the subject, and particularly those referring to immunization against the disease, have appeared at various intervals and have been the subject of discussion at several international veterinary congresses. While his work on the serum treatment of this disease is of great scientific interest, its practical value has not yet been proved. In the last annual vet-

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erinary report of the Prussian Government (1914) a detailed description is given of a series of experiments which were undertaken to establish the value of the serum prepared by Professor Loeffler's method in his own laboratories. These experiments proved that the serum does not protect animals in small doses (20-30 cubic centimeters) but large doses with repeated injections afforded a protection to the animals and might be employed to an advantage in the eradication work when control of the disease by quarantine measures is attempted. In the partly successful experiments, animals over three months old received four injections of serum at intervals of 10 to 14 days. The first injection consisted of 200 c. c. and the subsequent injections of 60, 30 and 30 c. c. respectively. Considering that the preparation of a liter (about a quart) of serum costs $25.00 in Germany, it would cost over $8.00 to protect every animal over three months old, provided the hogs used for the preparation of the virus are passed for food as is the case in Germany; otherwise the cost of the serum would be at least doubled. It should also be considered that even in these experiments 6 to 8 per cent of failures occurred, and it must be recognized that in a country like the United tates with so many highly susceptible animals a single failure of protection might prove to be the source of a new outbreak.

The impracticability of the serum immunization is further augmented by the difficulty of preparing the serum, and particularly on account of this disadvantage the method could not be utilized satisfactorily in countries where the disease is not prevalent or where it occurs only as a result of its periodical introduction. Moreover, the immunity furnished is of quite short duration, lasting only from two to three weeks.

The preparation of the serum requires a propagation of the foot-and-mouth disease virus, and its presence in this country would be a constant menace to the stock industry, even with the exercise of the greatest precaution and care. This has been substantiated in Germany where the Government was called upon to pay damages for losses from outbreaks resulting from the escape of the virus from Professor Loeffler's laboratories.

The live stock conditions prevailing in this country would also make the serum immunization extremely difficult, if not impossible. The shipment of stock over long distances, par-

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ticularly the shipments radiating in all directions from stock centers, would necessitate the protection of a large percentage of the stock in the country, or at least in an extensive area. This, with Loeffler's method of serum production, would be impossible.

Protective serum cannot be kept for a period of years, as it deteriorates, and therefore the preparation of such serum could only be considered at the time of the appearance of an outbreak. Considering the great amount of serum required for the immunization of a single animal, it is almost incomprehensible how a sufficient amount of serum could be produced to protect the stock even in a single state. It should be borne in mind that the vesicular contents of hogs affected with foot-and-mouth disease is used for the hyperimmunization of the cattle. One or more injections of 100 c. c. of such vesicular fluid are made into the cattle which produce the protective serum. The average amount of vesicular fluid obtained from a sick hog is about 5 c. c.; thus for each injection it is required to have about twenty hogs affected with foot-and-mouth disease. This fact alone clearly suggests the impracticability of Professor Loeffler's method.

Professor Mettam, in his report on foot-and-mouth disease for the Tenth International Congress at London, 1914, discussing the value of the serum treatment, said: "It must be admitted that serum therapy, as far as foot-and-mouth disease is concerned, is not upon a satisfactory basis. The amount of serum required is large and is costly; its action, as with other sera, is of short duration. It can only give protection for a few weeks at the most, and it may fail in its effects, because either the passive immunity established is of low degree or because the virulence of foot-and-mouth disease virus is variable; * * * the time has not yet arrived when we can accurately appraise the value of serum as a preventive against foot-and-mouth disease."

Leclainche at the same Congress stated: "Up to the present attempts to immunize animals against foot-and-mouth disease have not yielded any results capable of practical application. Effectiveness does not appear to be capable of accomplishment and serum therapy has not rendered the service expected of it. Experiments carried out in France, in which repeated injections of 40 to 50 c. c. of serum were administered, show

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that these doses only exceptionally confer any immunity. The use of large doses is hindered by considerable practical difficulties and it would be too expensive. Besides the conditions under which serum is obtained are such that its properties are very inconstant. It is impossible to standardize it before use and the effect of the treatment cannot-be depended upon. Serum immunization, therefore, has only an insignificant prophylactic value."

"Further investigations in this connection are an urgent necessity," was the conclusion of Nevermann, Germany's highest veterinary official, at London, in 1914.

In Hoare's System of Veterinary Medicine, Volume 1, 1913, under the heading of Protective Inoculation, appears the following: "Various serums have been tried by the continental authorities, but it cannot be said that such have proved of practical utility."

The English translation of Hutyra and Marek, Volume 1, page 151, states "The problem of general immunization is not solved at the present time," in referring to foot-and-mouth disease.

Not until a more practical method of immunization has been discovered will it be possible to utilize it for the successful eradication of foot-and-mouth disease in the United States or any other country.

(2) *Quarantine and Disinfection.*—It has long been maintained that the method of quarantine without slaughter is a possible means of eradication, but one which by its very nature admits of a greater spread of infection. As is well known, foot-and-mouth disease has been combatted by quarantine and disinfection in certain European countries for many years. The constant recurrence and widespread dissemination of the infection in these countries prove conclusively that these measures have been unsuccessful. The necessity for an absolute quarantine in a disease so easily transmitted is apparent, and this has been found impossible, even in Germany where military support is given to the best organized veterinary police system in the world. Indeed, every European country which now has the disease hopelessly fastened upon it has permitted the conditions to exist through this very system of attempted eradication. As a result the infection has become so widely distributed in many of these countries that the authorities are

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forced to accept this measure of control as the only available and economic method under the present conditions. The infective agent may be spread so readily that it is difficult to prevent its dissemination even where animals are confined in tight sanitary buildings with the most careful use of disinfectants and surrounded by guards, a method entirely impracticable on the average farm and nearly always much more expensive than the value of the average animal so quarantined. Added to these objections is the greater one of known failure in all countries where this method has been tried. In the outbreak of 1902 there were about 100 herds already affected in Massachusetts when the department began operations for eradicating the disease. Before all these herds were reported or could be reached the animals had recovered and subsequently were not slaughtered, but quarantined and the premises disinfected. The difference between the 4,712 cattle affected in the 1902 outbreak and the 3,872 slaughtered represents chiefly those that made a recovery, although it also includes a few that died of the disease. Some of the owners of the recovered animals visited the bureau office subsequently and requested that their herds be appraised and destroyed on account of the complications involving the udders and feet which had developed, making the animals unthrifty and unprofitable. Their requests were complied with and after the commencement of the work of eradication, no newly affected herds were allowed to be held for recovery. In the 1908 outbreak all herds that became infected were slaughtered, and the same is true of the 1914 outbreak, with the exception of one herd which was on exhibition at the National Dairy Show in Chicago when the disease broke out among them on November 1. At this time it was the desire of the department to slaughter the first few animals which contracted the disease, and to limit the spread of the infection to others by establishing hospital conditions, separating the herd into small units and segregating these groups by means of partitions and muslin curtains saturated with bichloride of mercury solution and other sanitary methods. While the latter was started and continued for a brief period it was soon abandoned, as certain herdsmen, with the approval of the employer, adopted the German method of directly exposing the cattle under their supervision in order that the disease might run its course in all the animals as quickly as possible. In the

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meantime, at the request of a committee of the National Dairy Show Exhibitors' Association, the Secretary of Agriculture granted permission to the owners to retain their cattle under absolute quarantine until they had fully recovered from the disease and were not disseminators of the virus, which should be determined by experiments to be applied subsequently. Before starting these tests it was the desire to move the cattle farther away from the Chicago stock yards, and arrangements for the removal of the cattle to the Hawthorne Race Track, near Cicero, Illinois, were completed on December 26. An inspection of the animals at that time revealed no cases of foot-and-mouth disease. Only a few cases of various forms of ailments, such as articular rheumatism, pulmonary disturbances and metritis were observed. Five cases of metritis, however, still persisted, and these, together with two tuberculin reactors, were destroyed prior to the moving of the cattle. In order to prevent the introduction of virus into the new quarters, so far as possible, it was decided to spray and scrub the animals with a three per cent cresol solution. They were then taken through a foot bath into a separate stable which had been previously cleaned and disinfected with a six per cent solution of cresol. The animals were then dried with towels, left there all night, and the next morning loaded into special box cars in which they were conveyed directly to their new quarters at Hawthorne Park. The same care was exercised with regard to the attendants; all their belongings and clothes were disinfected and fumigated, their shoes disinfected and the men themselves required to bathe and change to clean linen. At Hawthorne every precaution was used in unloading in order that no infection would be scattered and the grounds were guarded by deputy sheriffs during the entire period of quarantine.

It is not my purpose to go into details of the quarantine of the Dairy Show herd, but it should be of interest to record at this time the experiment which proved that the cattle in the show herd had fully recovered. Since the publications of Loeffler in 1904, it has been known that certain animals which recover from foot-and-mouth disease may act as carriers of the virus for a considerable period, precisely like persons who act as bacillus carriers for long periods after recovery from typhoid fever, cholera and diphtheria. Such virus carriers

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therefore must be considered a constant menace to the eradication of the disease when only quarantine measures are adopted.

In order to ascertain if any such virus carriers existed among the animals of the National Dairy Show, 50 head of healthy young cattle which had been secured for this purpose were placed in contact with them on March 25. These test animals consisted of 34 steers and 16 heifers, ranging in age from one year to eighteen months. The tests, which were conducted by veterinarians from the Bureau of Animal Industry, included inoculations of the saliva, feces, urine, vaginal discharges and hoof scrapings, feeding of milk, manure and direct exposure tests. In the exposure tests one susceptible animal was placed between two recovered show cattle and kept there for 48 to 64 hours, then changed and placed between two other recovered animals. This was done until all recovered animals had been given an opportunity to infect the susceptible animals and was repeated three times so that each recovered animal gave 144 hours of exposure to the test animals. At the same time the recovered herd was divided into 48 groups of approximately 15 animals each. From every animal of each group a small quantity of feces was collected, mixed with water, strained, and a cheese cloth saturated with the strained fluid. This cloth was then rubbed into the buccal cavity of the susceptible animals. If in the following seven days no indications of foot-and-mouth disease developed in any of the test animals the same grouping of the show cattle followed for subsequent tests which were undertaken in turn with saliva, urine, vaginal discharges, milk, and scrapings from the interdigital space and around the coronary band of each recovered animal. During the execution of these tests it was considered advisable to remove only a sufficient quantity of the manure and litter to prevent undue accumulation and to assure satisfactory sanitation, the object being to afford the susceptible animals an opportunity for infection with the virus, if such should be present in the feces. These tests continued until May 9. On April 8, 50 hogs were placed in temporary pens within the enclosure and fed on milk from the show cows and also allowed to consume the leavings and droppings from the cattle.

As a result of these tests no lesions of foot-and-mouth disease were produced, nor were any of the dire results promised by some apprehensive individuals witnessed, such as the pro-

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duction of tetanus, malignant edema, blackleg, necrosis, pyemia, septicemia, etc. On May 31, three weeks after the last inoculation test and seven months after the show cattle had been placed under quarantine, the latter were released by the Federal Government and permitted to move interstate subject to the regulations of the States at destination. At the beginning of the tests on March 25, 747 animals were included in the number quarantined. On May 30, at the conclusion of the experiment, this number had been increased to 752 by the addition of a number of calves. The conditions under which these show cattle were kept and the sanitary quarters in which they were confined during the period of quarantine would be almost impossible to duplicate under ordinary farm conditions while the great number of animals proportionately reduced the average cost of quarantine. Added to this, conditions permitted the removal of these animals from the infected barn and surroundings at the Union Stock Yards to the clean and sanitary quarters at Hawthorne at a very suitable time. That no virus carriers were demonstrated to exist in this herd is a definitely established fact, but this does not prove that such virus carriers would not exist in other herds under like or unlike conditions. It is, however, a source of gratification to this Department, as well as to the public, that conditions allowed these valuable animals to be preserved by the methods adopted.

(3) *Slaughter and Disinfection.*—With our present knowledge, slaughter and disinfection is the only satisfactory and economic measure for controlling foot-and-mouth disease in a country like the United States where the infection is not indigenous. All authorities on the subject agreed on this point in their respective reports to the Tenth International Veterinary Congress at London, September, 1914. Thus we have the report of Professor Mettam, Principal of the Royal Veterinary College of Ireland, who states, "Efforts should be promptly made to eradicate the infected centers. The animals affected and those which have been directly and indirectly in contact and which must be considered as probably infected, are slaughtered."

Professor Remmelts, of Holland, also claims that "preference must by far be given to the immediate removal of virus by slaughtering diseased and suspected animals than to any other measure."

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Leclainche, a representative of the French government at this congress, likewise advocates the slaughter of diseased and exposed animals in cases where the infection has not become firmly implanted and where natural boundaries are present.

Nevermann, the highest veterinary official in Germany, states in his 1914 conclusions that "the slaughter of infected herds in Germany has proved an advantageous method of fighting the disease under certain conditions." Earlier in his article he states, "with their slaughter, newly appearing outbreaks may be readily controlled and thereby the unpleasant spread from such outbreaks may be avoided. I desire particularly to call attention to the magnificent results of this method attained in England and in the United States."

An article by the venerable Professor Guillebau in the Swiss Veterinary Journal, 1915, claims that eradication by slaughter in the lowlands of Switzerland is indicated, but not so in the mountains.

Other authorities may be quoted, and the consensus of opinion is that in a locality where it is possible to control the disease by slaughter, this method should be given preference over any other.

In view of these facts and the results achieved in the present and former outbreaks of the disease in the United States, can any one doubt that the measures pursued in this country were not the most suitable for the conditions, especially so if the danger from virus carriers is given due consideration? And it would be desirable for legislative bodies and others to reflect that the kind of cooperation that checked and suppressed one of the most infectious animal diseases in the world can be used effectively against other enemies of the live-stock industry. Notwithstanding this, certain critics of the bureau are making similar attacks on the foot-and-mouth eradication work as they did years ago against tuberculosis control work. Were these criticisms to be heeded, foot-and-mouth disease would unquestionably be saddled on this country tomorrow, as tuberculosis is today.

"I know of nothing more practicable or more logical as a subject for sermons in our churches, than the importance and the necessity for observing those things which conduce toward an improved public health."—Wm. H. Price.

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THE CAUSE AND OCCURRENCE OF CONTAGIOUS ABORTION IN CATTLE.

DR. E. C. SCHROEDER, B. A. I. Experiment Station, U. S. Dept. of Agriculture.

Contagious or infectious abortion disease in cattle is the latest among the serious, destructive plagues of food animals to receive the wide recognition in this country its great economic importance merits. In Europe, probably because it has existed there longer and is of much commoner occurrence, the importance of the disease was recognized earlier than here. Its infectious character was suspected as early as the 18th century, though not conclusively proved until the last quarter of the 19th, and its specific cause, the abortion bacillus of Bang, was not discovered and described until the year 1897.

How young our knowledge of the real character of abortion disease in cattle as it occurs in America is, and how slowly we recognized the identity of the disease in America and Europe and wakened to an adequate appreciation of its grave, economic importance, may be gathered from facts like the following:

In the year 1908, or only seven years ago, one of America's foremost authorities on veterinary pathology and bacteriology, in a text book on the pathology of infectious diseases of animals, stated, regarding the specific cause of infectious abortion disease: "The investigations in the United States have failed to reveal the presence of Bang's organism, but instead a variety of B. coli communis has been found by Chester and by Law and Moore."[1]

In another text book on the infectious diseases of animals, published in 1912, or only three years ago, by one of the best known authorities and writers on veterinary subjects in America, the identity of abortion disease in this country and Europe is questioned, and the possibility suggested and discussed that each continent may have a distinct type of infectious abortion disease peculiar to itself.[2]

These statements, which show what prospective veterinarians were being taught about the etiology of abortion disease in our veterinary schools only a few years ago, are remarkable now mainly because of their evidential value to prove how young our knowledge of the true character of infectious abortion disease is, and they will not be charged too heavily against

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their authors by those who know that only five years have passed since the first account was published of the isolation in America of the real abortion bacillus of cattle,[3] the bacillus of infectious abortion of Bang, and that this event did not at once prove the identity of abortion disease in America and Europe, but at first only that European abortion disease of cattle had invaded America.

Among the infectious diseases of food animals, the importance of abortion disease in cattle is ranked today by many authorities as second only to that of tuberculosis, with the lamentable possibility in view, if its spread is not checked, that it may soon force tuberculosis into the second place. And yet, our appreciation of the magnitude of the evil is so recent, even among veterinarians, that a search of the Proceedings of the American Veterinary Medical Association for the years 1908, 1909 and 1910, reveals only one, purely incidental reference to it. Fortunately for the welfare of our livestock industry the Proceedings of the Veterinary Association for the years 1911, 1912 and 1913 prove that American veterinarians are giving abortion disease an increased, and an increasing, amount of attention.

The data I have available do not show when abortion disease was first imported from Europe into the United States, but this occurred many years ago, long before any one in either this or any other country possessed the necessary knowledge to devise effective measures against its importation.

Statistics regarding animal diseases in America are too meager to prove anything. Reliable, comprehensive statistics, had they been available, would no doubt have called attention with sharp emphasis to the rapidly increasing frequency of abortion disease in the United States a score or more of years ago, and would have given the investigations now in progress an earlier start. They certainly would have aroused a wide interest which, we may assume, would have prevented the passage of more than 13 years between the discovery of the abortion bacillus in Europe and the final determination in America that abortion disease of cattle in Europe and America are identical.

Although it was not known that the bacillus of infectious abortion in cattle is of common occurrence in the milk of infected cows until the year 1912, in which a bacillus, pathogenic for guinea pigs, previously discovered in and isolated

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from milk by Cotton and myself, was definitely identified by Mohler, Traum, Cotton and myself as the bacillus of infectious abortion of cattle, I believe the milk-injection tests with guinea pigs made in the Bureau of Animal Industry at different times during the last twenty years by Cotton, Brett and myself throw at least some light on the rapidity with which abortion disease increased among the dairy cows from which the District of Columbia draws its milk supply. In the year 1894, samples of milk from 19 different dairies were injected into guinea pigs. The samples from one dairy caused lesions which were very puzzling at that time, but which, owing to the precise description we have of their character, are now known to have been the lesions caused in guinea pigs by the bacillus of infectious abortion of cattle. In the year 1907, guinea pigs injected with 36 samples of milk from 32 different dairies proved that 12½ per cent of the samples were infected with abortion bacilli, and that 15⅝ per cent of the dairies were responsible for the infected milk. In the year 1912, guinea pigs injected with 77 samples of milk from 40 different dairies proved that 30 per cent of the samples were infected with abortion bacilli and that 37½ per cent of the dairies were responsible for the infected milk.

If we take the frequency of abortion disease as it is indicated by these tests to be equal to one in the year 1894, we see that one has grown to three in the year 1907, or 13 years later, and to seven in the year 1912, or after the passage of another 5 years, or from one to seven in the course of 18 years. At the present time I can say that repeated tests with guinea pigs of the milk distributed raw or unpasteurized in the District of Columbia by almost any large dairy which draws its supply from a number of different farms, sooner or later show that it is from time to time infected with abortion bacilli.

I would like to have it clearly understood, however, that I have not given these figures because I look upon them as reliable evidence to prove exactly how much abortion disease has multiplied in a given number of years in the United States or any portion of the United States. The figures are adequate data only, together with the gradually increased frequency with which abortion disease in cattle has been reported from year to year, to show that the growth of the evil is actual and not imaginary, and that some very real measures are imperatively required to check it.

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Now, having given this much attention to the occurrence and increasing frequency of contagious abortion disease in cattle in America, I will try to devote the remainder of my time to its cause.

The bacillus of infectious abortion in cattle, the abortion bacillus of Bang, is a short, non-motile, at times almost coccus-like rod. There are peculiarities about its growth on artificial media under laboratory conditions, its reaction with various stains, etc., to which I will give no special attention, because those who are interested in the subject will have little trouble to find elaborate and detailed published accounts.

In many respects the bacillus is a very remarkable organism. In cows, as we know, it causes abortions, but it does not seem able to maintain itself anywhere in their bodies but their udders and pregnant uteri. In the udder of a cow it may persist for years and contaminate her milk without affecting her health in any determinable way. In guinea pigs it is less commonly an agent which induces abortions, but is a cause of vast, destructive changes in their livers, spleens, kidneys, testicles, bones, etc.[4] In rabbits it is claimed to cause abortions and is capable of maintaining itself in their bodies for long periods of time without causing macroscopic lesions. It is capable of living weeks and months in the bodies of such widely different species of animals as monkeys, pigeons, rabbits, rats, mice, guinea pigs and cattle,[5] and in the bodies of children it causes bio-chemic changes which can be detected by agglutination and complement fixation tests.[6] Whether the bacillus is economically important as a cause of abortions among other species of animals than cattle, I am unable to say, but inclined to doubt.

Among the various special tests for abortion disease two have proved satisfactory, the complement fixation and the agglutination tests. The former is too complex for general use and the latter relatively simple and equally reliable. These tests do not prove that a cow has aborted or is going to abort; they simply prove that a cow is infected or is not infected with abortion bacilli.

The abortion disease investigations which are being made at the Experiment Station of the Bureau of Animal Industry by Dr. W. E. Cotton and myself, have proved, among other things, that some cows which have never aborted and which do not subsequently abort may expel abortion bacilli from their

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bodies with their milk, and that all cows which expel abortion bacilli with their milk react positively with the agglutination test, and that the agglutinating substance is present both in the blood and the milk of such cows. This is strong evidence to prove that a cow which has never aborted and seems to be absolutely healthy in every respect may be the cause through which abortion disease is unconsciously transported from one locality to another, or from an infected herd, either directly or indirectly, into a previously uninfected herd. It suggests strongly that the owners of herds of cows which have not been invaded by abortion disease should permit no new cows to enter their herds until an agglutination test has proved them free from infection.

But the mistake must not be made to rely on the agglutination test in selecting bulls. At the Experiment Station we have tested a number of bulls which had been used for varying periods of time to serve infected cows, and only two of these bulls reacted positively, and they were two which Cotton and I had given subcutaneous injections of abortion bacilli suspended in normal salt solution. It seems that abortion bacilli rarely get into the bodies of male cattle in a way that causes modifications which can be detected by any means we have at our command, but nevertheless bulls may play a very important part in the transference of abortion bacilli from cow to cow. It is easily conceivable that abortion bacilli may be deposited on the male organ of copulation, and when this is retracted into its sheath, find an environment in which they can multiply, strictly exterior to the body, and remain alive and virulent indefinitely. How important this mechanical part the bull may play in the dissemination of abortion disease is may be judged from the following observations made by Cotton and myself in studying three questions, namely, the persistence of abortion bacilli in the uteri and vaginae of cows after abortion; the possible appearance of abortion bacilli in the uteri and vaginae of infected cows during periods of oestrum, and the possible recrudescence of abortion bacilli in the uteri and placentae of cows at normal parturitions subsequent to abortions.

We found that the infected condition of the uterus and vagina of a cow after an abortion may persist as long as 7 to 8 weeks. This is in close harmony with the observations of McFadyean and Stockman, who established a period of about 30 days. Our tests, which are as yet far from complete, have

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failed thus far to show a reappearance of abortion bacilli in the uteri and vaginae of infected cows at periods of oestrum, but, concerning the recrudescence of abortion bacilli in the uteri, vaginae and placentae of cows at seemingly normal parturitions which follow abortions, of 13 tests so far made 6 were positive. We also found that this recrudescence of abortion bacilli is not limited to normal parturitions immediately subsequent to abortions; our records show that it may occur as late as the third normal parturition following an abortion.

We may well ask what chance, under these conditions, has the bull who is used to serve infected cows to escape becoming, himself infected but unaffected, a mechanical agent for the dissemination of abortion disease? And this should be taken, with good reason, as a sound argument against neighborhood bulls, and against the use of bulls in uninfected herds to serve a miscellaneous lot of cows that do not belong to his herd.

It is not difficult to see when we review the known facts about infectious abortion disease of cattle and the remarkable bacillus which is its primary, essential cause, why the disease has become widespread and strongly established in the United States. The fact alone that a large proportion of the cows which are attacked by the disease become and indefinitely remain carriers of its specific bacillus, a bacillus which is pathogenic in different ways for widely different species of animals, brings with it problems not easily solved.

Our methods of buying and selling cattle, our insufficient appreciation and use of modern tests to guard our herds against contamination through the introduction into them of seemingly healthy carriers of disease germs, our methods of permitting contact between animals at stock shows without first proving them free from contagious diseases, etc., together with other evils urgently need reforming.

I do not like to leave this subject without saying a few words in conclusion about the significance of the bacillus of infectious abortion as a parasitic organism which may attack human health. No proved disease germ is of commoner occurrence in cow's milk, and though no one has determined that it is truly pathogenic for human bodies, I do not believe that human health should be exposed to it. I believed at one time that it might be responsible in children for adenoid proliferations and tonsular troubles, because of the peculiar character of some lesions it causes in experiment animals, but Cotton

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and I, on the one hand, and Mohler and Traum, on the other, were unable to prove this to be the case by testing a large number of diseased tonsils and many samples of adenoid tissue removed from the throats and noses of children by local surgeons and kindly presented to us, although Mohler and Traum found that the diseased tonsil of one child in their series of cases was infected with abortion bacilli.

Two years ago I presented a paper to the American Veterinary Medical Association on the relation of the abortion bacillus to the production of pure milk, from which I wish to quote one paragraph, as I believe it states concisely how we should regard the preventable exposure of human health to bacteria generally, irrespective of their occurrence in milk or other articles of food or elsewhere.

The paragraph is as follows:

"We may say, relative to the bacteria against which human health should be guarded, that it is questionable whether exposure to a bacterium pathogenic for any species of mammals can be practiced with impunity; that it is dangerous to permit exposure to any bacterium that is pathogenic for several species of mammals, though it may be, so far as we are informed, harmless for human beings, and that it is a deliberate invitation to disease to permit exposure to a bacterium, like the abortion bacillus, which is pathogenic for widely different species of mammals and is known to cause changes in human bodies that can be detected by complement fixation, agglutination or other biochemic tests or tests of any kind."

It is only necessary to add that pasteurization, which we need to protect our health against a variety of thoroughly proved milk-borne evils, kills abortion bacilli in milk.

[1]The Pathology of Infectious Diseases, Moore, Third Edition, Revised and Enlarged, 1908, p. 525.
[2]Veterinary Medicine, Law, Third Edition, 1912, Vol. IV, pages 473 to 477.
[3]MacNeal & Kerr, Journal Infectious Diseases, Vol. 7, 1910.
[4]Schroeder & Cotton, B. A. I., Circular No. 216.
[5]Fabyan, Journal Med. Research, Vol. XXXVIII, No. 1.
[6]Sedgwick & Larson, Amer. Jour. Dis. Children, Vol. 10, No. 3.

"There is one optimistic viewpoint, and that is, as proper pasteurization becomes more universal, we are going to have fewer and fewer tales to tell about milk as a carrier of human disease."—Henderson.

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THE SIGNIFICANCE OF BACTERIA IN MILK.

L. A. Rogers, Dairy Division, B. A. I., U. S. Department of Agriculture.

Bacteria in milk may be considered from three distinct standpoints. We have first the effect of the bacteria on the consumers of the milk; in other words, the milk as a carrier of diseases.

Viewed more from the economic side we may consider the bacteria as they affect the milk itself, making it more or less palatable and consequently more or less valuable as an article of commerce. Neither of these aspects come strictly within the scope of my title, and I will confine myself to a consideration of bacteria as an indication of the way in which the milk has been handled.

We have for years drawn deductions from the bacterial count sometimes specifying with great detail the conditions which produced the bacterial picture shown on the plates. But bacteriology is still a very young science. Rapid advance in our general knowledge of the subject, constantly changing technique and frequent discoveries of unexplored fields make it advisable to stop occasionally to take account of stock. It is necessary now and then to study our methods and the deductions we are in the habit of making to see if they are in accord with the sound science of the time.

The use of bacteria as an indicator of pollution is based largely on the assumption that they are associated with dirt, and that their number in milk is in some ratio with the amount of filth which finds its way into milk.

Carrying this a little farther we look upon certain bacteria as indicating contamination with dirt from a certain definite source.

The bacteriological examination of water, for instance, is based on the hypothesis that bacteria giving certain reactions have their habitat exclusively in the intestines of warm-blooded animals, and consequently their presence in water is good evidence that the water has been polluted with sewage. Similar methods have been applied to milk work, particularly with the colon bacillus and the streptococci.

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Examined critically, we find that this hypothesis rests on two assumptions. It is assumed that we can determine a bacterial species, family or group, with reasonable accuracy and by the use of rather simple and easy methods.

It is very questionable if the present condition of systematic bacteriology will warrant us in adhering too closely to such a position. Much of our knowledge of bacterial groups is based on descriptions of insignificant characters and observations on a few cultures only. Systematic bacteriology would be better off if much of the knowledge obtained in this way could be discarded and forgotten. It should be said, however, that the usual tests as applied in water work are supposed to establish certain facts with a high degree of probability and that long experience has proved the soundness of this presumption.

Our second assumption is that the bacterial groups which our tests are supposed to establish are limited under natural conditions to a sharply circumscribed habitat, and here again we find ourselves standing on a very shaky foundation.

It is very reasonable to suppose that bacteria by long growth in certain conditions gradually acquire characters which fit them for those particular conditions and in course of time when these characters become fixed a group is established in which the individuals are related by a certain combination of characters which at the same time separate them from other bacteria. Numerous instances of the association of a particular type of bacteria with a certain habitat could be cited; but like conditions produce like results and our Sherlock Holmes deductions may be upset by the possibility of bacteria developing similar characters under conditions which may seem dissimilar and which have not been considered.

The formation of gas by the fermentation of sugar is the outward evidence of a very fundamental physiological phenomenon, which many distinct types of bacteria have acquired. Some of these groups of similar bacteria have been sufficiently studied to enable us to recognize them with reasonable accuracy. They may be found in milk and so far as we are familiar with their natural habitat they will give us an indication of the way in which the milk has been contaminated.

While we speak of milk bacteria and in many ways have treated bacteria isolated from dairy products as a class of bacteria by themselves, it is doubtful if there are any bacteria

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which are peculiar to milk in the sense in which we have a soil bacteriology. Many very definite types of bacteria live and multiply in the soil and are found elsewhere only as contaminations, but all, or nearly all, of the bacteria found in milk are the result of the addition to the milk of extraneous material carrying bacteria.

It is possible that a few types of bacteria have become adapted to growth in milk and are carried from one lot to another until they may be considered to have their habitat in milk. These are undoubtedly the exception, and if our knowledge was sufficiently complete we could trace practically all of the bacterial types found in milk to extraneous sources.

We cannot at the present time make any definite statement about the relative importance of different sources of bacteria, but the more obvious ones may be discussed with some assurance.

The interior of the udder must be considered as a source of bacterial infection. With some cows the number found in the fresh milk is very low, indeed, perhaps zero, but in others it may reach serious proportions.

The flora of the udder is limited to comparatively few species which may be peculiar to the udder, although the more common types are closely related to bacteria found elsewhere. Among these are the streptococci which occur in the normal udder more frequently than is generally supposed. The separation of the streptococci into species is a much debated question at the present time. It is evident, however, that the udder streptococci have some characters which separate them from the streptococci of the mouth, the intestines, sour milk and other sources, and which link them with the pathogenic type usually described as Streptococcus pyogenes. While this is the particular variety usually found in suppurations, it may not necessarily follow that the presence of this type in the udder is an indication of a diseased condition. It is constantly associated with mastitis, but is also found in udders in which there is no physical evidence of inflammation.

The organism most commonly present in the udder is a staphlococcus, a type which is also closely associated with pus formation. The udder staphlococci, however, seem to be near relatives of the chromogenic cocci parasitic on the skin and do not necessarily indicate any abnormal condition of the udder.

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A third group of bacteria which recent investigations have shown to occur not infrequently in the normal udder are demonstrated only by resorting to unusual methods. These are bacilli of the B. abortus group. The fact that this organism occurs in milk has been demonstrated by animal inoculations and serum reactions and very recently by direct plating. The latter method has shown that the bacillus of contagious abortion, or at least a very closely related variety, occurs in the fresh milk of many cows, frequently in large numbers. Anything I might say in regard to the effect of taking large numbers of these bacteria into the system would be purely conjecture, but it is clear that milk collected under the most approved conditions and which, by the accepted methods, gives a low bacterial count may really contain many thousand bacteria of the bacillus abortus type.

Included in the bacteria which fall with particles of dirt from the skin of the cow we would probably find typical soil bacteria. Bacteria which may be of this type are frequently found in milk, especially in milk which has been held at low temperatures, in which they produce an alkaline fermentation.

The cow manure which, unfortunately, too often finds its way into milk is the origin of two characteristic organisms, the fecal streptococci and the much discussed bacillus coli. The streptococci of the intestines have some characters which distinguish them from those of the udder, but the entire group is in such confusion that no hard and fast lines can be drawn. It is highly probable, however, that the intestinal streptococci are a distinct variety.

The colon group has always been held to include all bacteria which show certain characters, although it must be said that the boundaries of the group have never been absolutely fixed.

On the assumption that the habitat of the group was the intestines of warm-blooded animals, it has been held that the isolation from milk or water of cultures giving the characteristic group reactions was *prima facie* evidence that the milk or water in question was contaminated with fecal matter. Recent investigations have shown that the premise on which this conclusion rests is not entirely correct. The bovine digestive tract is the habitat of a variety of the colon group possessing very distinctive characters, but in addition to this variety there is a considerable number of other varieties also responding to the

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group reactions, but which may be sharply differentiated from the bovine type by proper tests. These non-fecal varieties seem to have a wide distribution in nature. The isolation of the fecal type of colon from milk, which is not a difficult matter, is strong presumptive evidence of contamination with manure but the mere demonstration of organisms giving the colon group reactions is not, so far as we know, of especial significance.

The air of the stable and the milk house is a source of bacterial contamination, but the ultimate source of the dust particles which carry the bacteria is so various that it is very doubtful if any definite type of bacteria could be said to be carried in this way.

No doubt the colon and probably streptococci are carried from the dust of the barnyard and driveways. Colon-like organisms are almost always on grains, and the dust of the feed room would convey them to the milk utensils. The milk utensils themselves are no doubt a source of bacterial infection, and if some of the recent work is correct, a serious source of infection. Here, again, it is not likely that any particular type is introduced into the milk by this means. The air dust may infect the utensils or they may be contaminated by milk which is diluted but not sterilized by wash water.

The milk count, however, is not expected to show in detail the source of the contamination. All we can expect of the routine analysis is an indication of the conditions under which the milk is collected and transported. In other words, is there a correlation between the bacterial count and the condition of the barn? This question is complicated by the unknown factor of bacterial multiplication between the stables and the time of sampling. How much of a high count is due to original contamination and how much to multiplication? I know of no results which give a satisfactory answer to this question.

It is reasonable to expect that more bacteria would be found in milk produced under insanitary conditions, but we know that in many cases milk with a remarkably low count is secured in barns that are far from ideal. Is it possible that we have put too much emphasis on some factors and neglected others which are more essential? We are finding also that the amount of visible dirt in milk is not a criterion of the number of bacteria. Is this because some kinds of dirt carry much larger numbers of bacteria than others?

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It suggests at least that in inspection work we may have to distinguish between measures to reduce the bacterial count and measures in the interest of decency and cleanliness. We do not insist on a clean bakery because we want the bacteria in the bread reduced, but because we want our food produced in a clean place.

The rapidly increasing use of pasteurization has complicated the application of the bacterial count to milk control. We are frequently asked what the bacterial standard for pasteurized milk should be, a question which can be answered readily only by those who have never studied the problem.

A percentage of reduction standard is not feasible because this is dependent on the number and nature of the bacteria in the raw milk. With a large initial number we may get a high percentage of reduction with a comparatively large number surviving; with a small initial number we may have a low percentage of reduction but a small number surviving. The destruction of the colon bacillus has been used as a measure of efficient pasteurization, but it has been shown that a few cells may survive the approved temperature. The number is so small, however, that they would probably not be detected under ordinary circumstances unless they had had an opportunity to multiply in the milk after pasteurization.

An absolute numerical standard is not fair because the number surviving will vary with the number and nature of the bacteria in the raw milk. In the last analysis, it is obviously unfair to proscribe a method of pasteurization and then held the milk dealer responsible for the results. The solution is to be found, perhaps, in rigid supervision of pasteurization with the bacterial count as a control.

Finally, the value of the bacteriological examination of milk is dependent on the accuracy with which the count is made, and we shall do well to scrutinize very carefully the technique which we are using. Bacteriology has been developed not as a pure science but as an adjunct to other branches, by the physicians on one side and the chemists on the other, while the systematic botanists added an occasional dash of confusion. Some methods have become fixed not so much because there is a good reason for their existence as because they have been handed down to us.

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The milk dealers have changed their attitude toward bacterial control very distinctly in the last few years. We can increase and retain this confidence only by deserving it and to deserve it we must have our methods beyond question. If there are any errors they should be removed by the bacteriologists before they are forced to by pressure from the outside. A position founded on an error cannot be long maintained, no matter how many committees report or influential societies pass resolutions.

I do not want to close this paper leaving the impression that I have little confidence in the bacterial count as a means of controlling the sanitary condition of milk. On the contrary, in producing milk for use in our laboratories we have found the bacterial count to respond to changes in methods of handling in a way which has made it invaluable.

I only wish to emphasize the desirability of rigid research in order that we may have a much more accurate knowledge of the channels through which bacteria find their way into the milk and the methods of determining their numbers accurately so that we may use the bacterial count more intelligently than we have in the past.

"It does not now become a man of science to doubt the possibility of anything."—Lord Kelvin.

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THE WORK OF THE AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS IN ITS RELATION TO A BETTER MILK SUPPLY.

PROF. W. A. STOCKING, Dairy Department, Cornell University, Ithaca, N. Y.

In discussing the work of the agricultural colleges and experiment stations in their relation to dairy inspection, it is scarcely worth while to enumerate to the members of this association the particular types of work which have been conducted by the various stations or the results which have been obtained. You are already familiar with these facts through your knowledge of the station and college publications. You are also familiar with the part which such men as Lane, Pearson, Trueman, Whitaker and many others "too numerous to mention," have played in this field of dairy work. To such men as these we are indebted for the formulation of our dairy score card, the subsequent development of which has been due chiefly to college and station men, since it has been under the direct supervision of the Dairy Instructors Association, made up of the members of the various dairy departments in the colleges and stations (including the U. S. Dairy Division). I do not, therefore, intend to take your time for a discussion of the work *done* by the colleges and stations, but rather to point out very briefly a few of the ways in which they may be of service in this field of dairy work.

FUNCTION OF THE STATIONS.

The chief function of the experiment stations is to find out new facts and present them to the public. It is then for the dairy inspector to make use of these facts and prove their value or uselessness in practical work.

When the score card was first formulated, it consisted of a long series of items, the real or relative value of which was largely unknown. The station men are making a careful study of these items, and gradually, but steadily, the score card is being transformed into a guide which has for its component

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parts items bearing some relative numerical value in relation to the producing and handling of clean milk. Many of these values are still far from the truth, but progress is being made, and the colleges and stations are of service in establishing what are the essential and non-essential factors in the production and handling of clean milk.

I regret that the results of some recent investigations have been interpreted as showing that there is no relation between the dairy scores and the cleanliness of the milk produced. That there are striking irregularities has long been recognized, and many of you will remember that I called this fact to the attention of the members of this organization at your first annual meeting in Milwaukee, in 1912. It is, indeed, true that too much faith has frequently been placed on the farm score, but with all its faults it has been of great value, and is still of value, as an educational force, and should not be discarded until we have something better to take its place. In the hands of the *trained* inspector, and between rather wide limits, the score is very useful as a measure of conditions of production where the factors of *time* and *temperature* are not involved. Liberality and judgment must be used in its interpretation.

IMPORTANCE OF MEN.

I am sure, we all agree that the greatest factor in milk inspection is the personality of the inspector. A few years ago our city officials did not appreciate the real importance of this factor and employed men without special training or fitness for their work. We are all gratified to see the change which has taken place and recognize the fact that at the present time men of high type are being placed in charge of our dairy inspection.

One of the functions of the agricultural colleges is to train men for this line of work, and it is now recognized that satisfactory dairy inspection cannot be done as a mere routine matter, but calls for the exercise of intelligence and keen judgment which can come only as the result of thorough scientific training and experience. The milk inspector must be a man of broad vision and sympathies, seeing at all times the problems and welfare of the producer, the dealer and the consumer.

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This organization and the dairy interests of the country are to be congratulated upon the group of men who are now directing dairy inspection work in connection with the milk supply of our cities.

MORE DEFINITE KNOWLEDGE NEEDED.

With our increase in knowledge regarding the conditions which affect the quality of milk, we have been obliged to change our attitude toward dairy inspection and the use of the score card. Instead of adhering rigidly to a large number of items, we are coming to give more attention to general principles and less attention to minor details. Each year gives us new knowledge. Our dairy inspection work is in a state of continuous and rather rapid evolution.

For some years we have worked on the assumption that the bacteria content is the final measure of the sanitary quality of milk, and we have relied on the plate count to give us this information. The recent work in New York City, under the direction of Professor Conn, has shown us the inaccuracy and unreliability of these counts in so far as the real germ content of any lot of milk is represented by a *single* count. We should not, however, lose faith in the bacteria content as an indicator of the conditions surrounding the production and handling of milk. But what this work does show us is that extreme liberality must be used in the interpretation of the plate count, and that it can be depended upon only between wide limits for setting definite bacterial standards until such time as we have a means of determining the germ content of milk with greater accuracy. We look to the experiment stations for help in this problem.

LIMITS OF REFORM.

In any campaign for improvement or reform, it is natural that its advocates should desire to carry results to the highest possible point. This commendable spirit has been prominent in our milk work, yet we must not overlook the fact that there are limits beyond which reform and improvement cannot be carried. In our milk work these limits are fixed by two factors: First, the economics of milk production, and second, the cost of food products to the consumer. It is a well recognized

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fact that the present position of the milk producer is not an easy one. With the high cost of all necessities in connection with milk production, the margin of profit to the farmer is, in most cases, extremely small, and it is an economic impossibility for him to materially increase his cost of production. He must have a margin of profit or he must quit the business

In the case of certified milk, a limited number of consumers are willing to pay a sufficient price to make possible its production, but in the case of our ordinary market milk the public has not yet reached the point where it is willing to pay a price which will justify or make possible its production under more expensive methods than are now used by the average milk producer. If we insist that market milk be produced under conditions approaching those of certified milk, it is inevitable that the price to the producer and consumer must also approach prices for the certified product.

In all of our milk work, therefore, we should recognize these limiting factors and not attempt to push our methods to unattainable extremes. We must keep clearly in mind the fact that increase in cost of production inevitably means increase in cost to the consumer. Fortunately, however, it is possible to produce clean milk of low germ content without expensive methods or equipment, and one of the most important functions of the inspector is to show the producer how this can be done.

CHANGE IN SPIRIT OF OUR FOOD CONTROL.

In recent years a marked change has taken place in the inspection and supervision of our food products. Formerly the prime object of the inspector was to bring legal action against and impose a penalty upon every man who did not conform to the established ideals. Fortunately, this spirit has given place to one of helpfulness, and the prime object of the inspector now is to *assist* the producer and handler in so conducting his business that his product will be of the best quality.

In these days the man who *takes pride* in the persecution, or even the prosecution, of the milk producer should be removed from milk inspection and transferred to the local police force, where by nature he belongs. Not that prosecutions must not be made, but they should be only as the last resort, and not as the prime object sought.

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RESULTS OBTAINABLE FROM NEW METHODS.

Perhaps I can best illustrate the results which may be obtained where the work is conducted in a spirit of helpfulness rather than of prosecution by giving you briefly some of the results obtained in connection with the milk supply of Ithaca, New York, where the work has been carried on by members of the Dairy Department of the College of Agriculture, under the direction of the City Board of Health.

RESULTS OF MILK INSPECTION IN ITHACA.

	1907	1914
Number of producers	98	124
Number of dealers	34	17
Average bacteria count	760,250	142,860
Per cent samples below 10,000 per c. c.	10.59	48.0
Per cent samples 10,000 to 50,000	47.01	31.0
Per cent samples 50,000 to 100,000	19.20	8.0
Per cent samples over 100,000	23.20	13.0
No. dairies scoring 75% or better, 1914	29, or 23.77%	
No. dairies scoring between 60% and 75%	55, or 45.09%	
No. dairies scoring between 40% and 60%	34, or 27.87%	
No. dairies scoring less than 40%	4, or 3.27%	

The number of producers and equipment used in 1907 and 1914 is as follows:

	1907	1914
Producers	98	124
Small-top pails	4	60
Milk houses	31	62
Damp cloth	1	12

During all this period it has been the purpose of the inspectors to give as much assistance as possible, both to producers and dealers, and during this time only one dealer has been fined for non-compliance with the health requirements, and one producer's milk excluded from the market because of bad conditions at the farm.

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It seems fair to say, therefore, that the improvements made here are the result of friendly cooperation and assistance, and equally good results should be obtainable in other places of similar size.

DISCUSSION.

DR. MALONEY. Did Professor Stocking have any definite data as to any willingness of the public to pay a reasonable price for a good milk?

PROFESSOR STOCKING. I do not know of any such data gotten out by the experiment stations.

DR. MALONEY. My purpose in asking the question is that in so many papers presented that item is made much of. In my own experience the opposite has been true. I am rather convinced that the public has not anything to do with it, that the price is raised or lowered by the dealer, and the public has not expressed itself.

MR. J. S. ABBOTT, Washington. I would like to know if there happens to be any one in the audience who knows of any organized effort on the part of milk producers or dealers to advertise the real food value of milk. I have reference to particular communities. For instance, a town of 50,000 inhabitants; do you know of any organized efforts in the people of such towns to advertise the value of milk as a food? I have been interested in the economic aspects of the question. To my mind, the reference to that by the gentleman who has just read the paper is the most important aspect of the whole milk proposition.

My experience as Food and Drug Commissioner of Texas is that the public is not willing to pay the price for good, clean milk, and it occurs to me that there is an opportunity in that direction for some good educational work. By the comparative value of milk as a food, I do not simply mean the relative cost of the proteids of milk, and the fat and the carbohydrates and the mineral elements as compared in quantity with those of meat and bread and other products, but I mean the real value of milk as a food, aside from the quantitative value of these different food elements, or the value of these different milk elements over the value of the same general classifications of food elements of other food supplies. I think there is a

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value there that has never been touched upon, and I have been wondering if there ever had been an effort to advertise milk as a food beyond the common efforts of advertising food values, which I do not think are accurate at all, although apparently they are accepted.

MR. PURRINGTON. I have had a little experience along that line. We got an act passed by our legislature giving us power to make regulations for inspected milk, and those producers that we license are given the right to use the cap with the name of the State of New Hampshire on it. They send us out around the State talking to all sorts of societies, women's clubs, medical societies, church organizations, and one of the things we talk about and lay considerable stress on is what inspected milk is, and I know for a positive fact that people that are making inspected milk are not losing customers. They all have increased their herds, and most of their stables are filled to full capacity.

PRESIDENT HENDERSON. We have special days we call Apple Days, and the newspapers and women's clubs and civic organizations display apples, talk of apples and eat apples. We have also Raisin Days, proclaimed by the governors of some States. Why not have a Milk Day, and put before the public the advantages and food values of clean milk. Let us have one big Milk Day! I cannot see why we cannot inaugurate a Milk Day and explain to the public the value of milk as a food.

"I have less and less sympathy with the argument that if the dairyman is to produce good, pure products, he must be paid something extra for them. That may be a necessary starting point, but the whole way will never be traveled until the dairymen produce good products, because they feel that they would be lowering themselves in the estimation of their fellowmen if they offered their neighbors anything less than pure, clean, wholesome products, and thus sacrificing something within themselves that no money could buy."—E. H. Webster.

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METHODS EMPLOYED IN IMPROVING THE MILK SUPPLY OF THE CITY OF MONTREAL, CANADA.

DR. RENE G. MAYOTTE, Chief, Milk and Dairy Farms Inspection Service.

MILK AND ITS INSPECTION.

Cow's milk is very generally used as a human food, and is especially useful as a food for the adult during various diseases and for the child that cannot be nursed by its mother. It is a complete food, on the condition that it be of good quality and kept in a good state of preservation.

Milk is the most perishable of all foods, and it too often carries pathogenic germs together with its nourishing constituents. As is well known, causes of infection are very numerous. Thus, under various circumstances, milk may transmit tuberculosis, cholera, typhoid fever, scarlet fever, infantile diarrhoea and many other diseases. This should not, however, prevent, nor even restrict, the use of such a precious food, because this inconvenience can be overcome by the practice of the rules of hygiene.

Ever since it became scientifically known that milk could keep and carry pathogenic germs, a simple and radical method was adopted. Milk being often infected and heat destroying, in more or less time, all the living germs, it is possible to protect the people from all kinds of infections by boiling, or by sterilization, or by carefully pasteurizing. Do not give raw milk; boil it; such is the advice since nearly thirty years.

This practice is perfectly judicious and it is a well known fact that it has rendered important services. It is not, however, an ideal method, for the infants as well as for the sick people; some stomachs that may not agree with sterilized milk or even cannot support it will digest raw milk without difficulty.

It is extremely desirable that the trade should offer to the public a milk that can be consumed in a raw state, while precluding all risks of infection. But producers and distributers of milk are very often negligent and ignorant of these facts. For this reason there has been instituted in the Department of

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Hygiene a special organization charged with teaching producers and distributers how they can prevent bad practices which are a danger to public health.

This organization is composed of twelve inspectors (two of whom are veterinary surgeons) and a secretary. The inspectors are divided in two staffs, one for the inspection in the country and the other for the inspection in the city. This inspection is made in virtue of the by-laws of the Board of Health of the Province of Quebec and of the Public Health Act.

INSPECTION IN THE COUNTRY.

Methods.

The inspector visits the dairies, stables, cow sheds, situated outside of the city limits, and if they are found to be maintained against the by-laws of the Provincial Board of Hygiene, he notifies in writing the owner to discontinue the sale and distribution of milk from his dairy until the by-laws are complied with.

In order to ascertain what progress has been made and to find out whether the system is efficient, a register was established by the means of an individual score card on which are entered all the details which may have an influence on the quality of the milk, each detail being awarded a number of points which varies according to its importance. The total possible score is 100 points.

This card is called "Dairy Score Card"; it is made in triplicate by the inspector during his visit, one copy being left to the producer, the second being sent to the office of the Inspection of Milk and Dairies, at the City Hall, and the third being delivered to the milkman (merchant or distributer) who buys his milk from this producer.

On the third part of the Score Card, the inspector enters: 1. The name of the producer; 2. the parish where he lives; 3. the name of the county; 4. whether he sells milk or cream; 5. the names of the shipping and receiving depots and the hour of the train; 6. the number of the cows and their breed; 7. the quantity of milk or of cream produced every day.

The second part is divided into ten sections, to each of which a maximum of ten points may be allotted.

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1. *Health of the Cattle.*

The utmost importance should be given to the test of milk cows with tuberculin. If the cows have been successfully tested with tuberculin, 8 points are awarded. The producer who wishes to be sure that none of his animals is affected with tuberculosis should submit them to the tuberculin test at least once a year. If, from their physical appearance, the cows seem to be in good health, though they have not been tested with tuberculin, 2 points only are awarded.

2. *Food.*

All the milk producers ought to obtain the maximum of points, because the milk cows give no profits unless well fed and well kept. The inspector ascertains whether the food given to the cows is of good quality; he gives a special attention to the quality of the water and makes sure that it is not polluted by manure.

3. *Cleanliness of the Cattle.*

It is useless to try and produce a wholesome milk with a good taste and a good smell unless the cows be cleanly kept. The inspector recommends clipping. It is not necessary to clip the whole body; the clipping of the hind part, that is, the external and internal faces of the thighs, of the udder and especially of the sides of the body is ordinarily sufficient.

4. *Light.*

In order to keep the animals clean and in good health, the stables must have windows. The by-laws of the Provincial Board of Hygiene require that the farmers put in their stables windows whose total glass area must be equal to one-tenth of the floor area. To get the maximum points, the farmer must have four square feet of glass for each animal. Mr. Grisdale, of the Ottawa Experimental Farm, in his report for 1913 and in Bulletin 72, recommends a greater abundance of light. He has built a stable in which the total glass area is of 19½ feet per cow.

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5. *Construction and Localization of the Stable.*

The stable should be built on high ground whenever possible and should have a great number of windows with a cement floor. The ceiling should be made in closely jointed boards and preferably doubled with an air loft.

6. *Hygiene of the Stable.*

This is paramount in view of the production of the milk, because it is impossible to have wholesome milk in a dirty stable. The inspector demands that all stables be whitewashed at least once a year.

7. *Cleanliness of the Stable Yard.*

The stable yard shall always be clean, because it often surrounds the dairy where are the cans and all the utensils used for handling the milk. In a well-drained yard no manure water will ever be seen.

8. *The Dairy.*

The dairy is indispensable and requires the most careful attention. In it are kept the cans, the vases, milking pails, strainers, etc. Where there is no dairy, the utensils are placed anywhere, on a fence post, on the well pump, where they are exposed to dust, flies, etc.

9. *Milking.*

The preservation of milk depends on the sanitary state of the stable and on the handling of the milk. Milk is influenced by many external conditions; its taste varies with the food consumed by the cattle and its smell with the smells of the stable and of the dairy. Decomposed organic matter, manure and manure water give rise to ammonia which saturates, in summer as well as in winter, the atmosphere of badly kept, insufficiently ventilated and rarely drained stables.

Cleanliness in milking is absolutely necessary. Milk procured under good conditions and coming from a healthy cow contains but few or even no microbes. It is fairly aseptic and may be kept for a long time without being altered. Nearly all the micro-organisms found in it have been brought there accidentally. Some come from the lower part of the ducts of

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the nipples and are brought out with the first drops of milk; others come from dirty matter adhering to the udder; some come from the hands and the clothes of the cow-keeper or from the utensils.

The vases must be carefully washed with lukewarm water, then with boiling water, or better still, steamed, then dried in a place where the air is pure from all kinds of dust.

The following points must be observed:

1. Don't milk the cows during their meal. 2. Before milking, wash the nipples with lukewarm water, then dry them with a clean towel. 3. The first four or five gushes of milk must not be drawn in the pail. 4. Use only utensils when thoroughly clean. 5. Milk the cows in the field rather than in the stable during the summer. 6. Filter the milk after milking.

10. *Cooling the Milk.*

A great many farmers seem unable to understand the importance of cooling the milk immediately after milking.

The milk may be cooled at the same time as it is aerated, but aeration, to be efficient, must be made in pure air, away from all dusts; otherwise it would be more noxious than useful.

Cold does not improve the quality of milk; it does not kill bacteria, it only prevents them from growing. Methods of cooling are numerous and vary according to the means at the disposal of each person. A very good method, and a comparatively cheap one, is a cement basin filled with water and ice. Immediately after milking, milk is poured in cans which are afterwards placed in the iced water. But the water in the basin must come higher than the milk in the can, otherwise there will be in the upper part of the can a certain quantity of milk which will not be cooled.

The milk sold in the city of Montreal and coming from the neighboring country is brought in by railway companies, by boat and in vehicles; it is from a few hours to two days old.

INSPECTION IN THE CITY.

When the cans are taken down from the cars, the boats, or the vehicles, the inspector takes a sample of the milk for bacteriological analysis; he then examines the milk to see how

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clean it is with a special instrument called Lacto-Sedimentator.

If the milk is dirty, it will be colored red with a special dye and sent back to the producer, who may use it to feed his pigs. In the larger distributing establishments, milk is filtered or is freed from the impure matter it may contain by centrifugal force, with a special instrument called Clarifier. These methods do not allow us to appreciate the bacteriological condition of the milk, but they help to show how clean it is and give an idea of its probable bacteriological condition.

This method is also useful, because it educates the producers in helping to show to them the impurities contained in the milk coming from their establishments.

The milk is then tested organoleptically. A food, to be beneficent and to bring about an abundant secretion of the digestive juices, must be pleasing to the taste and must have a good smell. Even when clean, the milk may be of a doubtful quality which we will notice through the senses. This test will make known to us the abnormal tastes of the milk caused by the food given to the cow.

The third test consists in finding the degree of acidity in milk by the means of the Acidimeter. Milk containing 2-10 of one per cent of acidity should be immediately returned to the producer.

The analyses made by the inspector consist of an examination for the quantity of fat and the percentage of water. If, for certain reasons, it is desired to have a more thorough analysis, the sample will be sent to the Municipal Laboratories to be analyzed either chemically or bacteriologically.

The samples of milk for analysis are collected in the morning, the afternoon being reserved for the inspection of dairies, groceries, dining rooms and restaurants. The inspector uses score cards especially drafted for each kind of establishment. For the milkman the score card is made in two parts.

FIRST PART.

The first part concerns the sanitary state of the establishment and of the utensils used; it is divided in five sections, the total of points being fifty.

Situation of the Establishment.—The establishment must be situated so as to be protected from all contamination. It must

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be at a distance of at least twenty feet from a stable, if the proprietor wishes to get the maximum of five points.

Construction and Ventilation.—The maximum of twelve points will be awarded only if the milkman sees that the floors are well made, tight, clean, that the ceiling and walls are in good order and painted in white.

Light.—A dark establishment is not sanitary. The window area must equal at least ten per cent of the floor area, to get the maximum of ten points from the inspector.

Installation.—The milkman who wishes to get the maximum of five points shall see that his dairy is divided as follows:

A room or separate space for the reception or delivery of milk; a special room for cooling and pasteurizing the milk; a room for the cleaning of the utensils and another for the handling of the milk.

Apparatus.—The machinery needed in a modern establishment consists of an apparatus for washing and drying the cans, another for bottling and capping the bottles, a clarifier and a good pasteurizer. The maximum is eighteen points.

SECOND PART.

The second part of the score card shows what methods are employed and how the establishment is maintained. It is divided in five sections with a maximum of fifty points.

Cleanliness of the Establishment.—Five points will be awarded to the owner who maintains in a good state of cleanliness the floors, walls and ceilings of the dairy, who sees that the windows and openings are covered with fly nets during the whole summer.

Cleanliness of the Apparatus.—To be awarded all his points, the milkman shall wash the apparatus employed in the handling of the milk with clean hot water and afterwards shall sterilize them with steam.

Handling of the Milk.—This being of paramount importance, a maximum of twenty-five points is awarded to the milkman who conforms himself to all the demands in this section. Pasteurization alone is awarded fifteen points.

Storing and Delivery.—No result will be obtained, even with the most careful handling, if proper attention is not given to the storing and delivery. Thus, pasteurization is useless if

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the milk is not kept at a low temperature. Milk must always be kept at a temperature not higher than 45 degrees F.

The delivery of milk in bottles is the only method to be recommended. By looking at the bottom of the bottle, the consumer may see if the milk is clean and does not leave any deposit. By looking at it sideways, he may see if the milk is rich in fatty matter by the thickness of the layer of cream in the neck of the bottle.

INSPECTION OF THE PRODUCER'S ESTABLISHMENT.

At first thought, it would seem that this section should belong to the farmer's score card, but it really belongs here, and it is put after the other paragraphs to force the person who receives milk to buy only from a farm controlled by the Milk and Dairy Inspection Division. By obeying this order, the milkman earns five points.

As there are many merchants, besides those who make it a specialty, who sell milk, it has been found advisable to draft another score card for them. The card is in duplicate, a copy being left by the inspector to the proprietor of the establishment and the other being kept at the Department of Health.

The score card used for the groceries, restaurants and dining rooms is divided into eight paragraphs or sections.

The first four sections concern the ice-chest. Thirty points are awarded to the proprietor who has a special ice chest where there is nothing else but milk, butter and cream. Ten points only are awarded to the one who keeps milk, butter and cream in a special compartment of an ice chest where other foodstuffs or eatables are kept. Five points are awarded for a clean ice chest.

The fifth paragraph concerns the utensils, such as vases, measures, etc. The inspector will award five points if the utensils are very clean, and also five points if they are protected from flies and dust.

The sixth and seventh paragraphs concern pasteurization. If the milk and cream sold in an establishment are pasteurized, the merchant gets ten points. This is a means of forcing the grocers, restaurant keepers and owners of dining rooms to give their orders only to sellers of pasteurized products.

The eighth paragraph relates to handling, the maximum of

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points being twenty. It obliges the grocer or other merchants to buy only bottled milk. For this ten points are awarded, and besides ten more points may be awarded if the inspector ascertains that milk or cream is kept at a temperature not exceeding 50 degrees F.

The organization in force will enable us to gradually improve everywhere the quality of the milk. Such an improvement must of necessity be gradual, but we may be assured, by perfecting our methods of control and counting on the zeal and devotion of our staff already much encouraged by the efforts of a great many producers and merchants, that, in the near future, the milk sold in Montreal may be compared favorably with the milk sold in the other great cities.

The inspection must very often completely reform the practices already in use; this is the difficult part of our work.

The public must also be educated, they must be made to understand that the preservation of health necessitates the consumption of wholesome foods of a good quality. The population of Montreal, knowing that they can always get information from us on the quality of the milk sold to them, will become accustomed to ask for our advice, and the time will come when the dirty and dishonest milkman will have lost all his customers.

I know that we will find help and encouragement among veterinarians and physicians. I am glad to say that our staff understand the work entrusted to them, that they give themselves to it body and soul, and that we hope in success, thanks to the support and the competence of our Medical Officer of Health.

"The good already accomplished by the exchange of ideas, the brotherly feeling toward our fellow members, bespeak for our association a place in the world's work."—Steffen.

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SOME OF THE METHODS EMPLOYED BY THE DEPARTMENT OF MILK INSPECTION, SOMERVILLE, MASS.

HERBERT E. BOWMAN, Ph. G., Inspector of Milk.

Somerville, Massachusetts, is a suburb of Boston, with a population of about 83,000. There are 517 stores and 72 peddlers distributing milk, which is produced at about seven thousand dairies. The milk from all these dairies does not come to Somerville every day, as part is delivered through neighboring cities, but it all goes into a general supply in the case of the contractors and may come to our city any day.

This milk is received at four railroad receiving stations, and one or two dealers ship in from the country by motor truck. The work of collecting samples, inspecting stores, receiving stations, etc., scoring milk plants and dairies, testing samples for visible dirt, making laboratory tests, both chemical and bacteriological, taking temperatures from the wagons and receiving stations is carried on by the inspector and one assistant.

In 1914 there were 2,278 samples of milk and ice cream examined in the laboratory. This year there will be between 3,500 and 4,000. We are trying to enforce twenty-one milk rules and regulations which were recommended by the Massachusetts Association of Boards of Health about five years ago, a copy of which was mailed to each local board in the State at that time, as it was felt that uniform regulations would materially improve conditions.

Many of the cities and towns have since adopted them with very few changes. The original draft contained 19 regulations, and we have since added two more.

One has to do with the selling of milk in sealed containers *only*, except when it is to be consumed upon the premises, and the other to bottling milk in any but regularly licensed places. In addition to this each peddler was notified last year that his license would not be renewed unless his milk room was equipped with steam, with suitable arrangements for properly sterilizing all milk utensils. As a result of this ruling, about thirty of the peddlers added between three and four hundred dollars' worth of machinery to their equipment, and we now feel that our milk plants are in very good condition and ready to meet

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any emergency. The average score is 64.73, using the United States score card for city milk plants.

By putting in steam when they did, many dealers have been able this year to add a pasteurizer at a nominal expense. Last year about 60 per cent of the twenty-two thousand odd quarts consumed daily was pasteurized, and this year at least 80 per cent is being pasteurized. We have in Massachusetts a new law requiring that local boards of health issue a permit to each dairy producing milk to be consumed in their respective cities or towns, as the case may be; also each local board is required to notify the State Department of Health of any producer's permit revoked, and then it is up to the State department to see that this milk is not used until produced in a sanitary manner. There is no provision, however, for the producer who has never had a permit and whose milk you wish to exclude.

Last year one of your speakers conceded that inspected milk might be possible for a village or even a small city, whose wants could be supplied by a few herds; but when the community grows beyond the power of the immediate country to furnish it with milk, almost all hope of an inspected supply is lost. Any inspector will find this is true who attempts to make headway with one assistant in a city whose supply comes from over 7,000 dairies. In my department we are devoting our time to the dairies whose milk is sold raw, as I believe the pasteurized milk is at least safe.

During the five years I have been inspector of milk we have had three serious epidemics traceable to the milk supply. Two were scarlet fever and the other typhoid. The first scarlet fever occurred on the route of a contractor who was not pasteurizing, and, in fact, was an active opponent to the process. He immediately installed a pasteurizer, and I believe now has one of the most up-to-date plants in the country.

The second epidemic was also scarlet fever and occurred on the route of a small dealer. We resorted to pasteurization immediately, and made a canvass of the dairies supplying him. At one place a child was ill with the disease and the woman caring for the patient was washing strainer cloths and milk utensils in the next room. The milk from this place was immediately excluded.

The third epidemic was typhoid and on the route of a peddler who was also a producer. There were 16 cases in Somerville,

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40 cases in the city of X, and 3 cases in the town of Y. Thirty-five of the cases in the city of X. had been reported before any appeared in Somerville. On the next day after, six cases came to our notice. In company with the Medical Inspector of the Board, the dairy was visited. Samples of blood were taken from each person coming in contact with the milk or utensils. On examination in our laboratory the same afternoon a positive Widal was obtained from one of the milkers. The man was immediately isolated, a steam boiler installed the same afternoon and the milk pasteurized before delivery the next morning. This controlled the epidemic. Later a positive reaction was obtained from the feces and urine of this man. The State Board of Health commended our promptness and method of suppressing this outbreak.

For the past five years the birth rate has been steadily increasing, as has also the death rate from all causes of infants under one year of age. The deaths under one year from enteric diseases have steadily decreased, the last year showing a cut over five years ago of 33 1-3 per cent.

Pasteurization of milk is increasing in importance each year in the solution of the milk problem, and I thoroughly believe that all large cities whose milk areas include several thousand dairies will be forced to adopt *pasteurization* as the only means of properly safeguarding the health of their citizens.

"There is a larger recognition than ever before of the fact that the future of the State depends upon the child of today."

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THE FIGHT FOR DAIRY INSPECTION.

MAX J. COLTON, *Health Officer,* Cumberland, Md.

When your secretary wrote and asked me to prepare a short paper on some phase of dairy inspection that had impressed me most during the year, I wanted to write and tell him that I could make it a very short paper, only two words—no inspection. We have only reached the stage where we are discussing the necessity of milk and dairy inspection. Not that the Department of Health does not consider this work necessary, but because there was enough pressure brought to bear by one newspaper and enough foolish arguments brought forth by the editor of that paper to induce at least part of the city fathers to withhold their consent for the establishment of dairy inspection.

Inasmuch as we are not engaged in regular dairy inspection, I shall give you a brief outline of what the Department of Health has done and is doing towards attaining that end. Cumberland, with a population of slightly over 25,000, secures its milk supply from 250 different producers. This means that every dairyman produces enough milk to supply 100 persons, or about twenty families.

The State of Maryland appropriates $2,000 yearly for dairy inspection. The money is divided equally among the different counties, and a worthy farmer politician is appointed for each county with a salary of $100 per year. You may judge for yourself as to what he accomplishes during the year.

Before the adoption of the Commission Form of Government in Cumberland in 1910, usually about $100 was appropriated yearly for health purposes. Since then the amount has steadily increased, and we are now receiving $4,500. Ever since the inception of the Health Department in 1910, it has stood for milk and dairy inspection, but it has been an uphill fight to convince a group of men who know nothing whatever about the subject that they should appropriate the money necessary to improve something that was good enough for their grandfathers.

However, early last spring a milk ordinance was adopted, with the hope that when the yearly budget was made up money would be allowed for the appointment of a dairy inspector.

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At this point of the game one of the local newspapers secured fame by opposing this "new-fangled idea" on the grounds that the price of milk would be advanced beyond the reach of the poor, that the city could not afford to spend money for something that had never necessitated any expenditure before, and that there were many more important(?) matters for which the money should be expended. The arguments and pleadings of the Health Department and others interested in clean milk were of no avail. They succeeded in convincing those who had the say so in not allowing this needless(?) expense. They are happy again, inasmuch as they can continue to publish obituary notices of children who die for the want of clean milk.

This, in brief, is the story of the fight for dairy inspection in Cumberland. Though it has not taken long to tell you about it, it has really taken five long years to pass a milk ordinance and to reach the point where all that is necessary is the appointment of a man to carry out the ordinance that was adopted.

Though we have not been successful in securing a dairy inspector, we have been examining our milk supply in the laboratory. We were rather fortunate in securing a laboratory with a full-time chemist and bacteriologist in charge. Through these means we are trying to keep a check on the milk supply, although I must admit that we have not been very successful so far. Educational meetings for the dairymen have been held from time to time with good results. At a meeting in which over one hundred dairymen participated, a resolution was adopted calling on the mayor and city council to appoint a dairy inspector. Many producers are alive to the necessity of clean milk and are exercising their energies towards attaining that end. Unfortunately, this group is in the minority and the rest must yet be shown.

"It takes more educational power to stop a man from doing what he has always been doing than to take a new man and train him up."—Wiley.

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UNIFORMITY OF STANDARDS.

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

Information recently collected from the different States regarding their standards for dairy products indicates that there has been a gradual tendency toward uniformity. This uniformity is noted in the following percentages of fat required in milk:

1 State	requires 2.5	per cent.
11 States	require 3.0	per cent.
3 States	require 3.2	per cent.
22 States	require 3.25	per cent.
1 State	requires 3.35	per cent.
4 States	require 3.5	per cent.
Total... 42	(including District of Columbia). Seven States reported no standard.	

These figures show that 22, or about one-half of the States reporting a standard, require not less than 3.25 per cent of fat in milk, which is also the U. S. Government standard. I think we are safe in saying that there has been, and is a gradual tendency toward uniformity of standards between the States and between the States and Federal Government. Other standards for dairy products besides the fat in milk show this same tendency.

According to my information on this subject, this uniformity of standards does not exist between cities to as great extent as it should. Some cities adopt their state standards, but many have independent ones. Would it not be better if all cities in a State had the same standard, and every State in the Union the same standard as the Government?

The present remarkable lack of uniformity between cities is shown in the following figures.

Three hundred and eleven cities reported in 1914 that they had the following standards for fat in milk:

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3	cities required	2.5	per cent.
122	cities required	3.0	per cent.
8	cities required	3.2	per cent.
61	cities required	3.25	per cent.
1	city required	3.3	per cent.
38	cities required	3.35	per cent.
6	cities required	3.4	per cent.
57	cities required	3.5	per cent.
2	cities required	3.6	per cent.
4	cities required	3.7	per cent.
1	city required	3.8	per cent.
6	cities required	4.0	per cent.
1	city required	4.5	per cent.
1	city required	4.85	per cent.

These figures show that no one of the above standards was in force in even a majority of the cities reporting. (This data was principally collected from cities having 10,000 or more population.)

The following figures collected from 167 cities give the following as the maximum number of bacteria permitted per c. c.:

2	cities permitted	5,000	per c. c.
1	city permitted	10,000	per c. c.
1	city permitted	15,000	per c. c.
3	cities permitted	20,000	per c. c.
5	cities permitted	50,000	per c. c.
1	city permitted	80,000	per c. c.
33	cities permitted	100,000	per c. c.
4	cities permitted	150,000	per c. c.
15	cities permitted	200,000	per c. c.
4	cities permitted	250,000	per c. c.
15	cities permitted	300,000	per c. c.
1	city permitted	350,000	per c. c.
2	cities permitted	400,000	per c. c.
77	cities permitted	500,000	per c. c.
3	cities permitted	1,000,000	per c. c.

A glance will be enough to convince any one that requirements should be much more uniform. The size of the city, age and temperature of the milk as received, local conditions, etc., are factors which have to be considered in determining a

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bacteria standard. I believe that it would be possible to have fewer and more uniform requirements that will be adaptable for cities of different classes, thereby simplifying and decreasing the confusion regarding standards now in use.

We again note remarkable variations in temperature requirements for milk as delivered to the consumer. Two hundred and fifteen cities reported the following temperature standards:

2 cities require milk cooled to 40° F. or lower.
1 city requires milk cooled to 45° F. or lower.
106 cities require milk cooled to 50° F. or lower.
1 city requires milk cooled to 52° F. or lower.
22 cities require milk cooled to 55° F. or lower.
2 cities require milk cooled to 58° F. or lower.
66 cities require milk cooled to 60° F. or lower.
7 cities require milk cooled to 65° F. or lower.
8 cities require milk cooled to 70° F. or lower.

The location of a city in respect to availability of ice, transportation, etc., has some effect on the temperature requirement that can be enforced. On the other hand, bacteria grow in warm milk whether in one city or another; therefore, why could not a maximum temperature standard be established that would be applicable to all or a majority of cities?

Some cities require a farm to score a certain number of points, yet there seems to be no universal requirement. Out of 104 cities reporting such a minimum score, the following figures were obtained:

1 city required a score of 30 points.
1 city required a score of 38 points.
7 cities required a score of 40 points.
3 cities required a score of 45 points.
1 city required a score of 47 points.
14 cities required a score of 50 points.
1 city required a score of 55 points.
40 cities required a score of 60 points.
10 cities required a score of 65 points.
1 city required a score of 68 points.
16 cities required a score of 70 points.
1 city required a score of 72 points.

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6 cities required a score of 75 points.
2 cities required a score of 80 points.

These figures bring up the question: Why should the sanitary requirements or score for a dairy farm to sell milk in one city be placed at 30 points, and at 80 points in another?

These figures have been given to show the trend toward uniformity of standards and the need of more uniformity. I see no real reason why 2.5 per cent fat for milk in one city should be legal and a nearby city require 3.25, yet these conditions exist. I believe the chemical standards can and should be made uniform throughout the United States. In regard to the bacteriological and sanitary standards, it may be doubtful if one standard could be enforced in all cities; however, I believe a few standards could cover the whole situation and thus simplify things materially. As conditions now exist, many cities are mere dumping grounds for inferior dairy products because they have no standards, or their standards are too low. Such a number of standards for fat in milk, farm score, temperature, bacteria per c. c., etc., as are now used by our cities tends to cause confusion and suspicion between all concerned in the milk situation. The time should quickly come when the requirements of the U. S. Government, the States and cities shall be as nearly uniform as possible. This association and its members should be the leaders in trying to bring about this much to be desired condition.

"Reform directed toward the advancement of public health must ever take precedence of all others."—Disraeli.

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THE DAIRY INSPECTOR.

J. A. GAMBLE, Dairy Division, B. A. I., U. S. Department of Agriculture.

For best results it seems necessary that the dairy inspector should be a man of training, ability and enthusiasm, one so qualified that intuitively men who love the dairy cow will recognize his worth and wish him for a friend. A brief review of the milk situation now facing our centers of population will convince one that decided improvement in our milk supply may most readily come through a system of inspection which more fully cooperates with and assists dairymen, and which so educates the general public to the value of pure milk that the better product secured will be better appreciated in a financial way. Without such appreciation on the part of the public no system of milk inspection, however competent, can hope to provide permanently a better supply.

It would seem that aside from the fear of contracting diseases from its use, the public is principally concerned in having its supply contain a goodly portion of butter fat and be sold at a price not higher, but perhaps a little lower than that paid by their neighbor. They even expect the milk dealer who delivers a quart of milk for 8 or 9 cents to donate with it a glass bottle, which costs him 4 cents. Those dealers catering to such a demand naturally purchase milk where they can buy for the least, this in turn compelling dairymen to produce the cheapest and *least cared for* supply. It would seem that if the future prosperity of our dairymen and the permanent improvement in our supply is to be secured, we must assist them to lower the cost of production by raising the average production of each member of their herds. We must help them to arrange their plants so that the work can be done with the least possible amount of labor, as well as to produce and handle milk so it will be most free from impurities.

Indeed, here, apparently, is the point at which the burden now resting on the milk industry can be lifted with the least effort. While dairymen are fairly conversant with what constitutes good milk, raising the average production of their herds 1,000 pounds of milk per cow per year seems as yet a matter too difficult to attain. We have a new race of cows

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every five or six years, and every year the number of herds in the country giving an average of over 7,000 pounds of milk has increased rapidly, yet in many States the general average remains very nearly the same.

From the foregoing we can gather something of the needs of the milk industry, and the qualifications the supervisor should possess if he is to make much impression upon the situation he is called upon to improve. That part of the dairy industry which caters to the milk supplies of cities and towns is capitalized at many millions of dollars and should have as its official supervisors men well qualified for the important work awaiting them.

The successful milk inspector of today is not necessarily the successful inspector of tomorrow unless he reads and follows the signs of progress.

In speaking of quality in milk, it can hardly be successfully argued that milk from a healthy cow, by whatever adjective best described when it reaches the consumer, be it certified, inspected, high-grade market, low-grade market, grade A, B, C or D, was not milk which met the exacting requirements of certified when the cow gave it. If it has fallen below that high standard it is not the fault of the cow, but of man, and conditions over which he has almost complete control. The man who cares for the cow and her product is the chief factor to be reached and interested if better milk is to be secured. "On him must inspectors rely for results and cities and towns for pure milk."

The dairy inspector of the future must be a man to whom the general public can look for information, and whose teachings in regard to milk they can accept. Such educational work must go hand in hand with dairy and milk improvement, for each is essential to the other. Without proper financial appreciation the production of better milk will not be a sound business undertaking, and any improvement secured will be only temporary.

A review of the work in cities where real progress in improving the milk supply has been secured would lead one to believe that such improvement was very largely brought about by the cooperation of producer, dealer and consumer. The situation calls for well trained milk and dairy inspectors, inspectors who can bring about improvements in milk produc-

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tion on dairy farms and prove to the satisfaction of both producer and consumer that the adoption of modern methods of production, transportation and distribution fosters the dairy industry, preserves the purity of the product, and makes the work worth while.

"There is no better index of the state of civilization of a community than the manner in which it approaches its public health problems."

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DETROIT'S EXPERIENCE IN ENFORCING COMPULSORY PASTEURIZATION OF ITS MILK SUPPLY.

E. C. KREHL, Chief Milk Inspector, Detroit Board of Health.

Last November, on the recommendation of the Health Officer, the Detroit Board of Health passed the following order:

That on and after May 1, 1915, no milk shall be sold in the city of Detroit (except Certified and Class "A") which has not been pasteurized.

Investigation of causes of typhoid fever in Detroit, for the year previous to the passing of the above order, showed that 14.8 per cent of the cases found were traceable directly to infected raw milk, and in no case could typhoid be traced to a dealer selling pasteurized milk.

Also, previous to the passing of the above order, a survey was made of the milk plants where milk was being pasteurized, and of all dealers who were handling pasteurized milk. A detailed study was made of the various types of pasteurizing apparatus used, their efficiency determined, and the methods employed in handling the milk after it was pasteurized.

This survey showed 158 milk plants handling milk both raw and pasteurized; of these, twenty-four plants were pasteurizing milk by the following methods:

Five plants were using the flash method of pasteurizing.

Nineteen plants were using the holding method.

Forty-four plants were buying pasteurized milk in bulk from some pasteurizing plant and bottling it themselves. Bacteria examinations of milk handled in this manner showed bacteria counts, in most cases, higher than the raw milk before being pasteurized, and in all cases higher than the plants where milk was pasteurized and bottled at one place.

Milk from the plants using the flash method also showed much higher bacteria counts than that pasteurized by the holding method.

Plants using the automatic temperature controls and recording thermometers showed better results than those not using these methods of control.

Plants using the vat systems of pasteurizing got more uniform results than those using continuous systems.

Ninety-one plants bottled raw milk, handling from forty

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gallons to fifteen hundred gallons per day. Very few of these plants had steam boilers, but were otherwise equipped with automatic gas hot water heaters.

Having this knowledge of what was actually being done at all these plants, the following rules and regulations were adopted for the proper control of pasteurization:

"That pasteurization of milk shall be performed by a process whereby every portion of the milk is raised to a temperature of 145 degrees F. and retained at that temperature for a period of 25 minutes by the holding process, and no other process shall be adopted or used, and immediately thereafter cooled to a temperature below 50 degrees F.

"That no pasteurizing equipment shall be used that is not approved by the Detroit Board of Health.

"That each pasteurizing apparatus shall be equipped with a time and temperature recording apparatus approved by the Board of Health. The records shall be filed at the pasteurizing plant and mailed to the Detroit Board of Health Thursday of each week.

"That all pasteurized milk shall be plainly marked on each bottle cap or other container in which such milk is delivered to consumers, with a label bearing the inscription, 'Pasteurized Milk.'

"That pasteurized milk shall contain not more than 100,000 non-pathogenic colonies of bacteria per c. c. in samples taken from containers being delivered to consumers.

"That immediately after the process of pasteurization and cooling, the milk must be put into the final container.

"That milk shall not be pasteurized more than once.

"That pasteurized milk shall be delivered to the consumer not later than 24 hours after pasteurization.

"That all cream and skim milk shall be pasteurized, or made from pasteurized milk.

"That buttermilk shall be made from milk or cream pasteurized before churning."

The order to pasteurize having been passed by the Board and the above rules and regulations adopted, the question was, how could the order be carried into effect without causing a turmoil among the dealers who were handling pasteurized milk bought in bulk and those handling raw milk, especially those handling less than fifty gallons per day.

This order was not published immediately after it was

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passed. Instead, the larger and better class of dealers who would be affected by the new ruling were first apprised of the action of the Board, and the reasons why it was necessary that the milk supply of large cities be pasteurized given. The smaller dealers were then notified as fast as the inspectors could get around, which was about three weeks. By this time, one of our larger newspapers heard what was in the air and a reporter was sent to the Health Department for an interview with the Health Officer regarding the new ruling. The facts and reasons for compulsory pasteurization were gladly given, and this interview was published the next day. This, of course, brought the question to an issue. It was expected that there would be some opposition, and there was on the part of a few dealers.

A general meeting of all the milk dealers was called by the president of the Milk Dealers' Association, and the Health Officer and Chief Milk Inspector were invited to the meeting to discuss the necessity of pasteurization and the regulations for its control.

Fortunately, there were three pasteurizing plants who had made it a business to supply small dealers with pasteurized milk in bulk, and we had the assurance of these plants that they would enlarge and put in equipment to bottle pasteurized milk for small dealers at a nominal cost, so that it would not be necessary for them to go out of business. Knowing this, it was not a difficult matter to show these dealers that they would be better off, in that they would be able to get a good, safe, uniform product, all ready for delivery, at a price which would leave them a fair profit; and that it would also relieve them of the long hours necessary to wash bottles and other utensils and then bottle milk and deliver the same, and that the carrying of any overhead expense, except that of maintaining a suitable horse and wagon, would be eliminated.

Along with this we had the assurance of the larger raw milk dealers that they would willingly put in pasteurizing apparatus.

Then, to facilitate matters, all dealers were given the assurance that they would be given a square deal, and that if the City Milk Inspection Division could be of any service in the matter of drawing plans and giving any other information which would help them in equipping their plants for the change, it would be glad to do so; and good use was made of this service by the dealers to the satisfaction of all.

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The owners of a few plants who were either erecting new buildings or were making extensive alterations and were unable to comply with the order by the first of May were given extensions in time until their plants were completed. By August 1, all were pasteurizing.

Only two dealers went out of business rather than pasteurize or handle pasteurized milk.

A survey of conditions since compulsory pasteurization has gone into effect shows:

Sixty-six milk plants equipped with pasteurizing and bottling apparatus.

Fifty-eight dealers are buying bottled pasteurized milk.

Six new companies were formed by a combination of from two to five dealers.

Ten plants use continuous system.

Fifty-six plants use vat system.

All milk is pasteurized according to the holding method.

Some trouble has been experienced with certain dealers in getting them to submit their pasteurizing record charts regularly, but this difficulty is gradually being overcome. These charts are being carefully examined each week and checked against the pasteurizing plant, all irregularities being noted, and the dealers are shown their mistakes, when mistakes occur, by personal visits of the inspector. It has taken some longer than others to learn the new way of doing things. To date, it has been necessary to revoke the permit of but one dealer who thought he could get away with selling some raw milk without our knowing it.

The following table shows the improvement in bacteria counts of milk being distributed for the months of July, August and September previous to the enforcement of the pasteurizing order, and for the same three months after the order went into effect:

Bacteria Counts of Milk Distributed.

Month	Per cent below 50,000		Per cent below 100,000		Per cent below 500,000		Per cent above 500,000	
	1914	1915	1914	1915	1914	1915	1914	1915
July	13.6	30.3	17.8	55.0	29.8	83.9	70.2	16.1
August . . .	16.2	35.4	24.4	59.3	44.3	86.6	55.6	13.3
September.	10.6	42.9	19.0	50.0	38.6	77.6	61.4	22.4

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COOPERATION.

HARRY S. MESLOH, Chief Dairy Inspector for State of Ohio, Columbus.

The principal agent tending to the development and promotion of efficient results in milk and dairy production has been *cooperation.*

In the fullest sense of the word, its policy has been extended whenever and wherever opportunity justified its existence. Considerable progress has been made during the past year. The milk supply has improved in quality, both sanitarily and chemically. Our campaign for better cream is in full swing. While the scope of inspection on cream production for butter is larger than can be met, yet by our system of cooperation with creamerymen and dairymen good results are obtained through moral suasion.

An improved quality of butter was a natural consequence and largely due to one of the movements in this campaign, which was termed "Cool Your Cream."

Few epidemics were experienced during the past year. In all cases the hand of cooperation between State and city authorities provided a strong check upon them.

To sum up, we have had excellent results in the advancement of the work of dairy inspection in this State during the past year, and this success must, in a large measure, be attributed to friendly cooperation of all concerned.

"Education, cooperation, and good will should manifest themselves in all of our efforts in behalf of better milk supplies."

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THE SUPERVISION OF PASTEURIZING DAIRIES.

WM. P. PALMER, Chief Dairy Inspector, Baltimore, Md.

In presenting this paper I assume that the appropriate thing to do is to begin with a description of the apparatus used in conducting the work, and then to follow it up with a discussion of the work accomplished.

The apparatus used was as follows:

1st. A recording thermometer used in determining the temperature of the milk from the heater.

2d. A smaller recording thermometer used in recording the temperature of milk during storage.

3rd. A collecting case, of which a somewhat detailed description is necessary. The case is essentially a wooden box lined with cork 1½ inches thick. It is divided into two major compartments, one of which is completely surrounded by the cork and used in the holding and refrigeration of the collected samples. The other is used as a supply compartment containing the unused sterile test tubes and towels.

In front of this second compartment is a manila envelope containing a sterile test tube used in the collection of milk samples. This piece of apparatus is a novelty in the collection of sterile samples, and was got up by Mr. Siegmund, the Supervisor of Pasteurizing Dairies.

The test tube which is enclosed in the envelope is one that is commonly found in the laboratory. Attached to this tube is a telescoping rod, which, when contracted, fits close to the side of the tube. In this form the tube is tightly stoppered with a raw cotton plug and enclosed in the envelope, the whole then being sterilized at 150 degrees Centigrade for a period of one hour.

In the collection of samples the upper portion of the envelope is torn off, allowing the handle of the telescoping rod and the cotton stopper to be grasped with one hand and the lower portion to be held in the other hand. The rod and cotton plug having been withdrawn from the envelope, the hinge at the junction of the rod and test tube permits the tube being used in any position from a vertical to a horizontal one.

The examination of the efficiency of the pasteurizing process is based on five primary steps: The determination of the tem-

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perature of pasteurization; the temperature of cooling; the temperature of storage refrigeration; the bacterial count of the raw and pasteurized milk; and finally, the bacteriological count on the empty bottles directly before being filled. With these five steps conducted concurrently, one is in a position to determine quite accurately the errors in the process.

In conjunction with this work an inspector goes to the pasteurizing dairies and collects, in sterile bottles, samples of the milk before and after pasteurization. The following day samples are taken from the delivery wagon on the street, which represents approximately the same milk that was sampled at the plant and enables us to determine the rise in bacteria, if any, between the time of pasteurization and delivery to the consumer.

This method has proved very efficient in determining the cause of the high counts and by the use of it, together with the cooperation of the dairymen, we have been able not only to get additional and better apparatus in many of the dairies and a great reduction in the bacteria in pasteurized milk, but have shown the dairymen that we are helping them instead of being against them.

"If the dairy industry is ever to be profitable—and I hope it will be—it must stand the test of time and criticism and the approval of the consumer."—Dr. Harvey W. Wiley.

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MILK INSPECTION IN SMALL COMMUNITIES.

WALLACE F. PURRINGTON, Inspector, New Hampshire State Board of Health.

Much has been said, and a great deal written, about the production, transportation and subsequent distribution of city milk supplies; but the small community problem, while not so complex, also has many difficult factors.

In the average small town, production and distribution are usually carried on by the same person, who handles the output of from six to twenty-five cows.

The six-cow man is more often poorly equipped to conduct the business properly, his barn more often poorly lighted, dirty and not well ventilated; the equipment of his milk room, most often the family kitchen, is of the crudest, consisting of a kettle of hot water and a dish pan. It is in such a place that the milk business is only a side issue, and the product, which requires such careful handling, is treated without the first knowledge of the laws of sanitation. Here it would be impracticable, of course, to suggest pasteurization.

A good part of the population of this country is situated in villages and towns, and the carrying out of the milk laws in many States is in the hands of local health officers, who, by reason of occupation or environment, are wholly unprepared to solve such a complex problem as milk inspection. The duty of providing clean milk in these places obviously devolves upon some State department.

In New Hampshire this matter rests with the State Board of Health, and I wish to show, in a few words, the method that we are taking to accomplish our ends.

First, there are two things to be considered: Results and expense. If we can produce milk of a bacteria count around 50,000 in a tie-up that is whitewashed once a year, where the cows are kept free from clinging manure and dirt, and the milk is cooled by ice in summer, and the utensils are subjected to the action of boiling water or steam, have we, as inspectors, a right to demand that there shall be no cellars for the keeping of manure under the tie-up? Ought we to insist that there be 4 square feet of light per cow? Or should we say that the milk house must be 50 or 100 feet from the tie-up?

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I believe that the State, through its agents, has no right to come to a farm and *order* definite construction of any kind.

For the small community, the usual bacteria limit is too high. One hundred thousand is plenty high enough, for the milk usually is not over twelve hours old, and the supply of ice, especially in the northern States, is no great problem.

If a man is producing milk with less than 100,000 bacteria and his premises are kept reasonably clean, this should be our guide, and not the number of points on an arbitrary score card. As a matter of record, the score card has its uses; but for the sake of better milk, a statement in a local paper showing bacteria count, butter fat and solids and physical appearance is of greater importance to the public.

It should be the duty of the State department to confer with local health officers, to visit the farms and point out to the farmer any changes that might be made without too much expense.

The question of proper sterilizing and care of utensils will require the hardest work. We demand that all producers of milk retailing their own product shall supply themselves with equipment not only to wash their bottles with hot water, but the bottles must be immersed in boiling water or be subjected to live steam. This for the man with only a few bottles would require nothing more than a large wash boiler.

There are sterilizing equipments on our market that do not cost over $150.00, consisting of a 3½ horsepower boiler, steam turbine, sink and hood sterilizer, which takes care of the 100-200-quart men, and these are giving excellent satisfaction.

The method of inspection carried out by us is first to get the local health officer to visit, with our inspector, the milk plant, and then an order is given to the producer by the State inspector which, in general terms, demands a change. For instance, if it is a case of not properly cleaning bottles, the wording of the order is to this effect: "You are hereby ordered to subject your utensils to boiling water or steam each time after using." This is the form of written order, and it gives the inspector a chance to explain, without committing himself to any definite form of apparatus. Then, if the local officer reports that no action has been taken on the order, a registered letter is sent to the party from the office of the State Board of Health embodying about the same words. We are now in a position

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to go into court, and the only thing necessary to prove is the fact that the party is using methods which might, and in our opinion have, spread contagion.

If an order were given demanding that a definite type of apparatus be installed, a good lawyer would give the inspector a merry time in court. An order should be as indefinite as possible while still conveying the meaning to the producer, in order to make an easy time in court later. A report should be required from the local health officer from time to time.

The greatest problem, where pasteurization is manifestly impossible, is the one of tuberculosis in cattle. It has been estimated, and I think quite correctly, that 20 per cent of the cattle in New Hampshire have tuberculosis. We know that where children are concerned this is a serious matter. As yet the tuberculin testing of cattle has not become widespread.

The legislature of New Hampshire gave to the State Board of Health authority to make regulations for a grade of milk to be known as "Inspected Milk." The requirements for this grade of milk are, briefly:

1. Clean, whitewashed tie-ups.
2. Clean cattle.
3. Tuberculin test yearly.
4. Bacteria count not over 100,000.
5. A maximum temperature limit of 50° F.
6. Sterilization of utensils.

The men producing this milk are licensed, and are given the privilege of using on each bottle a cap bearing the words "Inspected Milk. Licensed under authority of the State Board of Health of New Hampshire," with the dealer's name and address. This license is renewed yearly, after the annual tuberculin test has been applied, and is held at the pleasure of the State Board of Health, or until revoked for cause. This milk sells for a cent a quart higher than ordinary milk. We have been following this plan for two years, and have twenty producers interested. The average bacteria count of 180 samples taken monthly has been 25,207.

This, I appreciate, is not the solution of the milk question, but it does this: It gives the doctor, the sick person or the baby, a milk of reasonably high grade, from tested cows, at a price which is not prohibitive. Milk, like apples, should be graded

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according to quality, and the small town is a most excellent field for carrying out such a system. It builds up the whole tone of business in that town. It gives a standard for the rest of the community to reach.

By allowing any one who will come up to the requirement the privilege of using the cap, the question of favoritism is eliminated, and the health officer can advise the public that most any milk in town *may* be all right, but that there are known facts about Inspected Milk.

Our experiment station, through its dairy department, with our cooperation, is making plans to find out what it actually costs to produce a quart of this milk. This plan will be carried out on ten of these farms. A man will visit each place once a month for a year. He will first make an inventory of the buildings, equipment and stock. Records will be kept of the cost of feed, labor, bottle loss, bad bills, depreciation of stock and equipment and loss due to tuberculin testing, milk production and such other details that are necessary in the business. Figures are available at present as to the cost of feed and production of milk; but the question of cost of handling and distribution in small communities has not been undertaken.

Milk inspection in small communities should not be undertaken without the active cooperation of the local health authorities. Often this is the hardest part of the problem. The better this can be developed, the greater the results. Much depends upon the personality of the inspector, who should treat the matter of milk inspection with conservatism, common sense and due regard for both results and expense.

DISCUSSION.

MR. PURCELL. Have you found a demand for the higher price milk?

MR. PURRINGTON. The towns are small; a city is five or six thousand with us. There is a chance for one good producer in each town. We are not trying to make all the farms inspected, but we are trying to put out a milk that a doctor can use with a fair degree of safety. We can get a limited supply at a slightly increased price. Inspected milk sells from 8 to 9 cents a quart.

"Public health is the foundation upon which rests the happiness of the people and the welfare of the State."—Disraeli.

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METHODS EMPLOYED IN SECURING A MILK REGULATION IN MANCHESTER, N. H.

CARL O. SEAMAN, *Milk Inspector.*

When I was asked to read a paper at this convention, I decided that perhaps a subject of some interest would be our experience in securing a law requiring milk to be retailed in bottles, or some package satisfactory to the Board of Health.

From the best information I have been able to procure, I find that Manchester, N. H., and thirteen other cities require by law that milk be sold in bottles.

Prior to July 2, 1912, milk was retailed in Manchester in a very primitive way. The grocer bought milk in eight and one-half quart cans and measured it out to his customers as called for. Some stores had dip tanks, others had urns, nickle-plated affairs with paddles turned by a crank to keep the cream mixed.

Milk peddlers measured out milk on the doorstep, in the street, in filthy kitchens, or in any old place, into pitchers, bottles, cans, dishes, pails, etc. Any kind of container was good enough for milk. Only a few dealers were putting out a part of their milk in bottles.

In talking over the matter with milk dealers and grocers I found a decided objection to any rule requiring milk to be sold in bottles.

We had in the city government two aldermen who were grocers and another whose son sold milk. Three out of ten aldermen against, and working to defeat, any such regulation. We tried to get it through twice and failed, therefore we decided to try some other means of passing a regulation.

The Board of Health holds a meeting every Tuesday, and at these meetings we ordered every grocer who violated any regulation or who handled milk in an insanitary manner to appear.

Some we found leaving the milk cans out of the refrigerator when business was rushing, some failed to put the stopper in the cans, some we found with dirty measures and dashers, with no facilities for sterilizing them, and some were selling milk a little below standard in butter-fat when a customer got the last quart in the can. Grocers objected if an inspector took a sample from anything but a full can. The dip tanks were dirty and milk from these tanks ran high in bacteria. Filter pads from

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dip tanks showed much foreign dirt, and the tin dippers were invariably washed in cold water, soap being used only when it was handy.

We had 42 grocers out of about 200 who were selling milk appear before the Board of Health at one time, and from 8 to 24 at other meetings. We showed them that the system of selling milk was wrong, that they could not handle milk in a sanitary manner selling from the measure. We questioned them about washing the measure and dasher and found that only two had facilities the year round for scalding them with boiling water, and these men had bake shops connected with their stores. You may be sure that the two aldermen were invited to appear with the 42 grocers, and were asked more than their share of questions.

We showed the grocers that the Board of Health had the power to grant or refuse the license to sell milk, and one of the requirements would be sterilization of the measure and dasher after each use; also each sample found below standard, even if it was the last pint in the can, meant a prosecution in police court.

After several of these meetings, or you might call them conferences, we prepared an amendment to the sanitary milk rules requiring all milk sold at retail to be put up in original packages, in some container satisfactory to the Board of Health. This was passed through the city government with hardly any opposition.

Since milk has been retailed in bottles we have no trouble with milk below standard, and the grocers and milk dealers most opposed to any changes say they would not return to the old system now if they had their choice.

"Improvement of public health increases the resources of the commonwealth."—Buffalo Sanitary Bulletin.

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LESSONS TO BE LEARNED FROM AN INSPECTION THAT FOLLOWS MILK FROM THE COW TO THE CONSUMER.

SAMUEL G. SHARWELL, Chief Inspector Foods and Drugs, Newark, N. J.

As a usual thing we inspect milk at the retailer's and wholesaler's.

We find that it is contaminated in a general way. We know the sources of contamination to be unclean methods, heat or other causes, but very rarely find out in a given case just how that contamination occurs. This is because we don't watch the milk from its source until the time it is sold.

This idea came to me very early in my career as an inspector, and I concluded to satisfy myself at first hand just when, where and how the milk of which I was given supervision received its contamination. I made arrangements with our largest wholesale milk dealer to visit a creamery of his. I chose Baldwinsville, N. Y., because it is the most distant point from which milk comes to Newark, and to inspect milk on its longest journey is to ascertain most of the sources by which it is contaminated.

The inspection began at four o'clock in the morning, in the cow barns at milking time. It followed the milk produced in four of these through the creamery into the milk train and on to Newark. I did not lose track of a single can until the milk had been distributed to the retailers in four different sections of the city and was mostly in the hands of the consumers.

Four different barns were visited before milking time was over, and in each case the process was observed with the utmost care. Three of these barns were above the average, scoring 65, 68 and 70 per cent, respectively. They were fairly clean and equipped with cement floors and drops. The methods of milking were not of the best. The cows were kept fairly clean, but washing or wiping the teats and udders and the use of small-mouth milking pails were unknown.

No milk house was thought necessary by the farmers in question. In two cases the milk was strained into the can in the barn, the can standing open until it was filled. In the other, the operation was performed out of doors. The fourth barn was

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below grade, scoring but 55 per cent. The floor was of concrete, but filthy, and the milkmen were dirty and milked in a dirty fashion. The yard was a manure muck.

The milk was strained on a platform beside the barn, and in this case by the side of the road. The black dirt on the straining cloth looked as though the milk had been kept alongside a railroad track, but the farmer explained that he was taking all the dirt out of the milk.

In none of the dairies were there any appliances for cooling the milk.

The farmer pays ten cents a can for having his milk carted to the creamery. He puts his milk on a platform alongside the road. When it reached the creamery on the day of this inspection the temperatures of the products of the different dairies were 88, 86, 86 and 84° F., respectively; almost forty degrees above the danger point.

On the arrival of the milk at the creamery, it was thrown can by can into the receiving vat, whence it flowed over a tubular cooler whose pipes were filled with continuously running cold water, and was caught below in its original can. It was then placed in a large concrete tank containing ice and properly cooled. As it was placed on the milk car the temperature was 50° F.

While the milk was properly cooled at the creamery, it was improperly handled. The aerator or cooler was in a room where can washing and cheese making were carried on and the doors and windows were unscreened. There was absolutely no precaution against contamination, and one need not be surprised to find that even at this early stage in its journey the milk had a high bacterial content.

As the four marked cans, one from each of the dairies above described, stood on the platform ready for their journey to Newark, the bacterial count was as follows:

A. 5,400,000.
B. 5,400,000.
C. 4,500,000.
D. 1,530,000.

The bacterial standard in Newark for raw milk is 100,000, and yet here was milk some of which was more than fifty times

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as polluted before it was placed on the train 340 miles away from ultimate delivery.

There are several points of difference between a Twentieth Century Limited and a milk train. But if one is following milk over the country he must ride with it. So I found myself in semi-darkness among the milk cans bumping southward over the Lackawanna tracks as speedily as such trains usually travel. In each end of the milk car was a rack for the ice, which is supposed to refrigerate the car.

These racks are filled at Chenango Forks after a round trip of 680 miles. There was not 50 pounds of ice in the racks when I started with the milk. The temperature was 50° F., owing, no doubt, to the coolness of the milk and the chunks of ice the creamery man placed on the cans. It gradually rose to 65° F., at which point it remained during most of the time while I was on the car.

The rack was filled at noon. As to how the new ice refrigerated the car it can only be said that when the milk reached Newark three cans were at a temperature of 56° F. and one 58° F.; all several degrees above the danger point. This accounts for another increase of bacteria:

A. 9,000,000.
B. 7,700,000.
C. 13,700,000.
D. 16,000,000.

At Binghamton, N. Y., I left the train for a limited, which brought me to Newark in time for the arrival of the milk train at midnight. Samples of the milk then showed the flourishing of bacteria in my absence, notwithstanding the refrigeration of the car. The counts had run up to the following figures:

A. 19,300,000.
B. 15,700,000.
C. 18,000,000.
D. 25,000,000.

That is to say, upon arriving in town six hours before it was placed on sale the milk was seventy times as dirty as the law permits.

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From the railroad milk station the four cans were taken to the four milk shops in different sections of the city. Here they were closely watched and samples taken when cans were half empty, and so show only an average bacteria content, as follows:

A. 19,900,000.
B. 34,000,000.
C. 75,000,000.
D. 68,000,000.

The milk here considered, as the inspection showed, was produced at average dairies, transported under ordinary conditions and sold in the usual way. It was the average "loose milk" of the grocery and delicatessen stores. Taking the average count of the four cans we find that as it left the creamery it had a bacterial content of 4,207,500 per cubic centimeter.

After seven hours in a refrigerated milk car it contained 11,600,000 bacteria to the c. c.

This grew to 19,500,000 before the milk was placed on sale.

In the process of selling it increased to the appalling figure of 49,375,000 per c. c.

This leaves a bacterial content of 4,207,500 for the dairy and creamery to explain, another of 15,392,000 for the railroad, still another of 29,875,000 for the retailer.

As the result of the tour which I have described and many similar ones which I have taken, I am of the firm opinion that:

1st. The inspection of dairies and creameries is necessary.

2d. Great importance should be ascribed to proper methods of transporting milk by rail.

3rd. The eye of the milk inspector should be fixed on the little store in which it is sold.

"The successful milk inspector of today is not necessarily the successful inspector of tomorrow unless he reads and follows the signs of progress."

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PROBLEMS OF SUPPLY AND DEMAND.

RUSSELL S. SMITH, Dairy Division, B. A. I., U. S. Department of Agriculture.

Within the last few years there has been a great deal of agitation relative to better dairy conditions. This has been greater in some sections than in others, but it has reached over the entire country. We know that this agitation is especially noticeable in our larger cities, where boards of health and milk commissions have laid down strict sanitary rules or requirements in an endeavor to get a safe milk, and to that extent protect the health of their communities. To the old-fashioned farmer these new rules that require new methods to be introduced seem unnecessary, and they are likely to be ignored until he finds that his market is destroyed unless he complies with the requirements. When he has to make a few changes sometimes, expensive to him, he naturally becomes discouraged, especially if he receives no more for his milk. It must not be expected that milk producers of this type will readily accede to the demands of health authorities and inspectors and change their customary way of doing things, all at once and without apparent reason. It is the small producers of the country that determine to a large degree the total supply, and while there may be much fault-finding and criticism of this class, it is not always best to ignore their demands for a fair trial and a just compensation.

We like to think of a dairying community as being composed of up-to-date barns with sanitary equipment, arrangement and methods in vogue. It is a lovely picture in the mind, but we must deal with the facts and endeavor to help the ordinary farmer with this milk-producing problem. Thorough understanding of the problems of the ordinary milk producer must be had if we are to attempt to reach him and receive from him improvements. Let us first go into the history of this present condition and understand why we find him as he is.

Born and brought up, no doubt, on the farm he now lives on, he has been subject to the conditions and practices that have been in vogue there for many years. When he was a boy, cows could be bought for from $35 to $65, and good ones, too. They never thought of keeping a bull or of raising calves; there were plenty of cows anywhere. Milk was plentiful, and when the

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semi-weekly cream man did not come butter was made from the sour cream. The cows were not cleaned, no clean suit was put on prior to milking, no covered pail was used, and the milk was sometimes strained in the barn. Warm milk and gingerbread was the supper-time relish, and, possibly, because of the ginger, the odor and taste of dirt in the milk was unheard of. On many of our dairy farms conditions similar to those just outlined exist at the present day, even though we are loath to admit it, and it is evident that we have a big problem ahead. For every model dairy in the country there are no doubt hundreds that have almost no redeeming feature, either in equipment, character of output, in arrangement or in management. Likewise, it is also true that for every story of tested herds, cement stables, sanitary milk houses and bottling plants, there might be other stories of diseased animals, poorly constructed barns, impure water, lack of care and ignorant methods.

One might say that this should not be so, as enlightening bulletins, newspapers and other agencies have placed valuable information at the disposal of the farmer. Lectures have been given and schools and colleges have from time to time brought out the importance of clean milk, but still there seems to have been a failure to reach the actual producer.

We hear a great deal of late relative to the elimination of the small producer because he seems to be a retarding element in a general improvement, but it must be recognized that his elimination would result in a serious shortage in the supply. The policy of live and let live would seem to be a fair attitude for those who would eliminate the smaller producer because of his falling below the modern standards.

You have heard much about the education of the producer rather than prosecuting him, and you have also heard much about the education of the consumer to pay fair prices commensurate with the cost of producing milk, and of its delivery to their doors. The problems of those who are concerned with the business of milk production are many, and until some other solution has been proved to be more helpful and more sure of results, we must continue in our efforts to educate and enlighten the producer, dealer and consumer alike as to their responsibilities, and in doing this cooperation is needed all along the line.

Of course in any educational movement it is well to begin at the proper place. This may be the source of supply in the case

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of milk production, but we are well aware that in some communities the grade of milk is far beyond the demands of the consumer and that production is carried on at a loss.

It is very evident that the consumer needs a whole lot of enlightenment relative to foods, and especially as to milk, which is unlike other articles of food, in that the consumer cannot go to a market and select that which he prefers. Some means of advertising is necessary, and with the many and varied methods now in vogue it is hardly to be expected that the consumer can be otherwise than bewildered at times.

To depend upon the most attractive advertisements is the tendency of not a few city consumers, when it would be supposed that such a vital food as milk should receive more careful thought and attention than any food on the table.

Many health authorities publish valuable bulletins containing just the information that is necessary, but if it does not reach the masses of people it does but little good. Publicity of the right sort should be given to the milk situation, and here again we come to the question: "Which way is the proper way?" Surely, it is not always best to burden the public with stories of high bacteria counts and scares of epidemics, as such outbreaks would tend to indicate too much laxity on the part of the health board.

How to reach the average householder and secure improvement in her knowledge of dairy products is a problem in itself. Many different ways have been tried, among which are educational labels on the bottles, baby-saving shows under the auspices of the women's leagues, instruction in schools of domestic science, elementary instruction in the public schools, educational articles in magazines and newspapers, and the health bulletins referred to above. All these agencies have their value and influence, and if the information is of the proper sort such methods of dissemination of knowledge should be fostered and continued and receive the backing of producers and dealers alike.

It is deemed useless to produce milk for a public that is not ready to pay for it what it costs. Many have thought that the elimination of the smaller producer and dealer is inevitable because of his increased cost of production along up-to-date methods, but the smaller producer and dealer will have to be considered for some time to come, and we must be ever ready to assist those who wish to improve.

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THE VALUE OF COOPERATION BETWEEN CITY MILK INSPECTORS AND HEALTH OFFICIALS IN MILK-PRODUCING DISTRICTS.

WILLARD E. WARD, Agent, Food and Milk Inspection, Board of Health, Brookline, Mass.

In my attempt to show the members of the convention at least some of the advantages which my own municipality has derived through cooperation with health officials in milk-producing districts, I shall mention matters which may at first seem foreign to, but nevertheless have an ultimate bearing upon the subject. I will endeavor also to show the necessity of such cooperation as well as its value.

In my work of supervising milk supplies it has been necessary, in order to obtain permanent results, to spend at least one-third of the time in the dairy districts, and consequently I have been led to the conclusion that altogether too little attention has been given to dairy inspection by the average city inspector.

In such States where the laws provide that boards of health may make and enforce stringent milk regulations, as in Massachusetts, I am firmly convinced that the most practical and efficient method of inspection is that of excluding milk from undesirable dairies and licensing only dependable dealers, who can be relied upon to cooperate with the health officials in keeping their supplies up to a high standard. To allow a careless, undependable dealer to peddle milk and then prosecute him for violation upon low standards, foreign substances, high temperature, etc., nine-tenths of which are caused by carelessness, has in my experience far less corrective value than to cancel one such dealer's license, while to prosecute a dependable dealer for violations due solely to conditions of production upon contributing dairies, beyond his control, is not only unjust, but tends to discourage desirable men from staying in or entering the milk business, thereby greatly injuring the industry.

The city milk inspector can easily find out whether or not a dealer is handling his milk in a cleanly and proper manner, but how about its production back in the country? If the dealer observes the laws upon the delivery end and keeps out of court, he is doing all we can expect of him and much more than the

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average milk dealer does under the prevailing methods of inspection. Can we trust any one whom the dealer may employ, however dependable, to enforce sanitary corrections on the dairies? I think not.

The city milk inspector must supervise the production of all milk delivered in his district, and it seems to me that the rigid inspection of milk at its points of production is the most important and the hardest problem with which he has to deal, for if the dealer has unclean or contaminated milk from a few dairies it affects his whole supply, and how can the inspector hope to make permanent correction or locate the responsibility after the milk has been mixed and shipped into the city? With none too generous appropriations from our city governments, can we not look to the health officials in the milk-producing districts for at least a partial solution of this problem?

If I may be pardoned for referring to my own work, I will endeavor to show how this cooperation has been beneficial and helpful.

First, let me explain that my district consists of a town of 32,000 inhabitants in a very compact area, which is nearly surrounded by the city of Boston, therefore conditions and terms are analogous to those of a city.

Before licensing our milk dealers, we require a list of all contributing dairies, which must be inspected and approved before the license is issued, and licensed dealers cannot take on additional dairies without first having them also inspected and a permit issued by our Board of Health.

If a dealer has dairies scattered over large areas in the country, we do not license him unless he can arrange to supply our district with milk from one or more areas where the dairies can be more easily supervised. In this way our entire milk supply, with the exception of two pasteurized supplies, comes from comparatively small areas. This stipulation, although preventing a good many dealers from doing business in the town, has enabled us to keep in closer touch with conditions attending the production of our milk supply.

While inspecting dairies in a new district we make it a point to get in touch with the local health official and usually find some one upon whom we can depend for information regarding all matters pertaining to the supply in that district. It is true that sometimes the health officer in a small town happens

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to be a milk producer himself, and cannot be relied upon to report cases of disease, etc., upon the farms of his neighbors. Therefore, it is not always the local health official alone to whom we look for assistance. In selecting such persons, judgment must be used in obtaining a man who is absolutely dependable. The local physician or veterinary, in district where there are any, renders the most helpful assistance, but in such districts where there are neither active nor efficient local health officials we have obtained the services of men in various occupations.

In selecting these agents it is first attempted to have them fully understand that our object is to assist and encourage the farmers in the production of clean, safe milk and that sanitary measures would be enforced only to a point that was reasonable and just. Furthermore, we guarantee payment for any legitimate expense connected with protecting the milk supply trom infection. Thus in several cases, where typhoid and other diseases have been reported upon dairy farms, these local officials have been employed to handle the situation and to carry out such orders as we deemed necessary. While usually the milk dealer is called upon and does as a rule meet this expense, payment is always officially guaranteed.

Many of these agents will not accept any compensation, and seem only too glad to assist in any way they can in protecting the public health. In such cases the writer has made it a point to do anything possible to repay them for their courtesy and assistance. Various articles have been selected and purchased and business transacted to save them a trip to the city. Not only has this procedure been found most practical, but incidentally my associations with these agents in the country districts have proved to be most pleasurable.

We all know how hard it is for the city inspector to follow up and properly supervise the production of milk upon dairies one hundred or more miles away, and how easy it is for the farmer to slip back into the old rut after we have succeeded in having his premises put into proper sanitary condition.

When permits are issued to farmers with the understanding that they strain the milk in the milk room instead of behind the cows, use ice in hot weather, eliminate sand as bedding and horse manure in the gutter, etc., the local agent is advised under what conditions the permits are issued, and is asked to re-

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port any violations, which are in every case verified before we revoke the producer's permit; thus the agent does not run much chance of gaining the enmity of the farmers.

While this is very helpful, it is not to be compared with their assistance in tracing up cases and conditions which have been responsible for outbreaks of contagious and infectious diseases, especially in raw milk supplies. I might add here that over 40 per cent of the milk delivered in my district is unpasteurized.

Most of us have had experiences in trying to find the cause of a milk-borne epidemic, and after examining every person connected with the delivery end of the supply fail to find the carrier. It is in such cases that the local health officers in the country districts can be of the utmost service. In tracing carriers the local physician, veterinary or other health official not only can more quickly cover a district, but usually knows about all the employees upon the contributing dairies and consequently can do more thorough work in tracing the responsible party and in taking or assisting in taking blood or sputum specimens, where such action is necessary. I will give a few illustrations occurring with unpasteurized supplies.

In one instance, after several cases of diphtheria had appeared simultaneously upon one dealer's route, in addition to having an examination made of the dealer's employees, I telephoned at 2 P. M. to the health official, a physician, in the locality, fifty miles distant, where the dairies supplying the dealer were located, stating the circumstances. At 6.30 P. M. the physician telephoned back and reported that upon one of the contributing dairies he found a child ill with what he diagnosed as diphtheria, and a boy of sixteen, who had been assisting in milking, with a suspicious throat. The family had had no physician, relying upon the old-fashioned remedies used in the country. Thus I was able to have the milk, which had come down from the country that morning and had been bottled, pasteurized, and all further milk from this dairy effectively shut off until after the danger of infection was over.

In another instance the local health official, who happened to be a village storekeeper, voluntarily telephoned that one of the dairymen had that day employed a man who had just recovered from typhoid. We immediately stopped the milk until a specimen of the man's blood could be sent to a nearby city for examination. This man proved to be a very dangerous carrier and was immediately removed from the farm.

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And still another instance: A veterinary in a dairy district sixty miles away, telephoned after midnight that one of the milkers upon a dairy had been taken ill. The veterinary suspected that the man had typhoid, but could not induce the farmer to call a physician. We were able not only to exclude that morning's shipment of milk and the preceding day's shipment, which was then on the dealer's wagons ready for delivery, but were able to have the man examined by a physician and removed to a hospital before night.

Although many other instances could be related, these three, all of which might have resulted in more or less serious epidemics, emphasize the value of such cooperation.

Let us look at the other side for a moment and see if the country health officials do not also reap some benefit. It must be admitted that the larger and more congested municipalities have more modern equipment and their methods are more improved in matters pertaining to health questions, while the rural districts do not, as a rule, supply themselves with proper equipment or employ up-to-date methods, owing to their cost, even though their health officials may be thoroughly competent and up-to-date medical men. Then, again, even though local health officials are usually men of good type and purpose, it is too often true that they are not medical men and have had no training in public health matters. To both of these classes the city health officials can be most helpful by keeping the doors of their laboratories, hospitals, experimental stations, etc., open to them and by making analyses and examinations for them in addition to giving the benefit of their experience. By working together in this manner the country health officials are encouraged and stimulated, and several have told me that this cooperation has been responsible for their success in obtaining appropriations from their municipalities or districts for installing modern equipment and adopting more progressive methods.

Because of the value and benefit which my municipality has received from the method outlined, I can assure members of the convention, whose duties include the supervision of the production of milk in country districts, that they will find the cooperation of the health officials in the country one of the most valuable agencies in protecting their milk supplies, and I leave with you the future possibilities of such cooperation.

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METHODS EMPLOYED TO IMPROVE THE MILK SUPPLY IN THE CITY OF SCRANTON, PA.

FRED J. WIDMAYER, Milk and Food Inspector, Scranton, Pa.

My paper read at last year's meeting related to the existing condition of the milk supply of our city. I will not attempt to describe the details of my proceedings.

Samples of milk are obtained directly from the cans of the producer at the rural receiving stations. After thoroughly agitating the milk, it is poured into the standard tankard, temperature and specific gravity recorded. A tester is then used for sediment, the cotton disk removed and fastened on a sheet of white paper. The samples are then forwarded to the laboratory and chemically analyzed. The disk of sediment is placed under a microscope to detect the nature of the foreign substances for future reference.

A detailed statement of the analysis, including bacteria and leucocyte tests, with the cotton disk fastened on a conspicuous spot, is then mailed to the delinquent producer.

The average producer, after giving it a casual glance, would throw it in the waste basket, remarking, "Another one of those pestering inspector's fads." But a round black spot up in the corner of the letter arouses his curiosity and he reads the remarks below, which appear something like this: "Reduce the amount of hair and feces in your milk. You are required to observe the following recommendations: The use of a small-top milking pail, clipping the hair from the tip of the tail and bag, wash udder and teats before milking, do not allow your receiving can to remain in the barn during milking time, etc."

Result: Meditation. He bestows another glance on that accusing black spot, his sense of honor is touched, and he resolves to comply with the reasonable request of the inspector to make at least a clean milk. After a few weeks another test of his milk is made, and the arrival of the analysis is anxiously awaited. The result, if favorable, is not only satisfying to him, but you have made him a coworker for cleaner milk. With pride he will exhibit to all of his neighbors the statements of the milk inspector. Result: Cooperation; cleaner and better milk.

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I am compelled to credit the sediment test with being a most valuable assistant to the milk inspector, as an indicator and locator of a great percentage of causes of poor milk.

These records of tests are also of valuable assistance to the dairy farm inspector in the discharge of his duties.

Clean milk secured, then pasteurized under efficient official inspection, affords the greatest possible protection.

Pasteurization in this city scored a great victory, especially during the summer months. A great number of skeptics were convinced of its reliability and of its economic value. Complaints of sour milk were few; death records in children between the ages of 1 and 3 years decreased nearly 50 per cent.

Another prominent factor in our efforts for safe milk was the passing and enforcement of a city ordinance prohibiting the sale of loose or dip milk, compelling proprietors of hotels, saloons, restaurants, dining and lunch rooms to serve all milk sold over the counter in individual bottles. Loose milk is allowed to be sold only for culinary purposes. Several arrests were made, and the fines imposed had a salutary effect in checking violations of this ordinance.

A conscientious enforcement of the above-mentioned ordinance, and a common-sense application of methods as discussed, now seem to be a sufficient guarantee of a clean and safe milk supply.

"The problem before the people is greater than the passing of corrective laws; it is a problem of education—education that must begin with the child in the home and in the school, an education that will teach the coming generation the underlying principles regarding sanitation."—E. H. Webster.

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