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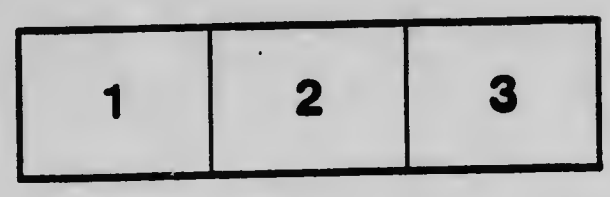

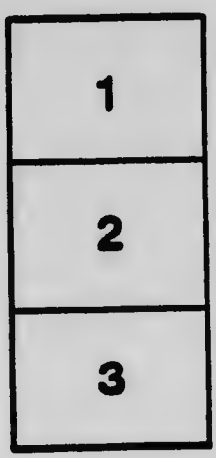

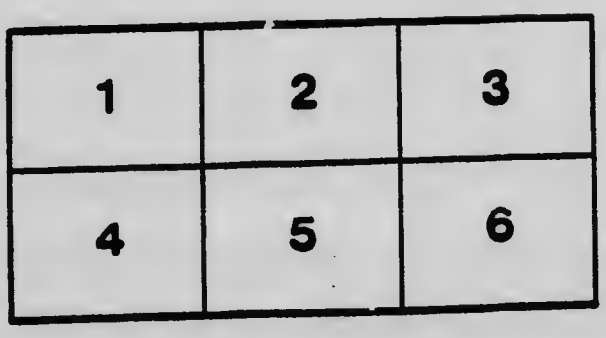

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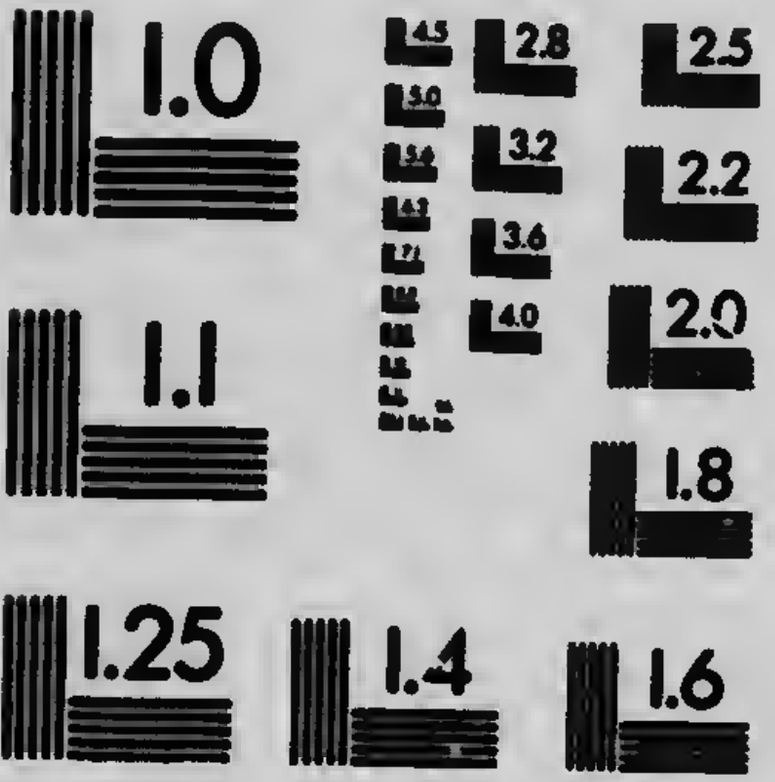

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REPORT

OF THE

MEDICAL OFFICER OF HEALTH

ON

THE SAFEGUARDING OF TORONTO'S MILK SUPPLY

WITH SPECIAL REFERENCE TO

PASTEURIZATION

TORONTO:
The Carswell Co., Limited, City Printers, 19 Duncan Street.
1915.

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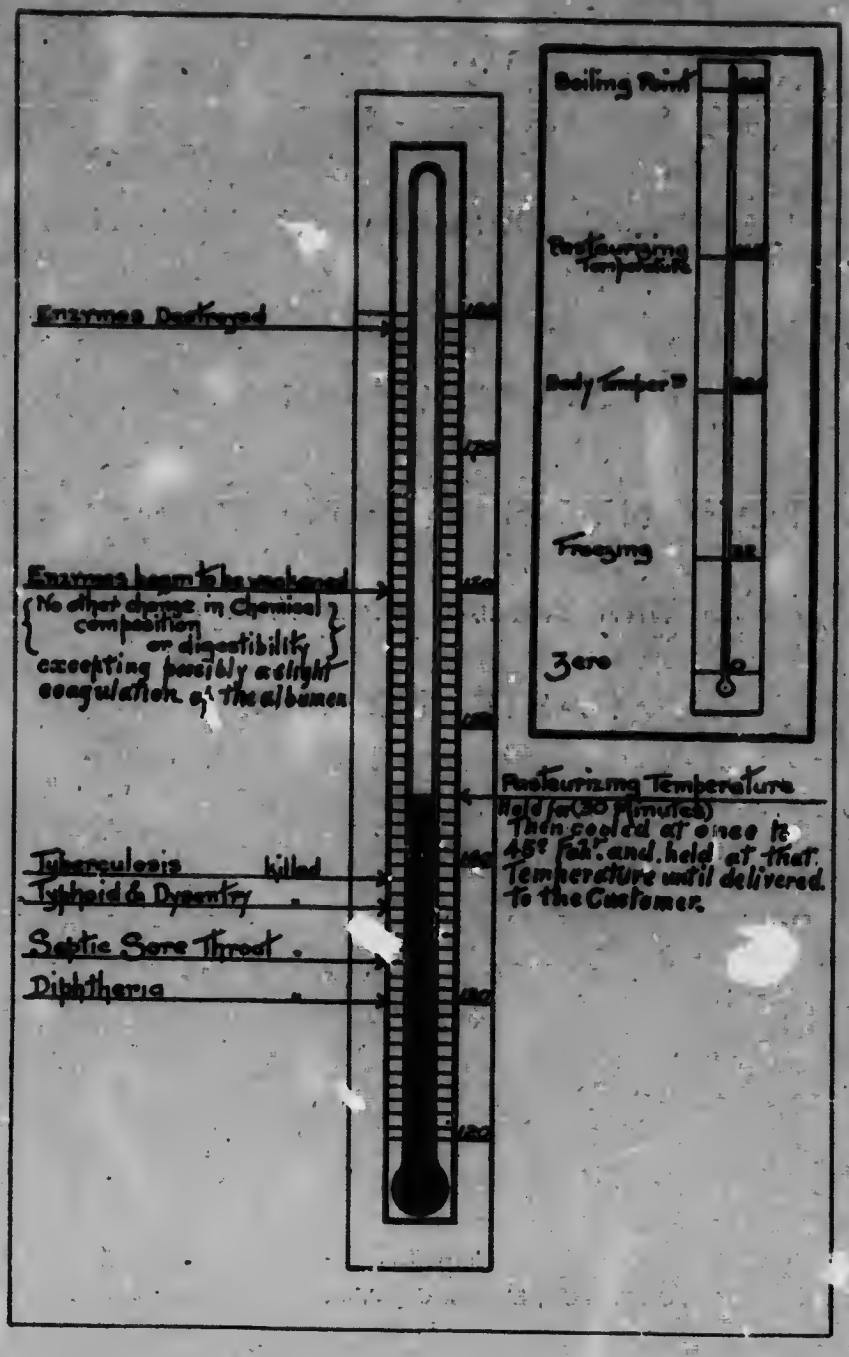

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REPORT

OF

THE MEDICAL OFFICER OF HEALTH

ON

THE SAFEGUARDING OF TORONTO'S MILK SUPPLY,

With Special Reference to Pasteurization.

Presented to the Local Board of Health on April 21, 1915.

In view of the fact that some misleading statements have been made concerning pasteurization, and that a leaflet has been circulated containing similar statements, by a certain physician in Toronto, we feel justified in assuming that this may have created some unrest in the minds of a few, who have neither the time nor inclination to give intelligent thought to the problem. It has been deemed advisable, therefore, to present to the citizens the facts concerning Toronto's milk supply and how it is safeguarded. I have consequently prepared the following report, touching on the principal features which have determined the necessity for pasteurization.

VALUE OF MILK AS A FOOD.

Probably no other phase of preventive medicine has engaged the attention of public health administrators, for the past five years at least, to the same extent as has the efficient safe-guarding of the public milk supply—and advisedly so, for in a modified form it is the most efficient substitute we have for mother's milk as a food for infants. There is no other food comparable in value for invalids, and in fact it should enter largely into the diet of all. Milk and its products, such as butter, cream, cheese, ice-cream, buttermilk and skim milk, are among the most important articles used for human food and constitute over 16 per cent. of the food used by civilized man.

As Prof. Magruder points out, milk furnishes all the elements essential for the sustaining of life and the growth of the body. These are the protein compounds, fats, carbo-hydrates and mineral matters.

The proteids are the albuminous compounds as found in the casein or curds, lactalbumin and lactglobulin. They correspond to the lean in meat and the white of eggs. They make muscle, bone and blood.

The fats, which rise to the top as cream, correspond to the fat of meat and oil, and supply heat and muscular power.

Carbo-hydrates are present in the form of milk-sugar and correspond to the starch of the cereals, and, like the fat, yield heat and muscular power.

The mineral matter is composed of a combination of lime, potash, sodium and other chemical elements essential for the building of the human body.

It is worthy of note, however, that milk alone would not be an economical food for adults, as it does not contain a sufficient proportion of carbo-hydrates; but milk, with the addition of cereals or bread, constitute a perfect mixed diet. All recognized authorities on dietetics and food values are a unit in the statement that milk is the most valuable single article of diet we possess. It is when comparison is made with other articles of food, that its economy is best appreciated. For instance:

One quart of milk (40 oz.) is equal in food value to:—

1 lb. of steak, of which the average cost is	22c.
11 eggs, of which the average cost is	33c.
3¾ lbs. fresh codfish, of which the average cost is	40c.
2½ lbs. chicken, of which the average cost is	56c.
$1 worth of oysters	$1.00
1 lb. of loin of pork, of which the average cost is	22c.

In comparing the cost of these different articles we readily see the economic advantages of milk; and, when we add to this the fact that in most institutions the cost of cooking and serving food is equal to or greater than the cost of the food itself, the economy of milk as a food in such institutions is still more apparent.

Obviously then, milk is a food that we cannot afford to do without; it is a food that we must have. And yet, as has been pointed out by Prof. Roseanau of Harvard, this most valuable article of diet, with its various contaminations as ordinarily sold in our cities, is responsible for more sickness and death than all other foods combined. Obviously then, we must see that our milk is safeguarded and these dangers removed.

THE DANGERS OF MILK.

In addition to the terrible role played by impure milk in our infant mortality (raw market milk is in a large measure responsible for the prevalence of diarrhoeal diseases in the hot summer months), we have the well-recognized danger of transmission of bovine tuberculosis to children. In addition to this, there have been numerous outbreaks of typhoid fever, scarlet fever, diphtheria, septic sore throat—and in fact, epidemics of all the communicable diseases have been traced directly to a contaminated milk supply.

DANGERS FROM BOVINE TUBERCULOSIS.

To what extent then does bovine tuberculosis affect man, and how can we best control it?

To the late Prof. Robt. Koch are we indebted for the discovery that the great white plague in man and beast is due to a germ known as the "tubercle bacillus," and for years he maintained that the germ in man and beast were identical. In 1901, however, at the International Congress of Tuberculosis in London, he took the stand that bovine tuberculosis was harmless to man. This statement has been regretted by many. In my judgment it was indirectly probably one of the most valuable features of his life's work, for I question very much if we would to-day be in possession of a fraction of the indisputable evidence we now have of the dangers of this disease to mankind, had this statement not been made. Immediately following this convention at which Prof. Koch promulgated his opinions, Royal Commissions were appointed by England, Germany and the United States, and it is to these commissions and many private investigations that we are indebted for our present knowledge of the real dangers of bovine tuberculosis to man. Of the various investigations made along this line on this continent there are none more valuable and better known than those made by Dr. Theobald Smith of Harvard, Dr. W. H. Park, director of the Public Health Laboratories of New York, and his colleague, Dr. Kenwin. The cases of human tuberculosis examined by Dr. Park and his associates are especially valuable inasmuch as they are not selected cases. The following are some of the figures taken from their report:

The total number of tubercular persons examined in the Research Laboratory of New York City relative to type of tubercle bacilli was 438; and of these, 32, or 7 1-3 per cent., had tubercle bacilli of the bovine type (contracted from the cow).

The 438 persons were divided into three groups, according to age:

1st.—297 persons, 16 years of age or over, among whom only one, or less than 1-3 of 1 per cent., showed bovine tubercle bacilli.

2nd.—54 persons between 5 and 16 years of age, among whom 9, or 16 2-3 per cent., showed bovine tubercle bacilli.

3rd.—84 children under 5 years of age, among whom 22, or 26 1-5 per cent., showed bovine bacilli.

The foregoing cases, with the addition of the total number of those examined by other investigators (which Dr. Park accepted as reliable after a careful analysis), total 1,038; and of this number 101, or 9 7-10 per cent., showed tubercle bacilli of the bovine type. If the 1,038 cases are divided into three groups according to age we have the following:

1st.—686 persons, 16 years of age or older, among whom 9, or 1 1-6 per cent., showed bovine tubercle bacilli.

2nd.—132 persons, between 5 and 16 years of age, among whom 33, or 25 per cent., showed bovine tubercle bacilli.

3rd.—320 persons, less than 5 years, among whom 58, or 26 4-5 per cent., showed bovine tubercle bacilli.

Dr. Park made the following significant statement which is contained in a recent annual report of the United States National Association for the study and prevention of tuberculosis:

"When the diagnoses of cases entering Mt. Sinai Hospital and the Babies' Hospital of New York, were examined, it was found that the majority of cases of meningitis, supposedly due to the meningo coccus, were really tubercular in character. 15 per cent. of the cases of broncho-pneumonia and marasmus were also found to be cases of tuberculosis."

Dr. Ravenell, Professor of the University of Wisconsin and director of the Bacteriological Laboratory of the Department of Health of Wisconsin, in referring to these figures of Dr. Park, says:

"I think we are now in accord on almost every point concerning this important question. There is now a world-wide agreement that bovine tubercle bacilli can produce serious and fatal diseases in

human beings, and these cases are seen chiefly among children under the age of 16 years, and especially under the age of 5 years."

Dr. Ravenell particularly emphasized the cases cited by Dr. Park in connection with the Foundling Hospital, and considers that Dr. Park probably had not gone quite far enough. He goes on to say that the series of cases at the Foundling Hospital, showing 55 per cent. of the deaths due to bovine infection, demonstrates clearly the actual danger which exists to-day from the exclusive use of raw cow's milk.

Prof. Sims Woodhead of Cambridge University, England, in an able and comprehensive address, delivered at the International Congress on Hygiene and Demography at Washington, when dealing with this subject, pointed out that the findings of the British Commission and the German Commission were practically the same as those of the investigators on this continent.

Prof. Woodhead cited the investigations and observations of Prof. Delepine, working in connection with Dr. Niven, Medical Officer of Health for Manchester, who made a thorough examination of the sources of Manchester's milk supply for the presence of tubercle bacilli; and in no town in the United Kingdom, and probably in no other city in the world, except perhaps Copenhagen, has the milk supply been more thoroughly controlled than in Manchester. Any improvement in the mortality from tuberculosis as the result of measures taken to control the milk supply could, th[illegible]ore, be better seen in Manchester and Copenhagen than in probably any other city. Prof. Delepine's figures and observations based on the reduction of tuberculosis, after the control of the milk supply, were most convincing. He concludes from his complete investigations, that, taking all this evidence into consideration: "It is possible to say," says Prof. Delepine, "without fear of exaggeration, that not less than 25 per cent. of tubercular children under five years of age suffer from infection of bovine origin."

These figures seem to bear out in a very striking fashion the experience of Copen[illegible]agen, where, under the advice of Prof. Bang, greater precautions have been taken to eliminate tubercle bacilli from the milk supply than in any other large city in the world; with the result that comparing the tuberculosis mortality in different countries with that of England and Wales (they being the longest and perhaps the most perfect), it is found that the mortality from tuberculosis in Copenhagen has fallen from a point considerably above that of the English curve, for an early period, to a point now definitely below the curve, the

two lines converging at a point representing a period after Bang's advice had begun to be followed. This, of course, in addition to the general precautions against consumption that have been taken in both countries.

The uniformity of the findings of all these investigators is inspiring and convincing, their conclusions being that, conservatively estimated, *25 per cent. of all cases of tuberculosis under 16 years of age is of the bovine type.* It is apparent then that tuberculosis, as contracted from cows through the medium of their milk, exists in children to a degree that cannot be longer disregarded by Departments of Public Health, and demands immediate action.

Furthermore, there is the additional danger of infection with the human form from some one suffering from tuberculosis handling the milk with contaminated hands, or sneezing or coughing over the vessel containing the milk.

To attempt to remove this danger of bovine tuberculosis by excluding from dairy herds all cattle suffering from tuberculosis would mean a milk famine, the cost would be prohibitive, and even then the milk would not be safe without pasteurization.

MILK AS A FURTHER SOURCE OF TRANSMISSION OF INFECTION

Typhoid Fever.

The following table has been taken from a pamphlet recently issued by Dr. Chas. E. North, Consulting Sanitary Expert, and Secretary of the Commission on Milk Standards, New York City.

This table represents a few only of the 317 outbreaks of typhoid fever traced to raw milk:

Glasgow, Scotland	500	cases from one raw milk supply
Cologne, Germany	270	cases from one raw milk supply
Port Jarvis, N.Y.	59	cases from one raw milk supply
Springfield, Mass.	182	cases from one raw milk supply
Oaklands, Cal.	262	cases from one raw milk supply
Monteclair, N.Y.	107	cases from one raw milk supply
Stamford, Conn.	307	cases from one raw milk supply.

These would have been prevented by pasteurizing the milk.

Scarlet Fever.

125 epidemics of scarlet fever traced to raw milk supply of which the following are a few examples:

Buffalo, N.Y.	57	cases from one raw milk supply
Washington, D.C.	33	cases from one raw milk supply
London, England	284	cases from one raw milk supply
Beverley, Mass.	6	cases from one raw milk supply
Liverpool, Eng.	59	cases from one raw milk supply
Mt. Vernon, N.Y.	45	cases from one raw milk supply
Boston, Mass.	195	cases from one raw milk supply.

Pasteurization is the only means by which this danger can be eliminated.

Diphtheria.

51 epidemics of diphtheria have been examined of which the following are a few illustrations:

Brooklyn, N.Y.	12	cases from one raw milk supply
Los Angeles, Cal.	35	cases from one raw milk supply
Wellsvale, N.Y.	84	cases from one raw milk supply
Clinton, Ohio	36	cases from one raw milk supply
Highpark, Mass.	69	cases from one raw milk supply
Warwick, R.I.	64	cases from one raw milk supply.

No epidemics have thus far ever been traced to pasteurized milk.

Septic Sore Throat.

Considerable interest has been aroused during the past four or five years as the result of a high mortality due to septic sore throat. Many of these outbreaks have been traced directly to the milk supply, partially through contamination by the handlers of the milk, who were affected or were carriers, and partially through an organism which is found in the diseased udder of the cow. 60 cases of sore throat in Stockholm in 1908 were traced to an abscess in the udder of a cow, which contained the same organism that was found to be responsible for the sore throat. This animal was one of a herd that furnished milk to those that became infected. This was one of the first observations made in this connection, and different outbreaks have been traced to this source since.

A very exhaustive study was given to the outbreak in Boston in May, 1911, where 1,043 cases were traced to one raw milk supply. In Chicago, Ill., an outbreak of 10,000 cases was traced to one raw milk supply; in Baltimore, 602 cases; and in Cortland-Homer, N.Y., 669 cases. This disease seems to attack adults especially.

Pasteurization would have made these outbreaks practically impossible.

The aforesaid dangers of infection through milk are accentuated by the fact that most of these disease-producing organisms multiply rapidly in cow's milk at the temperature of a living-room. This is especially true of the typhoid germ. This danger is further intensified here when we consider that most of the milk used in Toronto is thirty-six hours old before it is consumed.

Dr. Herman Biggs, formerly Medical Officer of Health of New York City, and now Commissioner of Health for New York State, in 1910 made some investigations in connection with certain outbreaks of typhoid fever in New York City, presumably from their milk supply. He was able to trace several of these outbreaks to the milk supply. The striking feature of these cases was that they were not traceable to any acute cases, or cases of recent development, but were all traced to chronic carriers who had suffered from the disease years before. These cases were only verified after excluding every other source and then making a bacteriological examination of the excretions from the bowels of the suspected producers and dealers.

In one instance of an extensive outbreak, it was traced to a carrier who had suffered from typhoid fever forty-six years before. His stools were found still to contain an enormous number of virulent bacilli. As Dr. Biggs points out, when you add to this danger that of the other communicable diseases, it is apparent that no system of inspection, no matter how well organized, could possibly detect these cases. To make such an intensive investigation of a city's complete milk supply, such as Dr. Biggs made in these few cases, would be as impossible as it would be unwarranted. Obviously then the only safety lies in pasteurization.

It was on these findings, together with the information already in the possession of the Board of Health of New York, that they decided to pass an Ordinance in 1912, requiring all milk not coming from cattle free from tuberculosis, as determined by the tuberculin test, and not produced under conditions necessary for the production of a certified milk, to be scientifically pasteurized. This Ordinance was not rigidly

enforced until 1914. That it has been for the past year rigidly enforced is evident from the following extract taken from the Weekly Bulletin of the Department of Health of New York City, June 6th, 1914:

> "The situation regarding compulsory pasteurization of all except the highest grade of milk sold in this City is extremely satisfactory, at the present time, *about 99 per cent. of the city's supply being efficiently pasteurized.* This represents an enormous improvement over conditions a year ago, and should make milk-borne disease a rarity in this city."

HOW CAN THESE DANGERS BE ELIMINATED?

With such overwhelming evidence of the dangers of the transmission of diseases through milk, the problem confronting Departments of Health is—how most efficiently to remove these dangers? The united opinions of those who have for years been carefully studying the relation of milk to diseases is that there are only two kinds of milk that should be permitted by any Health Officer to be sold for human consumption. These are certified milk and inspected scientifically pasteurized milk. We use the term "scientifically pasteurized" to distinguish it from the various commercial forms of pasteurization that have been used in the past. The following are the definitions of certified milk and pasteurized milk as contained in the Ontario Milk Act:

Use of the word "Certified."

> "It shall be unlawful to apply the term 'certified' to any milk which does not comply with the following standard:
>
> (*a*) It shall be from cows semi-annually subjected to the tuberculin test and found without reaction.
>
> (*b*) It shall contain not more than 10,000 bacteria per cubic centimetre from June to September, both inclusive, and not more than 5,000 bacteria per cubic centimetre from October to May, both inclusive.
>
> (*c*) It shall be free from blood, pus, or disease-producing organisms.
>
> (*d*) It shall be free from disagreeable odor or taste.
>
> (*e*) It shall have undergone no pasteurization or sterilization, and be free from chemical preservatives.

(*f*) It shall be cooled to 45 degrees Fahrenheit or under within half an hour after milking, and kept at that temperature until delivered to the consumer.

(*g*) It shall contain twelve to thirteen per cent. of milk solids, of which at least three and one-half per cent. is butter fat.

(*h*) It shall be from a farm the herd of which is inspected monthly by the veterinarian, and the employees of which are examined monthly by a physician."

Use of the word "Pasteurized."

"It shall not be lawful to apply the word 'pasteurized' to any milk unless all portions have been subjected for at least twenty and not more than thirty minutes to a temperature of not less than 140 and not more than 150 degrees Fahrenheit, and then at once cooled to 45 degrees Fahrenheit or under and kept at that temperature until delivered to the consumer; and the process of pasteurization shall be subject to inspection by the local Medical Health Officer or such inspector as he may designate; provided always that all such milk shall in all other respects be subject to all the terms and conditions of this Act."

However, we will not have reached the ideal in pasteurization until we have it done in the final containers. This is being done by a firm in Brooklyn, N.Y., and in some smaller places, but not in sufficient quantity to meet the needs of any municipality. The only places where this method is used in Canada are in the Toronto Hospital for Sick Children and in preparation of infant's milk at the City Dairy, Toronto. The Hospital for Sick Children buys certified milk and then pasteurizes it in the bottles in which it is delivered to the baby. This removes every possible chance of infection.

OBJECTIONS TO CERTIFIED MILK.

It is quite apparent that the high cost of production of certified milk will prevent its ever being extensively used in any municipality. This quality of milk has been offered for sale for from fifteen to twenty years in New York City, and in 1914, and for some years previous, it constituted only three-quarters of one per cent. of the entire milk consumption of that city. In the City of Toronto, though we have been having certified milk produced for the last six years and a half, the

consumption of this milk in the City last year was only one-half of one per cent. of the entire milk supply. Then there is a feeling of uncertainty even in regard to certified milk, as different epidemics have been traced directly to this source. These have been in most cases due to carriers handling the milk.

Furthermore, the cases of tuberculosis that develop, even in certified herds, during the course of the year, have been found to range from 5 per cent. to 25 per cent. A striking example of this occurred in November, 1914, when it was found that 191 tuberculous cows were taken out of a herd of 632 animals. This was one of the most celebrated certified herds in the United States.

The extent to which tuberculosis exists in all dairy herds is much greater than is generally supposed. In one herd in the United States, in December last, 72 tuberculous cows were found in a herd of 86. This was a "model" dairy where every expense and precaution had been taken, but was not a certified herd. Our Department of Public Health veterinaries advise us that from 25 per cent. to 50 per cent. of the cattle supplying milk to Toronto are tubercular. Approximately 30 per cent. of the dairy cattle in New York State are suffering from tuberculosis, and about 40 per cent. in Europe.

It is, therefore, the concensus of opinion of health authorities now that even certified milk should be scientifically pasteurized before being used for food for infants. It would, therefore, seem that we are left no alternative. If we are to safeguard our entire milk supply it all must be scientifically pasteurized.

PASTEURIZATION.

I refer to the advisability or inadvisability of pasteurization with apologies to my colleagues, with whom the discussion of this problem is practically ancient history. No one who has been making a scientific study of the milk problem, and who is, therefore, in a position to give an intelligent opinion, has, within the past five years at least, questioned for a moment the advisability of the pasteurization of all milk, for infants and children, that does not come from a herd that has been shown to be free from tuberculosis or that has not been procured under conditions necessary for the production of certified milk. However, I presume it is a matter of history repeating itself. In all advances of science there are always a few who cannot keep pace with advancement, and they expect others to wait for them. It is, therefore, necessary to repeat and repeat over and over again.

I am reminded here of Lord Cromer's address at the Annual Conference of the British Research Defence Society in London in July, 1910, when the question of inoculation of animals was under discussion, in which he said: "It seems unfortunate that we should have to waste time on problems that are so self-evident, in order to meet the objections of those who value the life of a guinea pig higher than that of a baby." He consoled himself by quoting the statement made by Mr. Cobden in the British House of Commons when endeavoring to bring about the repeal of the Corn Laws, which was as follows:

> "I have come to the conclusion that the only way to get an idea into the heads of the British public is to repeat the same thing over and over again in slightly different language."

This finds a fitting application in our present educative campaign in the necessity for pasteurization.

EFFECTS OF PASTEURIZATION ON MILK

It was fully demonstrated in 1907 and 1908 in the Hygienic Laboratories of the Public Health and Marine Hospital Service at Washington, that heating milk to a temperature of from 140 degrees to 145 degrees F., and holding it at that temperature for thirty minutes, would destroy all disease-producing germs, including the tubercle bacillus, which was found to be the most resistant of all, and at the same time would produce no appreciably injurious effect upon the milk.

The work done at that time by Schroeder and Cotton in connection with the experimental stations of the Bureau of Animal Industry was most valuable and has frequently been quoted since. They demonstrated that tubercular cattle discharged tuberculosis germs from their bowels almost constantly—at times to the extent of tens of millions per day. They also demonstrated that the cattle that passed tubercle bacilli by the bowels were not always visibly diseased—many were apparently in perfect health and were not known to be tubercular until the tuberculin test had been used. In demonstrating the efficiency of pasteurization, so far as the tubercle bacillus is concerned, they inoculated several hundred guinea pigs with the milk in its raw state from these tubercular cattle. Every one of the little animals showed general tuberculosis. Over 200 guinea pigs were injected with milk from the same cow after it had been pasteurized at a temperature of 140 degrees for thirty minutes. Not one of these developed any signs of tuberculosis. This work has been confirmed by Professors Rosenau, Conn, Theobald Smith, North,

Russell, Hastings, and many other investigators both on this continent and in Europe.

The investigations made by General Sternberg, former Surgeon General of the United States Army, have also demonstrated that a temperature from 140 to 145 degrees for 30 minutes will destroy all disease-producing germs and 99 per cent. of all other bacteria, and does not affect the taste *or in any way interfere with the nutritive value or digestibility of the milk.* This has been repeatedly confirmed by the most skilled investigators both in Europe and America.

Much of the difficulty experienced in securing the adoption of universal pasteurization of all milk is due to the deeply seated misconception of what efficient or scientific pasteurization really means. This is the result of the various commercial methods, or so-called flash methods, that have been used for years, that had no scientific value and afforded but a false security—the only object being to prolong the keeping properties of the milk. These methods are now illegal, only the holding method, or scientific pasteurization, now being permitted.

Much work has been done in the chemistry of milk by Kastle and Roberts, Prof. Conn, Profs. Victor Vaughan, Van Slyke, Bevis, Payne, Stokes, Richmond, Marfan, Giblett, Hertel, Muller, Bakarny, Babcock, Russell, and numerous other biological chemists on this continent and in Europe. All of these authorities have made extensive experiments in the action of heat on the enzymes of milk, and all agree that a temperature of 140 degrees F. to 145 degrees F. does not affect the enzymes—some claiming that from 170 to 180 is necessary to bring about any change. However, as Prof. Jordan points out, even if the enzymes were slightly affected there is not a particle of evidence to show that these enzymes have any favorable influences on human digestion and metabolism. The enzymes in raw meat or raw potatoes, as far as we know, are just as valuable.

Bulletin No. 166 of the U. S. Bureau of Animal Industry, 1913, prepared by Dr. Rupp, demonstrates very conclusively that pasteurization does not produce any chemical change in milk. Consequently the nutritive value of milk is not diminished, as demonstrated by the following:

1st. Milk pasteurized by the Holding Process at (145) degrees F. for 30 minutes does not undergo any appreciable chemical change.

2nd. The soluble phosphates of lime and magnesia do not become insoluble at 155 degrees F. The quantity of phosphoric acid, lime and magnesia in the serum of both raw and pasteurized milk is practically the same.

3rd. The albumen does not coagulate at 145 degrees F., but at 150 degrees F. 5.75 per cent. of the albumen is rendered insoluble. As the temperature increases the amount of coagulated albumen increases, so that at 155 degrees F. the quantity increases to 12.75 per cent., and at 160 degrees F. the amount coagulated is increased to 30.78 per cent.

4th. The time required for coagulating the casein by Rennin is slightly less in milk pasteurized up to 140 degrees F. than it is in raw milk. At 150 degrees F. there is a slight retardation, while at 167 degrees, the time is almost doubled.

5th. The acidity as determined by titration is slightly diminished in pasteurized milk.

The foregoing is a full endorsation of the statement in Bulletin No. 56 of the Bureau of Public Health at Washington, in which Prof. Kastle states that proper pasteurization does not exert any deleterious influence upon the chemical or nutritive value of milk.

These facts have been demonstrated in many places by actual feeding experiences. One occasionally hears the statement made, even yet, that pasteurized milk produces scurvy or rickets. To this we may say that thousands of children under the eyes of careful and competent observers have been reared successfully on milk so treated, without the slightest sign of scurvy or rickets.

Prof. Roland Godfrey Freeman of New York demonstrated some years ago that such instances of scurvy and rickets have, in his experience, invariably been traced to mixed feedings, and that heated milk has, in his judgment, no bearing on this matter. These observations have been strengthened by numerous observers in Europe where heated milk —even to the extent of boiling—is almost exclusively used.

However, there are a few physicians even yet who hold the opinion that raw milk has valuable properties that are destroyed by heat, and, therefore oppose pasteurization. Their opinions are antiquated and have long since been disapproved. Of interest in this connection is a recent publication of the Local Government Board of England on "Public

Health and Medical Subjects," in which a summary is given by Dr. E. J. Lane-Clayton—"Of the available data in regard to the value of boiled milk as food for infants and young animals." In this report the following conclusion, which is absolutely in harmony with the data obtainable from both experimental and clinical observations, is presented:—"When an animal is fed upon the milk of another species (which is precisely what is done when we feed human babies on cow's milk) such small differences, as have been found in the nutritive value of raw and boiled milk, have been in favor of boiled milk."

These observations have been recently confirmed by investigators in Europe and America, and yet boiling is going considerably further than we deem necessary—the boiling point being 212 degrees and our method of pasteurization being only 140 degrees to 145 degrees.

Prof. Winslow, in referring to the objections raised to pasteurized milk, on account of its digestibility having been affected, states—"This seems again to be an absolutely unfounded supposition. Within the last five years the milk supply of New York, Boston and Chicago has been transformed from 90 per cent. raw milk supply to 90 per cent. pasteurized milk, with no recorded increases in nutritional diseases of children. Even if scurvy were caused by pasteurized milk, it could at once be cured by adding orange juice to the diet, but it is not so caused."

In a recent careful study carried on in Washington 351 babies fed on raw milk gained on an average of .4030 oz. a day, while 557 babies fed on pasteurized milk gained on an average of .4077 oz. One hundred and ten babies were fed for part of the time on pasteurized milk. During the raw milk period they gained on an average of .4312 oz. and during the pasteurized milk period an average of .4607 oz. Some of the leading authorities in England and United States are now even advocating the use of boiled milk, the digestibility of which one might possibly suspect as being unfavorably affected.

Dr. North in referring to the digestibility of pasteurized milk gives the following practical evidence:

> Fortunately New York City has for the past three years carried out a gigantic experiment in infant feeding at its fifty-five (55) municipal milk depots, where babies are fed the year round, to the number of 18,000 daily in summer and 16,000 daily in winter. For three years all of this milk has been scientifically pasteurized. Records have shown that the babies have gained weight; have kept well;

have shown no signs of rickets or scurvy, and in every way gave evidence that pasteurized milk is not inferior in food value or digestibility to raw milk.

The death rate among infants during this period has been reduced from 125 per thousand to 94 per thousand, which places New York City in the lead of any large city in the world in the reduction of infant mortality.

Numerous other instances could be quoted of the unchanged nutritive value of pasteurized milk, but the foregoing are more than sufficient to demonstrate this fact.

OBJECTIONS TO PASTEURIZATION.

(1) It has been claimed that, all the lactic acid bacilli having been destroyed by pasteurization, the milk will not sour but rots. This is incorrect, as has been repeatedly demonstrated by bacteriological tests. Pasteurized milk will keep longer than unpasteurized milk, but when decomposition starts it sours the same as unpasteurized milk—all the lactic acid bacilli *not* having been destroyed.

(2) Some have expressed the fear that pasteurizing will have a tendency to influence people to relax in their efforts to secure an absolutely clean milk. This is another fallacy. No municipality should countenance the pasteurizing of milk of an unknown source of quality. Milk must be up to a certain standard and free from barnyard contamination, as determined by the dirt test, before being accepted as fit for pasteurization. This is the method used in the Department of Public Health in Toronto. In fact I can say, without fear of contradiction, that no city on this continent approaching the size of Toronto has a better organization for safe-guarding its milk supply.

(3) Then we occasionally hear the objection to the taste of pasteurized milk, but we hear this proportionately as frequently about certified milk. The complaint usually is, that none of the milk tastes the same as it used to. This complaint is for the most part well founded, but the change in taste is due to the absence of dissolved cow manure, which for generations—until recent years—has been an almost constant ingredient of market milk.

A practical illustration of how this flavor has become fixed on the human palate occurred in a dairy in the United States a few years ago, which was soon after certified milk began to be extensively talked about.

The owner of one of the largest herds supplying New York City, in a spirit of profound indignation, called upon one of the firms that dealt in certified milk only and asked for a glass of this new "fandangled" milk that they called "certified." After tasting it he smacked his lips and said: "Do you call that milk? That's not cow's milk; you can't fool me." The proprietor, knowing that this man was coming, was prepared for him, and asked him if he would like to try another kind of it. He replied "he would." The attendant going into an adjoining room returned in a few minutes with another glass of the certified milk taken from the same bottle, but to which he had added two or three drops of liquid cow manure. After tasting this the man smacked his lips and said "that's milk!" Hence, it is difficult to get away from the association of this flavor with cow's milk, but once the public know to what this flavor is due they will no longer be desirous of adhering to it.

The other objections that have been raised have all been explained away in this report, such as "the ill-effects of pasteurization on the chemical composition and digestibility of milk, etc."

ALMOST UNIVERSAL ENDORSATION OF PASTEURIZATION.

The facts presented in this report concerning the dangers of milk and the value of pasteurization have been known to all students of the milk problem for several years. It was with a knowledge of the foregoing facts in regard to the dangers of bovine tuberculosis and human tuberculosis being transmitted to children through milk, that the Washington Association for the Prevention of Tuberculosis, at a convention held in 1912, was prompted to pass resolutions positively endorsing the necessity of the efficient pasteurization of the entire milk supply of municipalities. Among those who were present and took part in the discussion and strongly urged the passing of the resolutions were:—

Prof. Geo. M. Sternberg,
Former Surgeon-General of U. S. Army;

Dr. Harvey W. Wiley,
Former Chemist and Chief of Bureau of Chemistry, United States Dept. of Agriculture;

Dr. A. D. Melvin,
Chief of Bureau of Animal Industry, United States Dept. of Agriculture.

Dr. John R. Mohler,
Chief, Pathological Division of the Bureau of Animal Industry;

Dr. Wm. C. Woodward,
Health Commissioner of Dist. of Columbia;

Prof. G. Lloyd Magruder,
Georgetown University;

Dr. Geo. M. Kober,
Prof. of Hygiene, and Dean of Georgetown Medical School;

Dr. R. M. Hickman,
Chief of Quarantine, Div. of Bureau of Animal Industry;

Dr. E. C. Schroeder,
Supt. of Experimental Station, Bureau of Animal Industry;

And other prominent workers.

It was with a knowledge of these facts that the International Congress of Tuberculosis held in Washington in 1908, unanimously passed a resolution that all milk not coming from herds shown to be free from tuberculosis, should be scientifically pasteurized. The National Association for the Prevention of Tuberculosis, the Canadian Association for the Prevention of Tuberculosis, and the Canadian Medical Association, subsequently passed similar resolutions.

It was a knowledge of the dangers of transmission of tuberculosis, together with the dangers of the transmission of other communicable diseases and of the dangers of diarrhoeal diseases through raw market milk, that prompted the Committee on Milk Standards, and subsequently, the American Public Health Association and the American Medical Association, as well as the Association of State and Provincial Health Officers, to pass a resolution that all milk not coming from herds free from tuberculosis, as demonstrated by the tuberculin test, and not obtained under conditions corresponding to those required for the production of certified milk, should be scientifically pasteurized before being used for human consumption.

Prof. Dean, of the Ontario Agricultural College, says that he regards pasteurization of milk as the greatest possible aid to life saving.

At the International Pure Milk Congress held in Brussels in 1907, the use of raw milk for infant feeding was officially condemned and pasteurization advocated.

Prof. Amyot, Director of the Laboratories of the Ontario Provincial Board of Health, seven years ago advocated this method of controlling our milk supply and still claims that it is the only safe method.

It is with a knowledge of the foregoing facts that Dr. Torrance, Veterinary General for the Dominion of Canada, unhesitatingly says that all milk not coming from herds shown to be free from tuberculosis by the tuberculin test should be scientifically pasteurized, and that in his judgment it is the only means by which we can efficiently safeguard our milk supplies.

It was with a knowledge of these facts that Dr. H. A. Harding, Prof. of Dairy Husbandry of the University of Illinois, in an address before the Industrial Milk Dealers' Meeting at Chicago in October, 1914, said:—"The proper pasteurization of milk is a simple and inexpensive process which leaves no objectionable influence upon the milk, and which takes from the milk not only the dangers of transmitting tuberculosis but also the danger of transmitting all of the other long list of diseases which are frequently transmitted by milk. The requirement of the universal pasteurization of the public milk supply is endorsed by the leading students of milk problems, regardless of whether they approach these problems from the avenues of science or of practice."

It was with a knowledge of these facts that the Minister of Agriculture for France in 1912 had legislation passed prohibiting the sale of any milk in France that had not been properly pasteurized. The Minister of Agriculture had behind him in this move a solid block of all the scientific and legislative powers, including: Prof. Bordeau, of the College of France, Prof. Metchnikoff of the Pasteur Institute, the President of France, the Deputies, the Senators, the Ministers, the Pasteur Institute, the College of France and the Medical Faculty.

Back in 1908 Dr. M. J. Rosenau, then Director of the Hygienic Laboratories of the United States Public Health Service, said: "Having carefully considered the advantages and disadvantages of pasteurized milk, my conclusion is that the advantages so far outweigh the disadvantages that I unhesitatingly recommend compulsory pasteurization of all milk not officially certified."

Prof. Wm. T. Sedgewick, of the Massachusetts Institute of Technology, and President-elect of the American Public Health Association, says:—"I have long been a believer in the necessity of pasteurization and went on record to this effect in my first paper on milk supply and public health in 1892, reiterating the same views in sanitary science and public health the same year. The opinion then expressed I hold substantially in the same form and for the same reasons to-day."

Prof. Jno. J. Kastle, Chief of the Division of Chemistry, Public Health and Marine Hospital Service, says:—"In my opinion only two kinds of milk should be permitted to be sold in any town or city: certified milk, and milk which has been properly pasteurized."

Denmark, the country that practically leads the world in dairying and in efforts to control tuberculosis amongst cattle and hogs, goes so far as to require that all skimmed milk and buttermilk required for the feeding of animals must be pasteurized, and also all cream used for the manufacturing of butter or ice cream.

No intelligent stock-raiser or agriculturist thinks of feeding his calves or hogs, milk from cattle that are not known to be free from tuberculosis, without first pasteurizing it, and intelligent physicians realise that infants are entitled to the same protection.

One of the most valuable advances towards the more general control and safeguarding of the milk supply in the United States and Canada was the appointment of the Commission on Milk Standards. The appointment of this Commission was the direct result of the observations of the New York Milk Committee, 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 health supplies. There was a need that health officers be furnished conclusions drawn from much experience and matured judgment, and that ordinances should be free from erroneous positions and as uniform as possible.

A special committee of the New York Milk Committee was appointed to consider names of more than 200 men of prominence in medicine, sanitation, public health and laboratory work, particularly those recognized as authorities on the milk question. Since regulations are based on standards and standards are based chiefly on laboratory analyses, the sub-committee selected 20 names of men distinguished for their knowledge of the bacteriological and chemical examination of milk and

for the enforcement of standards based on such laboratory examinations. The following is the personnel of this Commission on Milk Standards:

Dr. W. A. Evans,
Prof. of Preventive Medicine, Northwestern University, Health Editor of the Chicago Tribune.

Dr. B. L. Arms,
Dept. of Biology and Public Health, Massachusetts, Institute of Technology, Boston.

Dr. John F. Anderson,
Dir. Hygienic Laboratory, U. S. Public Health Service, Washington, D.C.

Prof. H. W. Conn,
Dir. Bacteriological Laboratory, Connecticut State Board of Health, Dept. of Biology, Wesleyan University.

Dr. E. C. Levy,
Health Officer, Richmond,

Dr. A. D. Melvin,
Chief Bureau of Animal Industry, U. S. Dept. of Agriculture, Washington.

Dr. W. H. Park,
Director, Laboratories, Dept. of Health, N. Y. City, Prof. of Bacteriology and Hygiene, New York University.

Mr. R. A. Pearson,
Pres. State College of Agriculture, Iowa.

Dr. M. P. Ravenel,
Dir. Hygienic Laboratory, University of Wisconsin.

Prof. M. J. Rosenau,
Dept. of Hygiene and Preventive Medicine, Harvard Medical School, Boston.

Mr. Chester H. Wells,
Health Officer, Montclair, N.J.

Prof. H. C. Sherman,
Dept. of Chemistry, Columbia University.

Dr. L. L. Van Slyke,
Dept. of Chemistry, N.Y. Agricultural Station.

Dr. Chas. E. North,
Consulting Sanitarian (Secretary).

Dr. N. J. Hurty,
Secretary State Board of Health, Indiana.

Dr. J. S. Neff,
Secretary Dept. Public Health and Charities, Philadelphia.

Dr. J. S. Fulton,
Dir. State Dept. of Health, Baltimore.

Dr. J. H. Landis,
Commissioner of Health, Cincinnati.

Dr. W. C. Woodward,
Commissioner of Health, Dist. of Columbia.

Dr. Chas. J. Hastings,
Medical Officer of Health, Toronto.

In the report issued by this Committee, regulations or standards were published to govern milk supplies in the various municipalities permitting of modifications to meet certain local conditions. The one recommendation, however, which was universal was that all milk not coming from tuberculin tested cattle and procured under the conditions necessary for the production of a certified milk, should be efficiently pasteurized. The majority of the Committee was of the opinion that the regulations should require that all milk, including the certified milk, be pasteurized before being used for infant feeding; but inasmuch as it was not unanimous, it was decided to forego the regulations governing the pasteurization of certified milk, leaving this optional.

These standards have been accepted and endorsed by the American Public Health Association, which is representative of all the health officers in United States, Canada, Mexico and Cuba. They have also been

approved and adopted by the American Medical Association and the Association of State and Provincial Health Officers. The work of this Commission has been most valuable and is undoubtedly the most important step yet taken in the interest of pure milk.

SUMMARY OF REPORT.

1st. Milk is the most valuable food we possess; is, or should be, the sole diet of all infants and small children and the principal diet of invalids; and is a valuable addition to the diet of all.

2nd. Milk is the most economical food we have, costing in proportion to food value, less than one-half the amount paid for meat, eggs, chicken, fish, etc.

3rd. Ordinary market milk is responsible for more sickness and death than all other foods combined.

4th. Milk is responsible for all cases of bovine tuberculosis which constitute 25 per cent. to 26 per cent. of all the cases of tuberculosis in children under 16 years of age, and is also a source of the transmission of human tuberculosis.

5th. Ordinary market milk is responsible for from 25 per cent. to 40 per cent. of all diarrhoeal diseases during the hot summer months.

6th. From 500 to 600 outbreaks of typhoid fever, diphtheria, scarlet fever and septic sore throat, have been traced directly to the raw milk supply. As many as 500 cases of typhoid fever have been traced to one dairy.

7th. Numerous outbreaks of typhoid fever have been traced to milk supplies—the milk having been handled by chronic carriers who had no clinical symptoms of the disease—(this applies in a certain degree to the other communicable diseases).

8th. No amount of inspection, no matter how well organized, could possibly detect these carriers. The same is true of the mild unrecognized cases of the various communicable diseases.

9th. There is only one method by which these dangers can be eliminated from our milk supply—that is, scientific pasteurization.

10th. Scientific pasteurization is heating milk to a temperature of from 140 degrees to 150 degrees, holding it at that temperature for thirty minutes and then immediately chilling it to from 40 to 45 degrees. This will destroy all disease-producing germs and 99 per cent. of all other bacteria in the milk and does not materially affect the nutritive value or digestibility of the milk.

11th. It has been demonstrated by chemical experts that proper pasteurization does not produce any chemical change in milk and therefore does not interfere with either the digestibility or nutritive value of the milk.

12th. There are only two kinds of milk recognized by health authorities as safe food for human consumption. These are: certified milk and inspected scientifically pasteurized milk.

13th. The high price of certified milk, as already pointed out, seems to make its use prohibitive, save for a few. Furthermore, it has been fully demonstrated that certified milk, while possessing a high degree of cleanliness, is not always a safe milk, as outbreaks of the various communicable diseases have been traced to certified milk as the source.

14th. Obviously then, if we are going to safeguard our entire milk supply, it must be pasteurized, as there is no alternative.

15th. There is no recorded epidemic of any form of communicable diseases that has been traced to pasteurized milk.

16th. Much work has been done by biological chemists on the chemistry of milk and the influence of heat on milk, all of whom agree that the heating of milk to a temperature of from 140 degrees to 145 degrees F. for thirty minutes does not destroy the enzymes, and in fact, the milk does not undergo any appreciable chemical change. Valuable evidence corroborating this has been obtained by observing the results of thousands of children fed solely on pasteurized milk.

17th. Pasteurization of all milk not coming from herds free from tuberculosis as determined by the tuberculin test and not produced under the sanitary conditions necessary for the produc-

tion of certified milk, has been endorsed by resolutions passed by the following:

1st.—International Association for Control of Tuberculosis.

2nd.—National Association for Control of Tuberculosis.

3rd.—Canadian Association for Control of Tuberculosis.

4th.—Washington Association for Control of Tuberculosis.

5th.—Canadian Medical Association through their Milk Commission.

6th.—Academy of Medicine, Toronto.

7th.—International Milk Congress held in Brussels in 1907.

8th.—Prof. Dean of Ontario Agriculture College.

9th.—Dr. Torrance, Veterinary General for the Dominion, who states: "Pasteurization is the only method by which we can make our milk supply safe."

10th.—Dr. H. A. Harding, Prof. of Dairy Husbandry, University of Illinois, who says: "Pasteurization leaves no objectionable influence upon the milk and removes all dangers. Pasteurization is endorsed by the leading students of the milk problems."

11th.—The Republic of France in 1912 passed legislation requiring all milk offered for sale for human consumption to be efficiently pasteurized. This was endorsed by the Pasteur Institute, the medical profession and the colleges.

12th.—Prof. H. Kenwood, M.B., F.R.S.E., D.P.H., Medical Officer of Health, Bedfordshire County Council and Metropolitan Borough of Stoke-Newington, and Medical Officer of Health for the County of Bedfordshire, Examiner in Public Health for the Royal College of Physicians and Surgeons, when in an address before the Royal Sanitary Institute on Pure Milk Supply, in

conclusion, said:—"No one acquainted with the facts can question for a moment the value of pasteurization of milk in saving lives and preventing sickness among infants."

It must be obvious to you then that the evidence concerning the advisability of pasteurization of milk has all been in for years and judgment has been handed out by the most competent judges. The case is therefore closed. It is consequently no longer debatable, all objections having been met to the satisfaction of any intelligent observer.

The safeguarding of a municipal milk supply is as important, if not more so, than the safeguarding of the water supply. A municipality would be no more justified in not enforcing the pasteurization of all milk not coming from tuberculin tested herds and up to the standard of certified milk, than they would be in not requiring the filtration or chlorination, or both, of their contaminated water supplies.

With this indisputable evidence of the unchanged chemical composition of milk and the unimpaired digestibility and unimpaired nutritive value of milk after pasteurization, you can quite understand our treating the complaints made about this unchanged milk disagreeing with infants, as a joke. In the light of modern knowledge no one who has any regard for the advances of medical science could possibly take any one seriously who does not believe in the bacterial origin of disease. I presume, however, we will always have people of this character to deal with.

Sir William Jenner, when he presented the principles of vaccination against small-pox; Pollender, who first discovered the germ of anthrax in the blood of the cow, and his successors in bacteriology, Devaine, Pasteur, Koch and a multitude of others, had to contend with similar obstructionists.

When Lord Lister introduced the principles of antiseptic surgery, which were based on the germ origin of infection, he was performing an operation in a London hospital, under these principles, an operation that no surgeon would have dared to perform previous to this. A London surgeon, standing by, said, referring to Lister: "That man should be tried for malpractice." Yet since the introduction of antiseptic surgery it has been the means of saving more lives than were destroyed by all the wars of the nineteenth century; and coming to more recent dates, we have the introduction of antitoxin for diphtheria, which, when admin-

istered early, has robbed this disease of most of its terrors,—and yet the virtues of this were discredited by many until results were so convincing that any further argument against its use was untenable. We are still experiencing to a certain extent the same attack in regard to anti-typhoid vaccine. In fact all who have stood for the advancement of medical science and the science of preventive medicine have had to stand fast, at times, against withering fires of criticism and abuse. As has been recently expressed in the New York Medical Record: "The antiquated, fetish-like arguments against pasteurization, like floating corks, keep bobbing above the surface; but pasteurization has come to stay, and its success in everyday practice, year after year, and in the case of thousands upon thousands, yea, hundreds of thousands of infants whose lives have been saved by it, should quiet all hostile arguments."

It was with a knowledge of the foregoing facts that the Local Board of Health on the recommendation of the Medical Officer of Health, passed the ordinance governing the pasteurization of Toronto's milk supply, after having previously considered most carefully every phase of the problem.

While we may at times feel sorry for those who are unable to keep pace with the advances of medical science, yet we cannot permit our sympathies to warp our judgments in the efficient administration of the sacred trust which has been placed in our hands.

Let me say in conclusion, while we will always courteously receive suggestions from any well-intentioned citizens and carefully weigh them, yet it must be remembered that a health ordinance is not a "scrap of paper," to be crumpled up or revised to suit the whims of any group of citizens. The Local Board of Health and the Department of Public Health are alone responsible for the safeguarding of the health and lives of the citizens, and consequently they and they only must decide the policy of public health administration for the city.

Respectfully submitted,

CHAS. J. HASTINGS,
Medical Officer of Health and
Executive Officer of the Board.