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The Water Situation in Toronto.

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ADDRESSING the Canadian Club on "The Water Situation in Toronto," Dr. Amyot, Bacteriologist of the Provincial Board of Health, said:

Mr. President and Gentlemen,—The water situation in Toronto is an important topic. We get our water from the lake half a mile from the south shore of the Island and a quarter of a mile east of the Lighthouse, at a depth of fifty feet, the elbow being some eighty feet down. It is conducted across the Island and under the Bay to the well at the foot of John street, and is pumped to the city just as it came from the lake—with possible additions. The pipe is on various levels and supplies the 30,000,000 gallons of water per day which is required. Now, I may say that this pipe must be a constant danger. There may be a break at any time. The pipe is only a temporary one, and Mr. Keating said he was surprised that it had lasted as long as it has.

Now, the physical condition of this water taken from the lake is good. The objection is to its hygienic condition, and probably, if it were not for the fortunate position in which the intake is located, there would be much more infection than there now is.

Toronto empties 30,000,000 gallons of sewage each day. Two-thirds of this is emptied into the Bay, and the other third goes to the lake direct; in other words, of the 30,000,000 gallons of sewage daily, 20,000,000 goes into the Bay, while 10,000,000 is taken directly to the lake. This at times reaches the water intake. The result is that we have typhoid fever in the city, just as we would expect. The Bay water does not get directly into the pipe. Sometimes two to four months will go by with no colon bacilli in the tap water. Then there is the other 10,000,000 gallons of sewage which empties east of the Island, and is at times swept over the intake. The result is inevitable. The history of all sewage polluted waters is typhoid.

Notwithstanding the fact that our intake is at a very good point, the death rate from typhoid in Toronto is 22 per

100,000. It is true that other places with intakes as close to the shore as ours and throwing in as much sewage, have larger rates, but that is probably due to the more or less protected position of our intake. Although there are many cities having a larger death rate than Toronto, there is no northern city with an unquestioned water supply that has as high a death rate. Chicago, for instance, with pipes four miles out, has as large a death rate.

That our water is infected has been proven by examinations made in the laboratory. In the last four years 964 specimens were taken on as many days, and 18 per cent. were found to be infected with colon bacilli, which are the bacilli of human or animal intestinal origin. During the summer of 1906 an investigation was made out in the lake, and on five occasions infection was found over the intake and traced from the Eastern Gap to the intake, or from the sewers to the west of the Island over the intake.

In Toronto during the last eight years there have been 368 deaths from typhoid fever. As the percentage of deaths to cases is about seven, it means that we have had about 5,000 cases. We have no gauge on the case rate, but we have a gauge on the death rate. The death rate in Toronto is 22 per 100,000. This 22 is not a very high rate, but Hamilton has only a death rate of 15, while Kingston, Ottawa, Montreal and Winnipeg are all higher. Among the American cities we have some lower, but many much higher. The United States is too young, too apparently engrossed in its own commercial development, to pay sufficient attention to the hygienic end. The death rates in the best American cities are not as low as they should be. In Boston the rate is 16 per 100,000; in New York 18, in Worcester 16, in Chicago 22, Albany 20, Cleveland 22, Buffalo 45, Philadelphia 65. So that Toronto's rate is not the highest, but the rate is too high for Toronto.

Now, make a comparison with the European cities that have had time and experience to meet this problem. They are cities that did have big typhoid death rates, but now, by looking after their water supply, have reduced their rates. Vienna and Munich, both of which get their water supply from the mountain streams, have a death rate of only 8. Others get their water from artesian wells: in unquestioned soil and have death rates as follows: Dresden 8, Frankfort 6, and Copenhagen 8. Other places which had big death rates have reduced them by filtering their water. There is Berlin with 8, Rotterdam with 8, Hamburg with 8, La Hague with 8, and Zurich with 8.

Everything is favorable here from the fact that Toronto has one single supply of water and an almost unexcelled water carriage sewerage. Toronto has no outhouses, and therefore enjoys fly exclusion. Again, the small quantity of typhoid in the country round about and supplying milk to the city is a great advantage. There really seems no doubt that by correcting the water conditions we would also have our death rate reduced to eight or thereabouts.

Other cities have experienced great alterations for the better. Chicago for three years had a death rate from typhoid of 115 with the old intakes one mile from the shore. For the three years after the new intakes were adopted four miles out the rate dropped to 40. Then they introduced the drainage canal. This carried away three-quarters of the sewage and the rate fell to 22.

Cleveland had a similar experience. With its old intake for two years the death rate was 165. With a new intake in the next two years it dropped to 22. Toronto with the old wooden conduit had 55. The next five years, with the steel pipe, it dropped to 21.

In Europe, Zurich, under the old unfiltered water conditions, in five years had a rate of 75, while after filtration it dropped to 8. Hamburg went from 28 with unfiltered water to 7 after filtration. In Lawrence, Mass., the death rate was 110 with unfiltered water. It has come down to 30 with the adoption of filtration, and Lawrence has a double water supply. In Albany for nine years the rate was 85, while for the next nine years with filtered water it came down to 20. Albany, too, has a double supply. The neighboring city of Troy made practically no reduction in this time.

What, then, is the remedy for Toronto? Filtration is proposed as a first choice and complete disposal of the sewage as a second choice. Filtration is the better because it protects us every hour of the day, while the disposal of sewage is placed in the second place because of its lack of uniformity in protection. Again, water filtration will cost very much less than complete sewage disposal, and can be put in with the least delay. A complete sewage disposal scheme would probably take four or five years to complete.

Now, as to location. The location of the filter would seem best at Garrison Commons. It would thus cause the least derangement of the present distribution system, and would present the least engineering difficulties, consequently it would cost less and we would run less risk of polluting our water after filtering it.

The filter must either be established at the high level or at the low level. A filter at the high level would cost a good deal more and would disturb the present distribution system, because of necessity it would have to be taken to Eglinton or Scarborough Heights. At the low level the choice would lie between the Island and Garrison Common.

The Island presents serious engineering difficulties and the water, after filtration, would run the risk of pollution on its way to the city under the Bay. At Garrison Common there would be no engineering difficulties, and there would be less disturbance of the existing distributing system. The danger of pollution after filtration would be reduced to the minimum. The filters and clear water reservoir being covered ones, no disturbance of park scheme would present itself. They would be under cover and out of sight, and thus an ornament rather than otherwise.

Now, having pure water, the question of sewage disposal is reduced to principally a mechanical one, and it is a question whether even a trunk sewer would be necessary. The only approximately safe way to treat the sewage to even partially effectually protect the water supply is by the intermittent sand filtration method. This would consist of a trunk sewer to the neighborhood of the Woodbine, septic tanks and reservoirs there to hold 30,000,000 gallons at least, and a high lift pump to raise the sewage by a force main to the neighborhood of Danforth Road, where some 400 or 500 acres of sewage beds would have to be laid out and maintained, the effluent from these being carried into the Don behind and thus into the lake.

This method would probably cost four times as much as the filtration of water would, and would protect us indifferently, whereas the water filtration would protect us uniformly and all the time.

Now, with a good water filter in, sewage disposal is reduced to taking the 200 tons of solids a day out of the Bay, which can be done by sedimentation tanks, and a reduction of the organic matter to one-half over the raw sewage by a series of septic tanks, and then by some chemical method there should be provided a very efficient sterilization for the harmful bacteria that still exist in the septic effluent. We would thus have a clean harbor and a clean water front and a water filter that would protect us against any of the harmful bacteria that might be left.