

Kober (Geo. M.)

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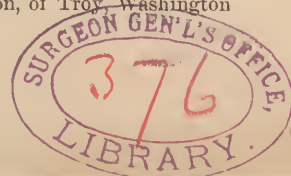
RELATIONS OF WATER SUPPLY AND SEWERS TO THE HEALTH OF CITIES, WITH SPECIAL REFERENCE TO THE CITY OF WASHINGTON.

[Address before the Civic Center by GEO. M. KOBER, M. D., January 15, 1897.]

It has been my duty, as a member of the committee on public sanitation, to study the relations of our sewers and water supply to the health of this city. Similar studies by medical men have furnished long ago the answer to the oft-recurring question, "How is it our fathers got along without these so-called modern improvements?" and "What has sanitation accomplished towards prolonging human life?"

Although sewers and aqueducts are not of modern origin, and figure in the history of Rome over 2,000 years ago, it is true that during the dark ages, when ignorance and brutal prejudice ruled, they fell into disuse, while in most places they never existed; but as pure air and water are a vital necessity to man, and therefore the chief sanitary requisites of a community, we need not be surprised that the mortality of towns without them was greater than the birth rate, and that the city populations had to be recruited continually from the country—conditions which existed until the beginning of the present century. Nor need we wonder that the average length of human life in the sixteenth century was only 18 to 20 years, while to-day it is over 40 years. (The mortality of London between 1660-70 was 80 per 1,000, between 1728-50 it was still 40 per 1,000, while at the present day it is from 20 to 21 per 1,000.) Indeed, we have ample evidence that with the introduction of these so-called modern sanitary improvements the general mortality in numerous cities during the past forty years has been reduced fully one-half, the good effects being especially shown by a marked decrease in the number of cases of typhoid fever, diarrheal diseases, and consumption. This statement is based upon statistical data, with which I do not care to burden you, but they are so conclusive as regards the diminution of typhoid fever that to-day an undue prevalence of this disease in a city is considered an index of an impure water supply or defective sewer system, particularly the former, and the question naturally arises, "How does our National Capital compare in this respect with other cities in the United States?"

I regret to state that of 54 cities tabulated by Professor Mason, of Troy, Washington



stands No. 7 on the list as regards the death rate from typhoid fever; only Denver, Allegheny, Camden, Pittsburg, Newark, and Charleston furnished a higher rate. This is all the more lamentable because our rate is double and treble that of cities like New York, Brooklyn, Boston, Buffalo, Milwaukee, Detroit, Toledo, New Orleans, etc. Nor can we console ourselves with the idea that this condition is purely ephemeral, for investigation has shown that typhoid fever has increased with approximate uniformity during the past fifteen years—that is to say, while the typhoid fever death rate in 1881 was only 3.6 per 10,000 living inhabitants, it has gradually increased with only slight annual fluctuations until for the year ending June 30, 1896, it has reached 8.12 per 10,000 of inhabitants. This would, indeed, be discouraging if investigation last year had not revealed the significant fact that the disease is more prevalent in the suburbs and in sections where people, in the absence of sewers and a general water supply, are compelled to resort to box privies and wells. Thus, for example, while the typhoid fever death rate in the suburbs and northeast last year was 8.44 and 8.76 per 10,000, the rate in the northwest section—i. e., the region west of Thirteenth street to Rock Creek and north of the Potomac to Florida avenue—furnished only 1.71 per 10,000, or only a slight fraction over that of Lynn, Mass., which city has a rate of 1.6 per 10,000, and stands at the head of American cities as regards exemption from typhoid fever. In other words, were every section of this district supplied with the same sanitary conditions as are enjoyed by the 52,000 residents of the northwest, the National Capital would lead her sister cities as regards exemption from this particular disease. This to my mind indicates the encouraging fact that the prevalence of typhoid fever in this city is not influenced by climatic conditions, but is associated with local unsanitary factors, and, therefore, to a great extent preventable.

I have already intimated that impure water and soil pollution must be invoked to explain the undue prevalence of the disease in the suburbs and certain parts of the city, simply because the absence of sewers compels recourse to makeshifts by which the soil is liable to pollution with the dejecta of patients suffering from typhoid fever, and by percolation we have subsequent infection of the well water. Leaky and defective sewers may, of course, produce the same ultimate result on wells within the city limits. As a matter of fact, of 436 cases of typhoid fever investigated 289 were largely consumers of well water, and 132 were largely consumers of Potomac water; and, as in 26 of 70⁰ samples of water examined by Dr. Kinyoun, of the Marine-Hospital Service, sewage bacteria were found, it points with more than mere suspicion to the fact that the germs of typhoid fever may be conveyed from the intestinal tract to the soil and from the soil back to the system, chiefly through the water supply.

In 1895 there were, in round numbers, 39,000 houses in this district with sewer connections and about 13,000 houses still supplied with makeshifts; and it is a noteworthy fact that the unsewered houses, constituting about one-third of all the houses, furnished 160, or more than one-half, of all the typhoid-fever houses investigated. The role these boxes play in the pollution of soil, water, and air is best judged by the fact that during the fiscal year ending June 30, 1895, the sanitary inspector reported 4,372 as "full," 746 as leaky, 5,201 as filthy, and 230 as dilapidated. These makeshifts, even if there were no wells, would be still a source of danger, in so far as they favor the transmission of germs by means of flies infecting the food. Nor can the possibility be ignored that these germs in leaky and overflowing boxes may reach the upper layer of the soil and with pulverized dust gain access to the system.

It is gratifying, therefore, that Congress during the last session passed a law providing for the drainage of lots, which will enable the health department to abolish a large number of these nuisances, and I may add that the Civic Center and the committee on legislature of the medical society materially aided our efficient health officer in the passage of this bill.

I deem it the duty of every good citizen to aid in the prompt abatement of these

nuisances, and after their removal the soil in the vicinity should be thoroughly disinfected, as the germs of typhoid fever implanted in the manner referred to may live for an indefinite time unless destroyed by germicides.

In regard to the number of surface wells, I am pleased to report, upon information kindly furnished by Captain Burr, that there were only 143 in service June 30, 1896, a decrease of 128 during the past five years, and also that, upon the petition of the residents of Takoma and Brookland, and at a considerable personal expense, Potomac water has been introduced for the first time in the history of Takoma, and distributing pipes have been greatly extended in Brookland. These suburbs suffered severely from typhoid fever last year, and are evidently hoping to improve their water supply.

In addition to the surface wells, there are now 11 artesian wells in the district, 9 having been sunk since July last—4 in the southwest, 4 in the southeast, and 1 in the northwest. While no bacteriologic examination has been made of these recent wells, the result of the first two justifies the hope that water free from sewage bacteria may be obtained; but until repeated examinations have proved their purity it will be unwise to advocate what has elsewhere proved a failure, for the city of Charleston is supplied with artesian wells, yielding 16,000,000 gallons daily, and yet its typhoid fever rate is 9.8 per 10,000.

If I were asked to explain the remarkable exemption from typhoid fever in the northwestern section of this city, I should attribute it not only to better sanitary environment, but also to the fact that the residents are especially careful in the selection of their drinking water.

While nothing short of a house-to-house census could determine the number of families who use domestic filters or sterilize their water by boiling, I am quite certain that these precautions are more generally employed there than in any other section of the city, and Körösi, of Budapest, has shown that of 7,000 residents in the most fashionable part of his native city those who used filtered water contributed 9.3 cases of typhoid fever and the consumers of unfiltered water furnished 14.1 cases per 10,000.

While I consider the prompt abandonment of every surface well and box privy as extremely necessary, because it eliminates two important factors in the dissemination of the disease, I fear the danger will not be removed until we secure a pure general water supply with a comprehensive sewer system. My reason for this belief is that the closing of nearly one-half of the pumps in this city during the past five years has led to no perceptible decrease in the amount of typhoid fever, showing that they were not the only cause, and that the other causes must really be on the increase. It is difficult to estimate the amount of injury done by scattering the germs from leaky or overflowing boxes, since the possibility of areal infection in the absence of positive proof is denied by many sanitarians; but there is no doubt about the increased sources of pollution of the Potomac River, which constitutes our general water supply. There are now over 23,000 people living in towns along the river, and since this stream receives directly or indirectly the drainage not only of these towns, but also of every hamlet and farmhouse washed by its shores and tributaries, and as the number of inhabitants in this watershed is constantly increasing and typhoid fever is very prevalent among them, and, finally, as sewage bacteria have been repeatedly demonstrated in the tap water of our city, the possibilities of infection with the typhoid bacillus are too numerous. These are disagreeable facts, but the sooner they are corrected, in the language of Dr. Busey, "the better it will be for the health of our residents and the fair name of our city."

You will ask, Can they be corrected? and I unhesitatingly answer yes, because a summary of the evidence on this subject reveals the significant fact that cities, both at home and abroad, in which there has been the most marked decrease in the typhoid fever death rate are those in which a pure water supply has been substituted for a pre-existing contaminated one. Thus, for example, the typhoid fever death rate in Boston in 1846-1849 was still 17.4 per 10,000; in 1890-1892 it had fallen to 3.2 per 10,000, the

city having in the meantime expended \$25,000,000 on its water supply. The rate from this disease in Lawrence, Mass., for five years prior to 1893 was 12.7 per 10,000. After the establishment of sand filters, in September, 1893, the rate fell during the first twelve months to 5.2 per 10,000. In other words, 48 human lives at a value of \$5,000 each, or a total value of \$220,000, were saved to that city by an expenditure of only \$65,000 for the plant and \$4,000 running expenses per year. The typhoid fever death rate in Chicago in 1892 was 14.3 per 10,000. After improving the water supply it fell to 5.6 per 10,000. In 1874 the rate in Vienna was 11.5 per 10,000, and with the introduction of a pure water supply it has fallen to less than 2 per 10,000. The experience of London, Berlin, Munich, and a host of other cities has been precisely the same.

Munich was notorious for its excessive typhoid fever death rate, it being 29 per 10,000 in 1856. With the introduction of a pure water supply and improved sewer system it has fallen to less than 2 per 10,000.

The question has passed beyond the speculative or experimental stage. Conservative cities are not in the habit of authorizing the expenditure of large sums of money without counting the cost and results; and the mortality statistics have furnished more eloquent and conclusive arguments than the most zealous advocates of sanitary reforms.

It is gratifying to know that a city like Philadelphia, with even a lower typhoid fever rate than ours, has recently taken active steps to improve its water supply; and Pittsburg, within the past week or two, has sent an official committee to Lawrence, Mass., to inspect the method of water filtration by sand.

An abundance of water does not limit the spread of typhoid fever, for New York City, with only 78 gallons per head a day, has only 2.3 deaths, while this city, with a daily per capita consumption of 173 gallons, furnishes 8.12 deaths. Let us advocate, therefore, an ample quantity of pure water, and until this is accomplished let us filter and boil our drinking water, boil our milk, and thoroughly disinfect the excreta of typhoid fever patients.

The frequent presence of dead animals, 16 of which, according to the report of the health officer for 1889, were found and removed in June of that year in the drifts near Seneca dam, the almost constant presence of sewage bacteria in Potomac water, and an excessive and ever increasing typhoid fever rate, I believe more than justify our claim for the necessity of an improved water supply.

Without underrating the importance of a perfect system of sewers and the reclamation of the low lands along the Eastern Branch, sand filtration of our water supply will accomplish more for the health of this city than any single factor; and if the expenditure of \$1,000,000, with an average annual expense of \$60,000, will save this city 100 deaths from typhoid fever per annum, not to mention ten times the number of cases and the stigma which now attaches to our city, it will indeed prove a profitable investment.

It is our duty and privilege to point out the facts; it is clearly the duty of those in authority to investigate and apply the remedy, and hygiene has long since demonstrated the methods by which it may be successfully accomplished.

And, as the right of petition is not denied to us, I submit the following resolutions:

RESOLUTION PASSED BY THE CIVIC CENTER JANUARY 15, 1897.

Whereas, the statistics of the health officer of the District of Columbia indicate an almost uniform increase and excessive prevalence of typhoid fever during the past 15 years, and

Whereas, the experience of the civilized world points to a contaminated water supply as the most important factor in the causation of this disease; therefore be it

Resolved, That we, the Civic Center of the City of Washington, a body composed of members who are working for the public good, most earnestly pray the Senate and House of Representatives in Congress assembled, that you will create a commission * * * for the purpose of determining the present sources of contamination of the Potomac River, and the measures necessary to remedy, remove, and prevent such pollution, if found to exist.