PURE vs. IMPURE DRINKING WATER

THE bearing which the impurity of water supply has upon the typhoid death-rate was indicated fairly well in an article by Mr. J. W. Ellms, filtration superintendent, Cincinnati Waterworks, in the December, 1913, issue of the American Public Health Journal. The article referred to conditions in Cincinnati before and after a purified water supply had been established.

For the three years preceding the installation of a purification system the typhoid death-rate averaged 53 per 100,000 population. For the five years following the purification of the water supply the death rates per 100,000 were 19, 13, 5.7, 11.4, and 7.1, respectively This represents an average reduction in the number of deaths from this disease of nearly 80%. The reduction in the cases reported is very nearly 85%, when estimated for this same period. Whether other sanitary reforms approximately coincident with the purification of the water supply have not played some part in the diminution of cases from this disease, the writer is not prepared to say; but there is little doubt that the principal agency has been the substitution of a pure for an impure drinking water.

A study of the accompanying table with a view to establishing some relation between the fluctuations in the typhoid death-rate and the quality of the water does not lead to any very positive conclusions. It immediately raises a question as to whether we really obtain any direct measure of the purity of a water in the usual bacterial examinations which are made. So far as the total number of organisms removed is concerned these results indicate a water of high purity. On the other hand, the presence of fecal or gas-producing organisms likely to be associated with the typhoid bacillus, as shown by the presumptive positive B. coli figures, would lead one to believe that the entire absence of these organisms in a water is by no means absolutely necessary as an indication of what experience has shown to be a safe drinking water. The reduction in the number of B. coli effected by filtration alone is evidently in the same proportion as that obtained in the reduction of the total number of bacteria. No selective action takes place in filtration, although there appears to be some such action when the disinfecting agent, calcium hypochlorite, is used.

So long as bacteriology is unable to furnish reliable and rapid methods for the isolation of pathogenic organisms in water, it will be necessary to rely on circumstantial evidence, such as has been furnished by the remarkable reduction of typhoid fever in Cincinnati, following the introduction of a purified drinking water. Since all those cases, in which the source of the infection remains untraced, may have been infected through agencies such as flies, shell-fish, raw vegetables, fruits and bacillus carriers, it reduces the probability of our present purified drinking water being a source of infection to practically zero.

Comparison of the Typhoid Fever Death-Rate With the Hygienic Quality of the Water Supply of Cincinnati, 1909 to 1912.

	1909.	1910.	1911.	1912.
Typhoid-fever death-rate per 100,000 of population	13	5.7	11.4	7.1
Percentage reduction from average death-rate for three years preceding introduction of filtered water supply	75	90	79	89
Average number of bacteria per c.c.—				
In river water	9,300	8,900	13,790	11,130
In filtered water	75	75	39	26
Percentage reduction of bacteria by purification	99.2	99.2	99.7	99.8
Yearly percentages of presumptive positive B. Coli results obtained in various amounts of the river and filtered water—				
In river water in 1 c.c.	93.2	91.0	85.3	93.5
In filtered water in 1 c.c.	1.0*	7.9*	5.2†	3.0‡
In filtered water in 100 c.c.	66.0*	65.0*	84.3†	51.6‡
Percentages of presumptive positive B. coli results in 100 c.c. of filtered water for the period of disinfection—				
Before disinfecting filtered water	....	....	88.9	89.3
After disinfecting filtered water	....	....	12.8	27.7

*No sterilizing agent used. †Disinfection with calcium hypochlorite for first three months of 1911. ‡Disinfection with calcium hypochlorite for first six and one-half months of 1912.

The project is being advanced by the Conservation Commission of New York State, which is akin to that of the Hydro-Electric Commission of Ontario. It is proposed to conserve, own, and develop, all the water powers in New York, so that eventually every factory in the state will be operated by electric energy and every house illuminated. It involves the further use of the Niagara Falls on the American side, the use of the Long Sault Falls, on the St. Lawrence, the Genesee Falls and the surplus water of the barge canal between Troy and Schenectady. Power on every stream in the state, will be taken over, and connected with the general plant so that in time the state, for many purposes, if not for all, will be independent of the coal interests.

Some time ago the company which supplies Berlin, Germany, with electric current, acquired lands with extensive deposits of lignite or brown coal at Bitterfeld 83 miles south of Berlin, and decided to build a power plant there to generate electricity for Berlin. Upon further exploration, however, the deposit of lignite turned out to be so vast that the company determined to build a plant large enough to supply all the towns within a radius of about 100 miles. The company thinks that it has an ample supply of lignite for nearly a 100 years. It will turn the coal directly into electricity; and this it proposed to do so economically that electricity will be used even for cooking and heating, because no other kind of fuel will be able to compete with it in price.