

THE SIGNIFICANCE OF B. COLI IN WATER EXAMINATION.

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WHILE too much importance has been attached in the past to the presence of B. Coli in water used for domestic supplies, it is regrettable that the pendulum is now showing a tendency to swing too far in the opposite direction. The paper of Geo. A. Johnson (Proc. Amer. Waterworks Assoc. 1913, pp. 399-455), of Johnson and Fuller, New York, is an illustration of this movement. The all too common practice of using arbitrary and empirical methods in the bacteriological examination of water is partially responsible for the present *status res*, and in this regard bacteriologists have only themselves to blame. As will be shown later, the mere presence or absence of B. Coli in an arbitrarily fixed amount of water may have no significance when considered without regard to other circumstances; and in attempting this we are merely opening the way for criticism. The Committee on Standards of the American Public Health Association (1912) evidently recognized the futility of such procedure when they recommended that quantitative estimations should be made of B. Coli. They add: "Qualitative results, when viewed superficially, may seem easier to obtain than, and quite as conclusive as, quantitative results; but detailed evidence shows that in general the quantitative tests are by far the most fruitful source of information." It would appear that the Committee might have gone further and deprecated the use of qualitative tests except under extraordinary circumstances. This procedure has also had a deleterious effect on those connected with sani-

all the higher and lower animals. In cold-blooded animals the occurrence is less constant, and more or less discordant results have been obtained. Dr. Amyot (Trans. Am. Pub. Health Assoc., 1901), concluded that B. Coli is not normal in the intestines of fish, and that when present it is due to the polluted environment. The tendency among animals generally is for B. Coli to become rarer as the zoological type becomes lower. None of the lower types, however, are susceptible to typhoid fever, man being alone in this respect, so that there is a possibility

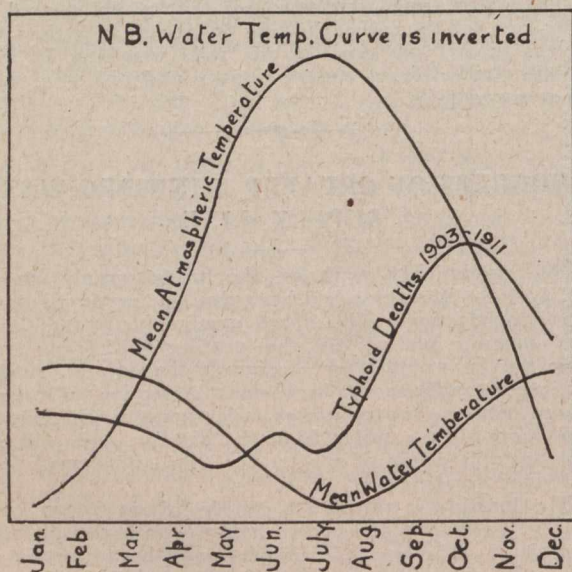


Fig. 1.—Showing Typhoid Deaths in Ottawa, 1903-1911.

tary work, and who, by reason of their lack of familiarity with the technique employed have accepted this sophism. The author believes that, even with all the assistance that quantitative methods of examination afford, it is often difficult to give a sound opinion on the hygienic quality of a water supply, and that it would be folly to revert to the older methods.

There are many points of difficulty surrounding the significance of B. Coli, and on several of these the present knowledge is very meagre. Almost everyone is aware that B. Coli is common to the excreta of nearly

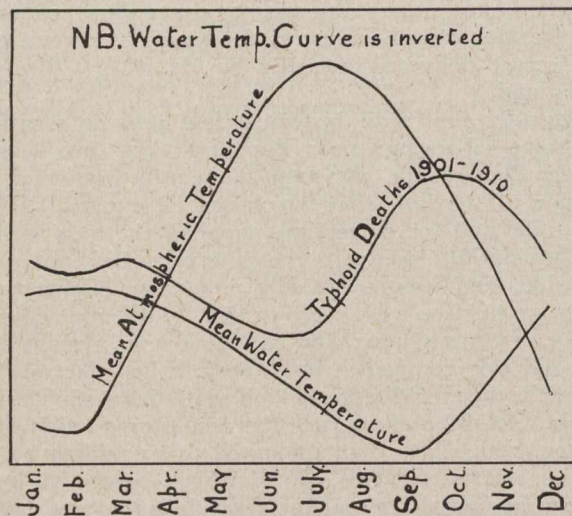


Fig. 2.—Showing Typhoid Deaths in Toronto, 1901-1910.

of having B. Coli unaccompanied by B. Typhosus. This B. Coli has, therefore, no significance.

In reference to the B. Coli present in a water supply and due to human sources, it is important that information should be obtained regarding the total population on the watershed, the prevalence of typhoid and the probable period elapsing before the diluted sewage reaches the water services of the town under consideration.

The population is comparatively easy to obtain, and the typhoid death rate can, in most cases, be calculated from past records. In addition to the mortality, however, the case incidence should also be considered, as this has an important bearing on the probable ratio of B. Coli to B. Typhosus by its influence on the number of carriers. In Great Britain and certain portions of Europe the incidence is much lower and the case mortality higher than on this continent, so that the ratio of B. Coli to B. Typhosus is entirely different. It is possible that this ratio is ten times greater in North America than in Europe, and much greater significance ought, therefore, to be attached to B. Coli here.

The period elapsing between the discharge of the sewage and the withdrawal of the water is the most important factor, and in this connection the temperature of the water must be considered. Typhoid bacilli, in the absence of suitable food material, find an unsuitable environment in water, and the cell energy being entirely of a katabolic nature, they die rapidly. It is obvious that this increases with the period of storage, and a consideration of the mechanism of the process also leads to the conclusion that the katabolic wasting increases with rise in temperature and vice versa. Dr. Houston and others have supported this hypothesis by numerous and conclusive experiments. It is important, therefore, that the bacterial contamination should be considered in its relation to the water temperature, and this leads to the conclusion that B. Coli should be regarded as having greater significance in winter than in summer. In the diagrams