

Lawrence ; causing there a later outbreak of the same disease that had prevailed in Lowell.

It is suggestive that the city of Haverhill, situated on the Merrimac nine miles below Lawrence, but not deriving its water-supply from this river, had a typhoid fever death-rate, in 1889 of only 3.33 per 10,000.

In the past year Lowell and Lawrence experienced an epidemic of typhoid fever of great severity. An apparently successful attempt was made to prove the existence of cases of typhoid fever at points on the river above Lowell, and to show that the discharges from the bowels of the sick had found immediate entrance to the river. In the months of August and September, several well-defined cases of the disease had occurred in people living along the course of stony Brook, an affluent of the Merrimac, entering the river at a

point about two and half miles above the in-take of the Lowell water-works. Some of the sick, in the early stages of the disease, had made use of the privies which overhang the brook.

The temporal connection of these cases was such that, with the allowance of two weeks for the time occupied by the incubation and early stages of the disease up to the time of taking to bed, we find an apparently direct relation to the serious increase of the disease in Lowell in October, 1890. The amount of infective matter did not at this time appear to be sufficient to pollute the river, to the same serious extent, at the in-take of the Lawrence water-works nine miles below Lowell. With the increase of the disease in Lowell, however, there came the growing specific pollution of the river, and the people of Lawrence began, in turn, to suffer, throughout November.

THE WONDERFUL WORK OF THE LEUCOCYTES IN ANIMAL BODIES.

IN "Evolution and Disease," Dr. J. Bland Sutton reviews the principal facts known in connection with the evolution of morbid processes, called disease. The blood of the higher animals contains, besides the "red blood-corpuscles," familiar by name at least to most people, large numbers of "white" or "colorless corpuscles," which fulfil some very extraordinary functions. These have been named leucocytes, and consist of little masses of protoplasm more or less rounded, without a surrounding membrane or wall, and *capable of motion*. They exist, too, in the lymph and other fluids of the body.

When a portion of an animal dies the leucocytes attack it; and if it be small, will cluster round and, by a process of intra-cellular digestion, devour it; if large, they effect a separation between the dead part and the living body. Not only are dead or damaged portions of tissue thus disposed of, but useless parts—such as the tails and gills of tadpoles, the milk or first teeth, &c.—are slowly re-

moved by the same process. Animal tissues appear to be incapable of resisting an attack of leucocytes.

Small pieces of clean sponge introduced into animal tissues disappear in a few days; while indigestible objects—glass, or a fragment of metal—are surrounded by a large number of leucocytes that are soon transformed into neutral tissue which isolates the intruders from neighboring parts. Should the intruded body contain particles of dirt offensive to the leucocytes, their action is intensified to a degree highly disastrous, for they die in the conflict, and in a few hours the foreign substance is surrounded by a fluid—pus—containing the dead cells. When this fluid escapes, as when a small abscess "breaks" or is lanced, the cause of the disturbance often escapes with it.

Leucocytes, in their behavior to foreign bodies, may be compared to bees. When the offender is small it is quickly stung to death and cast out. When large, it is deprived of life and rendered innocuous by a covering of wax.