

“Qualitative Analysis.

“Search was made for harmful varieties by passing 12 gallons of water through a sterile Pasteur filter and examining the resulting deposit. The sample thus taken represents water in the mains during the 22nd and 26th November. *Bacillus coli* was sought for and found by the neutral red method. The number per cubic centimeter probably is not high, as even in the deposit the reaction was delayed for five days. Still, the significance of the presence of this organism must not be overlooked.

“Klein’s method of anaerobic milk cultures was adopted for the detection of organisms of the *Bacillus enteritidis sperogenes* type, and by this means an organism was isolated causing butyric fermentation in milk, but not fatal to guinea-pigs. It is not the bacillus of Botkin, but of the same nature, and doubtless has the same significance.

“Interpretation of Results.

“So far as number of bacteria is concerned, the Auckland water this year remains much as it is generally—i.e., a water containing from three to four hundred organisms per cubic centimeter, which places it in the class of waters of medium purity. This result has been obtained at any analysis of tap-water made during the past five years. During the autumn of 1898 the water was of bad quality, probably a result of the use of an auxiliary spring during the dry weather, when the organisms sometimes numbered two to three thousand per cubic centimeter; but this was exceptional.

“It is interesting to compare my results this year with those of Mr. Pond, whose samples were taken about the same time as mine. The main spring showed only twenty-five organisms per cubic centimeter, and this is bacteriologically a very pure water at present. Probably in very wet weather, when a greater share is thrown upon the scoria beds over the catchment-area, this water would be less satisfactory; but at present the chief source from which the bacilli are derived is the Nihotupu water, which Mr. Pond found to contain 236 per cubic centimeter. This is not unduly high considering the distance it has come and the nature of the ground from which the water has been collected. In the Ponsonby reservoir he found only 67 per cubic centimeter, which suggests that at the time he took the sample only a small proportion of Nihotupu water was being pumped, and the chief source was the main spring. A month later I found 130 organisms; this would be about the proportion were the Nihotupu and main spring waters equal in amount in the reservoir. The difference between our observations is not too great to be accounted for by some variation in the proportion of the sources. Any water repeatedly observed shows great fluctuations in the numbers of organisms, often varying to the extent of several hundred per cubic centimeter in a short time.

“Judged merely by numbers, the water is fairly satisfactory, but when we come to consider the nature of the organisms present it is more disquieting. The presence of the *Bacillus coli*, though not necessarily sufficient ground for condemning a water outright, is at least enough to make us inquire very carefully into the sources from whence this organism can be derived, as it undoubtedly indicates animal pollution, and where it is present other organisms of an animal origin and of a more serious nature may also find their way. So, too, with the milk-curdling anaerobic bacillus and those forming putrid decomposition in the gelatine. None of these should be found in a really pure water—yet here we have them in a water which is chemically, and according to numerical bacterial analysis, satisfactory. This indicates that the source of origin of these harmful germs is small in quantity. Were there any large source of pollution the number of germs would be thousands rather than hundreds per cubic centimeter.

“It is evidently not at the main spring; for this source of supply, though indubitably in a dangerous position, is according to Mr. Pond’s observations very pure at the present time. If the scoria-beds through which the water for this spring percolates were admitting the *Bacillus coli* other organisms would probably be present in larger amount also. The Nihotupu water, though it has a fair number of organisms, comes from a catchment-area where one would not expect to find organisms of the type found in animal excreta, &c. The pipes which pass through the pond at the western springs are liable to leakage, and in water drawn from the pond one might well expect to find *coli* and the other undesirable ingredients; yet were they to come from this source the water drawn from the pumping-well at the Western Springs would give an indication of such pollution, and Mr. Pond’s analysis done on the 1st November shows this water to be if anything purer than that in the main spring.

“I conclude that the pollution is derived from a source after the water has passed the pumping-station, and this I take to be the very faulty construction of the roof at the Ponsonby reservoir by which all the dust from the street which lodges on the roof is washed by the rain back into the tank. It is difficult to see what advantage is gained by this arrangement, yet the attention of the Council has been drawn to this defect, both by yourself and formerly. The *Bacillus coli* and other bacteria might well be derived from horse-droppings and from the house-refuse blowing about the street. Such a source would give just the proportion of undesirable organisms as was found—no widespread pollution, but sufficient to be detected—by the methods of analysis adopted, and sufficient also to cause disturbances of the digestive organs, more especially in young children using this water unboiled, since organisms of the *coli*, *proteus*, and gas-producing types are each in themselves known to have been the cause of outbreaks of diarrhoea, enteritis, and so forth.

“In order to test this supposition that the Ponsonby reservoir roof might be the fault in the system at which the contamination gains entrance, I made examination of some of the muddy water found in the gutter running along the western aspect of the reservoir. In this mud a gas-producing organism was found identical in every respect with that found in the tap-water, while the *Bacillus coli* was also present. As this mud would wash down into the reservoir at the first rain, it seems to me conclusive that at least a portion of the pollution comes from this source; and I consider you would be justified in laying before the Council this further evidence of the necessity for removing this very insanitary arrangement.”