

Metropolis water supply : remarks on the water supplied by the West Middlesex Water Works Company / by Alfred Swaine Taylor.

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METROPOLIS WATER SUPPLY.

REMARKS

ON THE

WATER SUPPLIED

BY THE

WEST MIDDLESEX WATER WORKS COMPANY.

c BY

ALFRED SWAINE TAYLOR, ESQ., M.D., F.R.S.,

Professor of Medical Jurisprudence and late Professor of
Chemistry in Guy's Hospital.

1872

WEST MIDDLESEX WATER WORKS.

OFFICE,—19, MARYLEBONE ROAD,
LONDON, N.W.

12th March, 1872.

At a Board of Directors this day, a voluntary communication from Dr. Alfred S. Taylor to the Secretary having been read, it was

RESOLVED,—That the same be printed, with Dr. Taylor's sanction, for the use of the Company.

W. H. WHIFFIN,

Secretary.

15, St. James's Terrace,
Regent's Park.

March 7th, 1872.

Dear Sir,

I have received a copy of Dr. Whitmore's report on the quality of the Water supplied to Marylebone by the West Middlesex Company, dated 26th February, 1872. I do not know whether I am indebted to you for the report, but whether or not, you may like to have my opinion of it, as the subject of water-analysis has occupied me more or less during the last forty years. Dr. Whitmore describes the means of filtration and purification adopted by the West Middlesex Company, and the results of his analysis show that the solid contents of the filtered water are not larger than are commonly found in good river and spring water, and that the organic matter is small, not amounting to one grain in an imperial gallon, i.e. less than one seventy thousandth part of the weight of the water. These results, in my opinion, clearly justify the conclusions which he has drawn:—1st. That the West Middlesex Company have adopted the best practical means of filtration which can be applied to so large a quantity as a daily supply of nine millions of gallons; and 2nd, that the water as it is supplied by the Company is of good quality and perfectly wholesome.

Having during the last twenty-one years made many analyses of the water supplied to my house by the West Middlesex Company and compared it with numerous waters derived from rivers, springs and lakes in England and Scotland, I can confirm Dr. Whitmore's general conclusion that the water is good in quality and perfectly wholesome. This opinion is not based merely on chemical analysis, but on twenty-one years' experience derived from its use for all domestic purposes.

I object to the use of the word "impurity" in Dr. Whitmore's analysis, because it has a tendency to mislead the public. He obviously employs this term to represent the solid or mineral constituents of the water, i.e. he applies it to substances such as carbonate of lime, common salt, &c., which are found more or less in all

terrestrial waters, which are natural to these waters, and quite inseparable from them when they have once come in contact with the earth. To prevent their introduction into water as it descends from the clouds, you must prevent it from exerting any solvent action on the mineral and organic matters diffused through the atmosphere and the soil. This is a simple impossibility. We must accept air and water as nature gives them to us, and it is well known to all chemists, that within certain limits, the presence of these ingredients, dissolved from the air and the earth, does not affect the wholesomeness of the water, or, in the ordinary meaning of the term, render it "impure."

There has been of late years a great outcry on the subject of "Sewage Contamination," and some sanitary reformers have gone so far as to describe the Thames water supplied to London as so much "diluted sewage." Dr. Whitmore finds neither sewage nor the products of sewage-decomposition in the water supplied by the West Middlesex Company. This is quite in accordance with the results which I have obtained by an examination of the water supplied to my house. Since the threatened approach of Cholera in 1870-71, I have, for my own information, frequently examined the water for the products of decomposition, but have found none. As to "previous sewage contamination," I believe it to be a myth if we are to understand thereby that the presence of sewage-products in water at any previous time renders that water noxious or unfit for use for ever after. Those who adopt this theory can have but little faith in chemistry, or in the chemical changes which are constantly going on around us. Sanitary reformers might with benefit extend their views beyond towns and cities, and condemn all shallow wells or springs in villages which are so frequently found near manure heaps, middens, or decomposing animal matter!

I have gone more into this subject than I had at first intended, but the Company may like to have the benefit of an independent opinion respecting the water which they supply to this district. I believe there is nothing to apprehend of the dissemination of Cholera or other diseases from the use of such water as that which is now supplied by the West Middlesex Company. For my part I shall regret any change either in the source or mode of supply.

I commend the common sense way in which Dr. Whitmore puts his analysis. A gallon of water is an intelligible quantity. A man may easily calculate within what period of time he consumes a gallon by daily use, and with it the 21 grains of innocent solid substances contained in it. This is preferable to a system now adopted of giving the assumed constitution of 100,000 tons, or a corresponding number of kilogrammes or cubic metres of water. So enormous a quantity is of course beyond the reach of chemical analysis, and the tons of chalk, salt, and organic matter, said to exist therein, are only arrived at by multiplication. A ton of water represents 224 gallons. Within what period of time will a ton of water be consumed by any unit of the community? The answer to this question will show that such modes of laying plain matters before the public are more sensational than practical.

I am, yours faithfully,
(Signed) ALFRED S. TAYLOR, M.D., F.R.S.

P.S.—You are at liberty to make any use you may please of this communication.

W. H. WHIFFIN, Esq.

NOTE ON "LIVING AND MOVING ORGANISMS" CONTAINED IN WATER USED FOR DRINKING.

I agree with Major Bolton, in the opinion expressed in his Reports on Water Supply, dated 31st January and 16th February, 1872 (page 11), that the frequent use of such phrases as "*living organisms*" and "*moving organisms*" in reference to the water supplied to London, is only calculated to excite needless alarm, and to create a prejudice against the use of river water. The terms "*living and moving organisms*" are vague: they may be applied to a slug or a worm, an eel or a monad, the latter being the twenty thousandth of an inch in diameter, and only visible under a powerful microscope. What is probably intended by these

words is the presence in unfiltered water of infusoria or microscopic animalcules.

There is nothing surprising in this announcement, and certainly nothing to create alarm. Microscopic animalcules (living organisms) are found in all waters, whether derived from rivers, lakes, or springs. All that is required for their production is the presence of vegetable or organic matter in a state of partial decay. The leaves of trees, grass, water-weeds, hay, or decaying wood, will in a few days lead to their production in myriads, according to temperature, exposure to air, light, &c. I have thus produced them by soaking the leaves of the elm, lime, and other trees and plants in pure distilled water; and in rain water, collected as it fell in glass vessels, and subsequently filtered through charcoal. They were chiefly animalcules of the genus *paramecium* so frequently found in unfiltered river water. The idea of keeping these animalcules out of water which is exposed to light and air is perfectly utopian, as every microscopist knows. Decaying vegetable matter furnishes their food, and wherever their food exists, there they will be found. Their ova are there developed, and they grow and multiply by millions in a few days. Their presence or absence is no test of the wholesomeness or unwholesomeness of the water. It simply shows that it contains decaying organic matter. When their food, the decaying organic matter, is separated by filtration, these animalcules are no longer found.

In filtered Thames water, such as that which has been supplied to my house for many years by the West Middlesex Company, I have not found them, but in the confervoid mass left on the great filter-beds of sand, I have found the dead and dried animalcules (*naviculæ*) in quantity.

If a water is to be condemned as unwholesome and unfit for domestic use, because "living and moving organisms," i.e. animalcules are found in it, then there is no water in the world which can escape condemnation. The waters of the lakes of Wales and Cumberland, and even the water of Loch Katrine of Scotland, which is commonly taken as a type of purity for domestic use, would on this ground be pronounced undesirable for human consumption. In short, those who would keep these minute infusorial animalcules out of any river or lake water on the earth, must adopt some

scheme for preventing water-plants from growing in the water, or leaves, grass, or other organic substances from falling into it.

It has been recommended that Lake water should be substituted for River water in the supply of London. If the presence of "living and moving organisms" is to be made a test of the fitness of water for domestic use, then it may be well to consider what a great authority, Ehrenberg, says on this subject :—

"The rapid and mysterious transition of colour which is observable on lakes, and which has often created alarm in the timid minds of the superstitious inhabitants of their borders, the microscope has shown to arise from certain changes in the condition of infusoria. Thus a lake of clear transparent water will assume a green colour in the course of a day, nay more, it will become coloured and turbid in the middle of the day, where the sun brings these creatures to the surface and rapidly develops them or causes their dead bodies to ascend, whilst in the morning and evening it will again be clear."—(History of Infusoria living and fossil translated by Pritchard. p. 11).

As to their diffusion, the same authority tells us, page 2:—

"In the clearest waters, and also in the turbid, strongly acid and salt fluids of the various zones of the earth: in springs, rivers, lakes, and seas: in the internal moisture of plants and living bodies, and probably at times carried about in the dust and vapour of the whole atmosphere of the earth, exists a world, by the common senses of mankind unperceived, of very minute living beings, which have been called for the last seventy years *Infusoria*." * * *
 "They are moving bodies from the 1150th to the 25000th part of an inch in diameter." He also says, "All the observations that can be depended upon tend to show that infusions of vegetable or animal matters, whether natural or artificial, only offer food for the nourishment of these living atoms, whose germs are almost every where present, but are only developed in solutions congenial to their nature." (p. 23).

Ehrenberg for many years has experimented with simple spring water, with distilled and rain water, and these both boiled and cold, as also with and without vegetable matter; in open vessels, after a longer or shorter time, depending on

temperature and other circumstances, he invariably found the infusoria, while in closed vessels they were rarely to be met with. (p. 24).

These statements are fully corroborated by the researches of Dr. Carpenter, Rymer Jones, and other competent authorities.

Considering the facts here adduced, it is desirable that future scientific reports on the quality of the water supplied to London should not contain these alarming statements of the presence of "living and moving organisms" in turbid and muddy samples, or it should be fairly stated that they are just as likely to be found in turbid water taken from any lake, river, or spring. The latter fact is suppressed, and thus it is made to appear to the public, that the presence of "organisms" in Thames river water is a proof of its unwholesomeness, and that it is an exceptional impurity as contrasted with other waters.

There can be no doubt, as Major Bolton observes, that these published official Reports are far more alarming when cursorily examined than when closely inspected. (p. 14). I quite agree in this opinion; and I believe that I understate the case when I say, that for one person who closely inspects such reports, there are ninety-nine who cursorily examine them. The great majority of readers, who are unacquainted with the microscope or with chemistry, are liable to be misled.

The Major also properly points out the confusion likely to arise from the comparison of the amount of *organic matter* in water, and the *organic elements* in sewage, which are in fact identical with those of most of the solids used as food. (p. 14.)

As to the influence of these animalcules in water on health, Major Bolton deduces from the statistics of the parish of St. Mary's, Newington, that over a period of five years, the highest death-rate appeared in that year in which "the living and moving organisms were *not* found in the water," (p. 13), and yet their presence in the water was made, by the Vestry of the parish, the basis of a complaint of its being unfit for domestic use.

ALFRED S. TAYLOR, M.D., F.R.S.
15, St. James's Terrace,
Regent's Park,
March 11th, 1872.