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LOCAL DECOMPOSITION IN LEAD AQUEDUCT PIPES.

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IN many cities and towns supplied with aqueduct water, physicians not unfrequently meet with certain anomalous affections in patients, which do not readily yield to what seem to be appropriate remedies. Confident that the general influence of the water is harmless, and not suspecting any decomposition resulting from *local* causes, sufficient to change its character, the idea of lead-poisoning does not enter the mind, although the diagnostic symptoms point in that direction. The same class of perplexing, persistent symptoms are often met with in individuals and families using well and cistern water, brought to them in contact with lead, and the character of the disease is not suspected until the plumber is required to repair the pipe made leaky by corrosive action.

The physician is not, however, so liable to overlook or mistake the cause, when lead affections exist in families removed from town or city supplies. The reason is, that competent chemists are commissioned to make careful and extended experiments to ascertain the effect of such water upon lead, and their reports generally assert the non-liability of contamination. It is just that confidence should be reposed in the results of their investigations. The experiments and conclusions, respecting the *general* influence of the waters upon lead, are usually accurate and reliable.

There can be no doubt that the waters of Cochituate Lake, like those of most New England ponds, in their freedom from chlorides and nitrates, and generally holding in solution sufficient carbonic acid to change soluble oxides into insoluble carbonates, are safe to use after passing through lead pipe, under ordinary circumstances. But to form an opinion of their entire safety at all points of delivery, we must inquire if the relationship of chemical forces may not be so affected or changed in one locality, as to change the

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character of the water flowing in that direction. We certainly ought to infer that such is the fact, when the presence of lead is detected in the water, and cases of lead disease are found following its use.

Several years ago, the writer called attention to the instances and causes of local decomposition in lead pipes, through a public journal, and since that time the additional instances that have come to his knowledge have convinced him of the importance of the subject.

The late Dr. Treadwell, of Salem, several years since, suspected, from his symptoms, that he was suffering from lead disease, and sent to me, for analysis, samples of water supplied to his dwelling. The amount of the metal present was found to be large; so large, that, for the purpose of obtaining a comparison of results, a portion was sent to a distinguished chemical friend for his examination. The results in no respects differed. The violence of the symptoms in Dr. T.'s case rapidly abated upon his abstaining from the use of the water. A specimen of this aqueduct water, taken from another locality, afforded a trace of lead, while that from other pipes gave no lead reaction with the most delicate tests.

Instances of the kind, that have come under my observation, and those on record, are numerous. It is safe to say that there is no time when there are not individuals in this and other cities and towns suffering from lead disease. It is marvellous how susceptible some individuals are to the influence of this metal in the system. I have been made acquainted with a case where two members of a family of seven were made seriously ill from the use of water containing only, at times, a mere trace of lead—a quantity so infinitesimally small as not to have the least effect upon the health of the others.

In view of the facts, it seems necessary to inquire, what produces this lead impregnation in certain houses or districts, while the general waters of a supply remain unaffected?

In the course of investigations, several interesting facts have been developed, tending to throw light upon this subject. I have noticed in the leaden pipes removed from cess pools, sinks and wells, that the intensity of corrosive action had been in a great measure confined to the sharpest bends and depressions in the pipe, and in some instances other portions remained intact.

I have in my possession a section of supply-pipe, removed from the aqueduct of a neighboring city, in a portion of which corrosive action had proceeded so far as to cause leakage. The part thus acted upon was confined to an acute angle, and there is evidence to show that the plumber, in placing it in position, bent it in the wrong direction, thus creating the necessity for another turn in the opposite. This pipe had doubtless been subjected to two violent turns, which seriously impaired the homogeneity of the

metal. An examination of lead pipe removed from buildings will certainly show that where there has been any perceptible amount of decomposition, it has been confined to the angles and depressions in its course.

There are three causes or agencies which may, perhaps, be sufficient to produce these results:—

1. The disturbance in the crystalline structure of the metal by bending, whereby its electrical condition is changed and voltaic action promoted, giving rise to chemical decomposition.

2. The presence of organic matter, such as fragments of leaves, and impurities pervading all pond waters, and which may be detained in angles and depressions of the pipes. Their presence, undoubtedly, promotes oxydation, and the protoxide of lead will remain in solution, unless sufficient carbonic acid is furnished to change it. It is easy to conceive of conditions where this could not be the case.

3. Corrosions may be produced in lead pipes by the accidental presence of pieces of mortar. Where mortar is present, the lime would assist in oxydizing the metal, and also aid in the solution of the oxide. Considerable portions of fresh mortar are frequently deposited in lead pipes, during the erection of buildings. When the family commence the use of the water, it holds the salts of lead in solution, and its presence may be detected for months. The process of oxydation, which is retarded or prevented altogether by the presence of neutral salts in water, could not be materially interfered with under the conditions considered.

It is obvious, if these observations and conclusions are correct, that much care should be exercised in placing pipes in position, in buildings. In those leading to the culinary department, angles and depressions should be avoided. Violent twists and turns should not be permitted; and during the erection of houses, the open ends of protruding pipes should be carefully closed.

Assuming the general fact that lead pipes, conveying the waters of our New England ponds, become coated and protected by an insoluble lead salt, the question arises, how long before this protection is secured, or, how soon may a family commence the use of water passing through new pipes, with safety? In view of the manifest danger from local disturbances, the most sensible reply would be, *never*. A section of new lead pipe, immersed in Cochituate water one hour, at a temperature of 65° Fahr., gave a decided lead reaction with sulphhydric acid. Removed, and placed in six fresh portions of water, one hour in each, the waters, when tested, gave similar results. The experiment continued during two weeks. Varying the time of immersion in fresh portions of water from one hour to ten, the lead indications continued, although at last feeble. These results are sufficient to show that individuals or families should not commence the use of water

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flowing through new pipes, until a considerable time has elapsed, and much water contact secured.

It is important that medical gentlemen should be made fully aware of every source from whence disease may arise, and if there are symptoms in patients indicating lead affections, it would seem desirable that investigations should be instituted to ascertain the facts, although there may be no apparent source through which the salts of lead could be introduced into the system.

12 *Kilby Street*, September, 1860.

THE BED CASE,

OR AN IMAGINARY AFFECTION WHICH CONFINES THE PATIENT IN BED, AND IS PRECEDED OR NOT BY DISEASE.

BY WALTER CHANNING, M.D.

[Concluded from page 142.]

A PROFESSIONAL friend, of the highest reputation among his brethren for his knowledge of disease, and of its treatment, related to me the last case but one, and some others of the affection under consideration, of singular interest. The first of these was in a lady, the mother of two daughters. She gradually sank, and, after a long confinement to bed, and much suffering, she died. One of her daughters sickened, and took to the bed, which at length became her only dwelling place. She died after long suffering, and without manifesting any other symptoms than those which have marked my own narrated cases of the disease. The surviving daughter, not long after, gave indications of the approach of Bed Case, and at its earliest appearance my friend labored to prevent its establishment. There was the same apparently unconquerable disposition to go to bed, and to continue in it, as in the preceding cases. He succeeded in preventing the gratification of this intense longing; and for a short time the young lady seemed to be doing well. Pulmonary consumption, however, gradually showed itself in its severest signs, and was fatal. A question suggested itself to the narrator, how far the prevention of Bed Case was the cause of consumption; and almost regret was expressed at the course which was adopted when it first showed itself. But the result in the two first cases was a demand for prevention of the Bed Case, and the means used were successful. This did not save from death. The form only was changed under which death came.

I was called, three or four years ago, to see a young lady who was represented as having been bed-ridden for some years. I reached the address, and was introduced to the patient, Miss —, who seemed about twenty, and was lying on a low bedstead, as if for the convenience of being tended. Her appearance was of perfect health; with that addition to a natural delicacy of skin