ENTERIC FEVER, DIARRHŒA, DIPHTHERIA, AND SCARLATINA, ORIGINATING FROM DRINKING-WATER.*

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I. MRS. P., farmer's wife, aged 35, in June 1871, suffered from a typical attack of enteric fever, with hæmorrhage from the bowels, from which she made a perfect recovery. Diarrhœa had previously never been absent for more than a fortnight at a time from the house. Either the father or the mother, or one or other of the four children, or one of the servants, was the sufferer. Two children had been attacked with scarlatina, of which, and of the other ailments enumerated, there had been no case in the neighbourhood for more than two months previously. Nearly the whole household had also repeatedly suffered from more or less severe sore-throat, one child having diphtheritic patches on the tonsils on one occasion. By the method of exclusion, I arrived at the conviction, after the milk-supply had been changed with no benefit, that all these illnesses, to which the family were so prone, must arise from the water of the well used for drinking purposes. My opinion was not seriously listened to till the typhoid fever set in, when the alarming state of the patient secured me, at last, a favourable hearing. The water formerly in use was given up, and a new supply brought from another well about fifty yards off.

The unhealthy symptoms ceased from the day of the change. So marked was the improvement that, in a month, the farmer and the landlord (the latter's mansion being close by) at length consented to my long urged request to clear out and examine the old well in the yard, the water of which they had formerly drunk. An old drain, which carried the liquid refuse from the pigstye and cattle-sheds, was found opening into the well, about five feet from the surface.

After this outlet had been built up, and the drainage of the yard diverted into an adjoining water-course, the family once more resorted to the old well; and, during the three years they remained at the farm, there was no recurrence of any of the former symptoms.

I ought to add, that neither enteric fever nor any similar disease had affected the stock during the whole period of the illnesses referred to.

II. In the residence of the gentleman who owned the farm where so much illness arose from the use of contaminated water, and which was not more than one hundred and twenty yards from the farmhouse, sore-throats, twice accompanied by diphtheritic patches, were seldom absent. Diarrhœa was also a constant guest; but, though frequently of a typhoid type, it never passed into thoroughly developed enteric fever.

Every other source of poisoning having been eliminated by elaborate inquiry, I laid it down that the symptoms must arise from the pollution of the potable water. The aged head of the family, who, strange to say, was the only inmate who never suffered from any of the symptoms referred to, was of the old school, represented by a worthy and reverend friend of mine, who died from enteric fever, who did not believe in modern sanitation, and who was accustomed to boast that he had a cesspool so deep and so capacious that it needed cleaning out only once in every thirty years. My hale and venerable patient, firm in his belief that neither bad water nor bad smells ever hurt anyone, had always ridiculed my interpretation of the cause of the constant unhealthy state of the household, and would never accede to the well and drains being examined. But the result of the inquiry into the sanitary state of the farm so convinced the rest of the family, that a thorough inspection of the sanitary state of the house was instituted. The result was unmistakable. The well from which the supply of drinking-water had been taken was in the middle of the courtyard, which latter was traversed by four brick drains, one from each corner of the house, these drains converging into one large common drain at a point adjoining the well. Large leaks were found in all the drains, the leaks being caused by rats. The refuse from the drains had thus been freely soaking into the well. It only remains to add that, since the defects were made good and the drainage no longer allowed to pour into the well, the old diphtheritic and enteric symptoms have never reappeared.

III. Three sons of a gentleman farmer, aged respectively 13, 11, and 8 years, were simultaneously struck down by diphtheria. Notwithstanding the most watchful care and nursing, all three died within ten days. No other member of the numerous family was attacked. There had been no diphtheria in the neighbourhood, and none of the family had been where it was. The milk-supply was found blameless; so, unless it be contended that the poison was "in the air", there was no other

possible solution than that the drinking-water was at fault. The well lay in a hollow in the farmyard, and there was considerable leakage into it from the brick drains leading from the cowshed and pigstye, through the surrounding damp soil.

IV. In an old county family, the father, aged 35, was seized with diphtheritic sore-throat and typhoid diarrhœa; and the son, aged 5, with similar throat-symptoms and extreme weakness. Both had suffered previously from repeated, though less severe, attacks of sore-throat and diarrhœa respectively. The milk was minutely examined, and found pure; but, opening into the well (behind the immense pile of buildings), from which the drinking-water for the establishment was drawn, were found leakages from seven different drains emerging from the house. As soon as proper sanitary measures were completed, the family, who had all left, returned; the old well was used as before; and no ill consequences of the nature to which the father and son had formerly been subject thereafter overtook them.

REMARKS.—These are but a few cases, selected from a large number, where contaminated water seemed to be the originating cause of enteric fever, diarrhœa, diphtheria, or scarlatina. I have seen, in one family at the same time, one member struck down by scarlatina, a second by diphtheria, a third by diarrhœa, a fourth and a fifth by slight sore-throat, and a sixth by erysipelas. In more than one instance of this kind, the varied diseased conditions were all traced to the impure drinking-water.*

I have long been driven to the conclusion that the same contaminated drinking-water may, without the presence of specific germs, give rise to different diseases, the poison making itself manifest in the shape of erysipelas, scarlatina, diphtheria, diarrhœa, or enteric fever. The source is the same, the poison is the same, but the physical state of the individual constitution, or some idiosyncrasy of susceptibility, or some differential surrounding condition, is the factor in determining the special form of ailment which the poison may assume in any particular case.

FACTS ILLUSTRATIVE OF THE SPREAD OF ENTERIC FEVER AND DIARRHŒA, BY THE AGENCY OF POLLUTED DRINKING-WATER.†

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THE distribution of enteric fever in the central mining district of West Cornwall is so peculiar as to be worthy of record; and, as we ascribe this peculiarity to the varying nature of the water-supply, a short account may not prove uninteresting to those who take part in this discussion.

The district presents an area of about 40,000 acres, and a population of about 50,000 persons. The occupation of the working-classes is, to a small extent, agricultural; but the great industry is tin and copper mining, with its subsidiary employments. The density of population varies very much, some of the courts in Redruth and Camborne being as overcrowded as similar arrangements in large cities; while, in other parts, the district is so purely agricultural as to have a very thinly scattered population. The towns of Redruth and Camborne have each a population of about 8,000; but the distance (three miles) between these towns is occupied by three villages and their offshoots, so that the roadway is almost a continuous street. These towns are only three miles and a half from the north coast of Cornwall, and the whole district is daily swept by Atlantic breezes. No sewage-works have as yet been completed for this district. In Camborne, the pipes are being laid down; in Redruth, the engineers' plans have not yet been sanctioned by the Local Government Board. Redruth dates its water-supply from 1854. Camborne received its boon of a bountiful supply of pure water from a public company in 1870. The milk-supply of the two towns and the many villages is not carried out on any largely organised plan, many of the small farmers keeping a few cows, and disposing of the milk and cream to their immediate neighbours.

It will be seen that the conditions are favourable for the study of the etiology and spread of any zymotic disease, as the factors of sewer-gas and polluted milk-supply, which frequently give trouble in large towns, are at once eliminated from the inquiry by their non-existence. The seaboard also effectually guards against the admission of any infectious disease from without, except at certain ports; and almost invariably infectious diseases may be traced along the lines of traffic from one

* It should be understood that in these remarks I refer only to the apparent origination of disease. Instances of propagation, through water infected with excretions from previous cases of disease, are continually confronting me.

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