symptoms are really but secondary, and the sign of absorption of bacillary products, then doubtless the same holds with the numerous other diseases due to these minute living bodies.

I fear that our increased experience has not shown us any specific remedy capable of controlling the disease, unless salicin or the salicylates may in some degree possess this power. As its main effect is to depress nervous vitality, so the avoidance of any debilitating treatment has been the first essential principle, and all measures calculated to rest and comfort and support the patient the second. Of drugs, I think that antipyrin in five-grain doses has held its ground as the most effective remedy for the primary headache; whilst for the bronchial irritation and inflammation, nothing has appeared to be so generally useful as the carbonate, or the spirit of ammonia with tincture of bark, combined with chloric or sulphuric ether as required. Champagne, or other wine, or some spirit, has been most valuable; and warmth externally, anodyne embrocations, and inhalations of carbolic acid with conium have proved most useful in suitable cases; also, after the existence of the disease for some days or longer, the tincture of iron with quinine and a mineral acid has occasionally given distinct relief. The treatment by iron has of late been specially recommended, but we must not forget that in 1847 Sir Thomas Watson wrote: "I know no tonics so good as the sulphate of quinine or of iron for these patients." The iron salt would appear to be specially useful in those cases where a suppurative or alkaline tendency has shown itself.

THE DISCHARGE OF TOWN SEWAGE INTO THE SEA IN THE VICINITY OF WATERING PLACES.

By LOUIS C. PARKES, M.D., D.P.H.LOND.,

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WHILST a majority of those who are engaged in public health work are ready to admit that the water-carriage system of removing sewage from towns is far superior as regards health, comfort, and decency to any conservancy system, it cannot be denied that water-borne sewage is more difficult to dispose of satisfactorily than the waste refuse obtained by the more primitive methods. In the case of towns on or near the seashore, the problem looks simple enough. The sea is close by, the volume of water in it is immeasurable; therefore why not cast the sewage into the sea? Many towns, including a good many noted health resorts, pursue such a system to the greater or less satisfaction of their residents and visitors; why should not all do so? This, then, is the consideration I wish to bring before you on this occasion, in a town whose popularity is so immense, that its future as a successful rival of Brighton, the queen of English watering places, is only a matter of time.

First, if the sewage is discharged by an outfall sewer or sewers close to the confines of the town, unless the period of discharge is very limited, and the site of the outfall very carefully chosen, it is more than probable that the sewage, or part of it, will be cast back upon the beach within the town, or will traverse more or less of its frontage. If the sewage is conveyed outside the town, even for a considerable distance—two, three, four, five, or six miles—there is still a risk of such occurrences during certain states of tide and weather, for it must be remembered that on our coasts sea currents and tides flow only in one direction for a certain time, and then flow back again, so that it is possible that when spring tides are giving place to neap, or the reverse, and when aided by strong and persistent winds from the right quarter, the sewage discharged on any one tide may be carried back by the next, or those following it, and so reach the beach, the promenade, and the pier of the town from which it came. Such sewage is, of course, much diluted with sea water, but the mixing action between sea water and sewage is not so quick or intimate as between sewage and fresh river water, and it

may well be that under certain circumstances the mixing and dilution has not been sufficient in amount to destroy and render innocuous the harmful matters of the sewage.

Again, the effect of the sea salts upon the dissolved matters of the sewage is to cause their partial precipitation, and upon the suspended and solid matters to harden them and cement them by a sort of pickling action. Human faeces have much the same specific gravity as fresh water. When not buoyed up by gases entangled in their meshes they usually, however, sink in water. Owing to the greater specific gravity of sea water faeces come to the surface and float when sewage is discharged into the sea, and the lumps of solid faeces not broken up by the flow of sewage in the sewers are hardened by the salt, rise to the surface, and, floating there, are liable to be acted upon by the winds and propelled in directions and to distances which often seem impossible. Probably many bathers at a great number of seaside resorts, especially if long swimmers, have been surprised, when at a considerable distance from shore, to come across some of these unwelcome visitors which seem to have come from no one knows where. I myself have had such unpleasant experiences, and probably some of my audience could corroborate me.

Now, if such things can and do happen, what are the consequences? We all know that people who bathe, especially the inexperienced bathers—the women and children—are very apt to swallow involuntarily at times some of the fluid in which they disport themselves. Does there not lie here an explanation of some of that illness—attacks of diarrhoea, vomiting, headache, etc.—which visitors at some seaside resorts appear to suffer from, whose cause is often very doubtful, but which is generally attributed to the strength of the air, the heat of the sun, or some other fanciful origin? And if such cases, why not those apparently unaccountable cases of typhoid fever, which are so often said to have been incubating since the patient left his or her home, and which nothing in the sanitary condition of his lodgings or of the town generally can satisfactorily account for? I do not wish to lay too much stress upon this point, but to ask my hearers who are medical men at seaside resorts, when they meet with suspicious cases of illness simulating drain poisoning, or even with attacks of typhoid fever for which they cannot find a cause, to inquire as to the bathing habits of the patient, and as to his ever having found himself in the neighbourhood, when bathing, of floating sewage.

Besides this danger, which is a hidden and insidious one, there is of course the obvious and recognisable offence of sewage matters cast up on the foreshore in or near the town. The nuisance here, and the danger to those who make the beach their playground, is so obvious and tangible that I need not allude to it further. A remedy is sure to be sought and applied by the responsible authority for the good name and material interests of the town. My intention is rather to indicate the hidden and unseen dangers of discharging crude sewage into the sea, and to sound a note of warning to the authorities of those towns who—relying upon the advice of engineers and the evidence of float experiments carried on usually under normal conditions of wind and weather—are prepared to assert that the method of discharge which they are about to inaugurate is absolutely incapable of allowing any sewage to find its way back to the town and its beach. No one believes now that sewage discharged into the sea is carried away at once to mid-channel, there to disappear. What usually happens is that the tidal currents setting along the shore carry the sewage a certain distance up the coast, and then bring it back again, more or less diluted it is true, and not generally recognisable as sewage, but still possibly pregnant with danger from non-destruction of its harmful qualities.

The general conditions I would formulate under which town sewage may be discharged into the sea are briefly as follows:—

1. The spot chosen for discharge should be some miles from the town or from any part of the beach usually resorted to by visitors.
2. The sewage must only be discharged for three hours of every tide, and of course with the tidal current carrying it away from the direction of the town. If discharged for much longer than three hours some of the sewage will be borne back past the outfall with the flowing or ebbing tide, as the

case may be, a considerable distance in the direction of the town.

3. Reservoirs must be constructed to store the sewage awaiting discharge. Tank sewers, that is, long lengths of large outfall sewer designed to accumulate the sewage when the tide is unfavourable, are insanitary abominations. The solid matters deposit from the stagnant sewage, putrefy and give rise to offensive gases which no amount of ventilation can render innocuous. If the gradients are insufficient to allow of the sewage being conveyed by gravitation to the proper distance outside the town, pumping must be resorted to. Shone's system of sewage ejection has answered well in several seaside resorts, and the sewage is delivered fresh and undecomposed at the outfall.

4, and lastly. The sewage should be treated with sufficient chemicals in the reservoirs at the outfall to cause the deposit of the greater part of the suspended and solid matters in it. If this is done there will be no danger of solid floating faeces finding their way back to the bathing grounds. If such chemical precipitation is considered too costly, at least the sewage should be thoroughly well strained through sieves of small mesh, so as to arrest those solid matters which are at once the most offensive and the farthest travelling constituents of the sewage when ejected into the sea.

These remarks are applicable to the cases of all towns discharging their sewage into the sea, but mainly so in the case of towns of some size, say, exceeding 10,000 in population, where the volume of sewage to be got rid of is considerable.

A DISCUSSION

ON THE

WATER SUPPLY OF RURAL COMMUNITIES

WHERE (A) STREAMS, (B) PONDS, OR (C) SHALLOW WELLS ARE RELIED UPON.

In the Section of Public Medicine at the Annual Meeting of the British Medical Association, held in Bournemouth, July, 1891.

I.—JOHN C. THRESH, M.D. (M.O.H. Essex).

THIS is one of the important subjects which has been selected for discussion by the members of this Section of our Association. To medical officers of health for rural districts it is of the greatest interest from its practical character. Probably in all large rural districts a certain number of villages or hamlets were supplied with drinking water from such sources, and in the great majority of cases analysis would show that the waters were more or less seriously polluted either with vegetable or animal matter, or with both. From time to time outbreaks of diarrhoea or of typhoid fever are traced to the use of such waters, but as a rule, in the intervals between such epidemics, the most careful examination of the mortality statistics fails to discover any effect upon the death-rate either from all causes or from any particular cause.

Quite recently I published the results of my inquiries into the water supplies of the sixty-five parishes in my districts, and the tables exhibited, which are based upon that report, show that the influence of the character and quality of the water supply could not be traced. That it has a prejudicial influence I feel convinced, but it is so masked by others, that as yet I have been unable to demonstrate it. There is no doubt that the system adopts itself to the use of such waters, and unless some specific poison gains access to the supply, the evil effects produced are but slight and escape detection. That this is the case is, I think, proved by instances such as the following, which I have recently observed. A family accustomed to drink the water of a sewage-polluted well removed into another portion of the district, where a pond was the nearest available water supply. The children all suffered from diarrhoea. The family asked permission to take water from a well on a neighbouring farm which I had condemned as dangerously sewage polluted. The diarrhoea at once ceased, and the children again enjoyed good health. In another case a labourer, having removed to a cottage on the marshes where water could only be obtained from a pond, a child was attacked with "marsh" fever, and the general health of all the other members of the family was affected. After a few months he

was obliged to remove to another portion of the marshes where a shallow well water was available, and in a very short time the effect of the change was most marked. Pond waters almost invariably contain much vegetable matter. In shallow wells, on the other hand, the polluting matter is of animal origin. In rivers there is usually both.

Given that supplies from such sources are alone available, how can the risk necessarily attendant upon their use be reduced to a minimum? Domestic filters, and the boiling of water in all cases before use, naturally suggest themselves. In my experience neither are practicable. Supply a number of cottages with filters, as I have seen done, and in twelve months' time most of them will be broken or unused and the remainder totally unfit for use. As for boiling, it is quite impossible to insure that all the water taken by children shall have been boiled. If the water is to be purified, or if any attempt is to be made to purify it, this must be done before the water enters the house. River or pond water may be caused to filter through sand or some purifying material into a well from which it can be drawn by a pump. My experiments with filtering media for this purpose, other than sand and gravel, have so far all been failures. Recently a filter bed containing a layer of a certain compound of iron had to be removed and simple sand substituted, as after a time the people asserted—and rightly—that the pump water was worse than the pond water. Such filtering materials unfortunately require constant aëration if their purifying properties are to be maintained, and this as yet I have been unable satisfactorily to accomplish on a small scale. If the filter bed could be freely exposed and the river or pond water discharged automatically from a siphon at such intervals as to allow of the aëration of the filter bed between each discharge the result might prove a success. As yet I have not had the opportunity of testing such an arrangement.

Shallow wells are almost invariably defective in construction. No portion of the brickwork is cemented, and, if the water is raised by a pump, the top is often covered by old railway sleepers and a few inches of earth. I invariably recommend such wells, after being thoroughly cleaned, to be rebuilt for a number of feet proportionate to the depth—4 or 5 feet at the least—the new brickwork to be set in cement and well puddled behind with stiff clay; the top should be domed over and similarly protected. In this way access of surface water is prevented. All the water which reaches the well must have percolated through 4 or 5 feet at least of earth, and have had its organic impurities more or less oxidised by the nitrifying organisms or the oxygen occluded in the soil.

Wherever practicable there should be a public supply, for the purity of which the sanitary authority is responsible. Where the expenditure necessary to obtain such a supply would be too great for any one village, it has sometimes been found possible to obtain sufficient water from one source to meet the requirements of a group of villages, amongst which the expense could be divided.

II.—E. F. WILLOUGHBY, M.D.

DR. WILLOUGHBY said that in a somewhat extensive acquaintance with the dairy farms of the midland counties from Berks to Somersetshire in the west and to Bedfordshire in the north, and on every geological formation from the Reading beds to the lower oolite, his attention had been specially directed to the frequently unsatisfactory and sometimes sadly deficient water supply of the rural populations. He criticised the term "shallow" wells as equivocal, for depth *per se* was of little importance, since one of 20 feet deep fed by percolation from the surface might be dangerous, and another of 15 feet beneath a superficial bed of clay 6 feet thick would be perfectly safe. The efficiency of mere mechanical filtration was proportioned to the thickness of the filtering stratum, but the purifying process dependent on the nitrifying action of bacteria did not take place to any appreciable extent beyond 6 feet from the surface. Ten feet of homogeneous sandy loam surmounted by clean turf formed an ideal filter on which slops might be thrown with impunity, but the pollution of wells most often resulted from horizontal percolation from cesspits, and on a plane beneath the bacterial zone, especially in rocky strata in which the masonry of both was apt to be