be classed as "suspicious." However, it is abundantly used by the bazaar people, and the club uses it for every purpose, even for the manufacture of soda water. There can be no doubt but that the spring comes from the base of Mount Murdar, and that it gets contaminated as it approaches Quetta.

The Hunna Pass Water from Zarghum.

Chlorine	-	-	-	1·19	grains per gallon.
H ₂ SO ₄	-	-	-	2·52	" "
Silica	-	-	-	·14	" "
Lime	-	-	-	1·61	" "
Magnesia	-	-	-	1·19	" "
Total solids	-	-	-	7·70	" "
Free ammonia	-	-	-	·29	grains per million.
Albuminoid ammonia	-	-	-	·14	" "

Considering the large amount of ammonia present (according to the same author), the Hunna Pass water must be classed as "impure." There are several small country mills and some small villages built on the Hunna stream, and there can be no doubt but that the water is fearfully contaminated by the natives before it reaches Quetta.

With regard to the water supply of Peshin, I have roughly examined it, and find it is very impure. Consequently it may be laid down as a point of fact that the drinking water supplied to the troops serving on this frontier is most dangerous. Wherever there is a spring, there you will find a native village, or camping ground, or graveyard, and these will most certainly contaminate the water as it flows past. However, the remedy for such a nuisance is quite evident, and needs no further remarks from me. I have shown that the climate is bad, that the quarters are bad, and that the water is dangerous. Consequently it may reasonably be inferred that certain diseases must be very prevalent; and we will now turn our attention to the consideration of them.

[*To be continued.*]

ART. XX.—*On an Outbreak of Diphtheria.*^a By ALBERT MOUILLOT, M.B., Gorey.

AN outbreak of diphtheria which came under my observation last year seems to me to be worth bringing under the notice of the Academy of Medicine as a contribution to the natural history of

^a Read before the Medical Section of the Academy of Medicine in Ireland, Friday, February 25, 1887.

that disease—particularly as all the cases that recovered have been under my observation ever since the outbreak occurred, and consequently none of the after-effects are likely to have passed unnoticed. On the 12th of December, 1885, there were twenty-four children attending the female and infant school attached to the Gorey Workhouse. All were in good health. On that day the first case was brought to me, and in a short time fourteen of these children, whose ages ranged from three to sixteen years, had diphtheria. In addition to these I had four other cases—one the mother of one of the children; another an infant, whose sister attended the school; a third, a child admitted to the school subsequent to the 12th December, who was seized in seven days after admission; and the fourth, a patient who was a convalescent from typhus, and took the disease in the fever hospital, to which place all the cases were transferred as they occurred.

It would take too long, and be too tedious, to give in detail my notes of these eighteen cases, so I shall content myself with giving an analysis of them; after which I will lay before you what I believe to have been the cause of the outbreak, and conclude with a few observations on the lessons taught me by it.

In three cases—aged five, six, and sixteen—the appearance of the throat was characteristic of diphtheria, and both local and constitutional symptoms were extremely severe. Of these cases one, aged five, died on the tenth day, with laryngeal symptoms; the others recovered without any ill effects. In four cases the false membrane was well developed, though the local symptoms were mild. One of this group, a child, who was attacked while convalescent from typhus, had her larynx involved on the fifth day. The dyspnoea was most distressing. I was anxious to perform tracheotomy, but the mother objected; however, after a severe struggle the child recovered. The three other cases got well; but one, aged four, suffered from ocular paralysis and partial paraplegia for six months. The cervical glands were enlarged in all cases in both these groups. In ten cases the appearance of the pharynx was that of follicular tonsillitis; there was no tendency to the formation of membrane; the tonsils were enlarged and the follicles covered with the usual yellow secretion; in eight of these cases the cervical glands were enlarged. The symptoms were mild, the only complaint being slight soreness of the throat. One of these cases subsequently suffered from paralysis of the palate, and nearly died of inanition in consequence. The remaining case was an infant, thirteen

months old, who was not brought to me until the larynx was involved, and she died in a few hours.

To sum up briefly—out of eighteen cases two died, two had paralysis, and the remaining fourteen recovered without any after ill effects.

I should mention, however, that even in the mildest cases recovery to complete health was very slow. The nurse, who has had twenty years' experience in the fever hospital, remarked one day that she did not understand how it was that though many of the children did not seem "very bad," yet they did not "come round" like those recovering from fever.

The routine treatment I adopted was the tincture of perchloride of iron and a weak gargle of permanganate of potassium. Stimulants were freely given in a few severe cases, and steaming was used in the three cases in which the larynx was involved, with emetics, when required to relieve the dyspnoea. From the time of the commencement of the outbreak I ordered all the children in the school extra diet, and inspected their throats every morning, so as to isolate them as soon as possible.

In order to come to a correct conclusion as to the cause of this unfortunate outbreak it will be necessary to remind you that the school children have very little opportunity of mixing with the outer world, or even with inmates of other classes in the house. I may also add that neither my friend Dr. Weldon nor myself was aware of any cases in the district at the time. The cause must then be looked for within the workhouse walls, and as only children in the female school were affected it is more likely to be found in some insanitary condition affecting them alone than in polluted milk or water, which would probably also have affected the boys' school and infirmary, all being supplied from the same sources.

In a plan of the drains which I prepared it can be seen that immediately behind the girls' school-room and dormitory is a small yard. This yard had long been disused and never opened. It had been quite forgotten that the drain from the wash-house ran through it instead of taking the more direct course to the outlet. The consequence was that the drain had become choked at a place marked X on the plan, and a most sickening odour was emitted from the catchment trap situated immediately under both school-room and dormitory windows. The conclusions I have drawn from the outbreak are as follows:—

In the first place, it shows, almost beyond doubt, that true

diphtheria *can* be caused by foul drains, and can commence *de novo* in consequence of them, for the drainage of the workhouse is quite separate from that of any other building, and I find no record of any cases having been in the house for twenty years. As diphtheria is a specific disease, some authorities doubt the possibility of this; and if it is possible in the case of diphtheria, why not in typhoid fever? though it is extremely difficult to understand why a bad drain odour should produce one disease in one case and differ in another. Some light might be thrown on this subject by considering the nature of the material which the drains are employed to carry away. In this case the drain is mainly used to convey the washing from the laundry, consisting of soap-suds and water. There are no closets in connection with it, but I have no doubt that urine is occasionally thrown into it, and possibly some of the broth used in the house, which contains meat and vegetables. The second important conclusion is that diphtheria *can* be so like ordinary tonsillitis that, without the history of the case as to opportunities of contagion, it would be impossible to distinguish between them. If one of the ten mild cases mentioned had come first under my notice I would have without hesitation admitted her to the infirmary, in which case the disease might have spread much further.

It can hardly be doubted that these mild cases were really diphtheria, as they were produced by the same cause, followed by paralysis in one case, and in all cases by prolonged debility; and, lastly, because none of the children so affected afterwards got more marked diphtheritic symptoms, though placed in the same ward with certainly diphtheritic cases. This point is of great importance to us in practice. My experience will make me very cautious in declaring any inflammatory sore throat as unimportant and non-contagious if it can be traced to defective drainage. It is remarkable, too, that the cases should vary so much in severity when one considers how much alike the children were in their surroundings.

I have now finished my brief record, and must apologise for the want of any observations on the presence or absence of albuminuria. I found it impossible to have each child's urine kept separate, owing to being short-handed in the nursing department.