as regards faecal contamination, has been fully set forth, but unless the evidence obtained from the presence of members of this group justifies the assumption of gross pollution, as in the case of sample No. 23, it is undesirable to condemn a batch of mussels on this test alone, or indeed on any one test. The combined results of the various tests applied during the present enquiry have to be taken into full consideration.

Bacillus Enteritidis Sporogenes. This organism was sought for in every case. It was not found in one instance, and in the remaining twenty-four samples it occurred as follows:—

Thirteen samples contained between 10 and 100 spores of this organism per mussel.

Ten samples contained between 100 and 1,000 spores of this organism per mussel.

One sample contained between 1,000 and 10,000 spores of this organism per mussel.

Dr. Buchan regards more than 1,000 spores per mussel as evidence of serious pollution.

Streptococci were not found in five instances, and it is interesting to note that none of those five samples yielded any other appreciable evidence of pollution. Of the remaining twenty samples

3 yielded between 10 and 100 streptococci per mussel

5 " " 100 and 1000 " " "

6 " " 1000 and 10,000 " " "

6 " " 10,000 and 100,000 " " "

Dr. Buchan thinks that mussels containing less than 10,000 streptococci per mussel may be considered satisfactory.

B. Typhosus.—Diligent search in the case of every sample was made for the *B. typhosus*, but in no case was it discovered. In this enquiry, malachite green proved somewhat disappointing as a differential agent. The following experiment was made to ascertain the length of time typhoid bacilli may live in mussels: Twelve fresh and live mussels from Killorglin were put into a jar containing a large quantity of Birmingham tap water, to which a little salt had been added, on 20th February, 1908, and an agar slope culture of the *B. typhosus* (48 hours' growth) was added. One day afterwards, a mussel was withdrawn and found to contain many typhoid germs. A mussel was withdrawn each day up to the fourth day, when the mussels were found to be dead. In every instance, typhoid germs were recoverable from the live mussel. At varying intervals after this, up to the twenty-sixth day from commencing the experiment, a mussel (now dead) was withdrawn, and always found to contain typhoid bacilli in abundance. Although the conditions here are somewhat different to those found in nature, the fact is clearly shown that mussels exposed to specific contamination by typhoid bacilli can take up these germs and retain them for a considerable time. This experiment emphasises the need for protecting mussel layings from all possibility of sewage contamination.

A MIXED OUTBREAK OF SCARLET FEVER AND DIPHTHERIA DUE TO INFECTED MILK.

By R. W. C. PIERCE, M.D., B.Sc. Lond.,
Medical Officer of Health, Guildford.

THE following account of an outbreak due to infected milk may be interesting, on account of the fact that the milk appeared to have been charged with the germs both of scarlet fever and diphtheria, and also because of the fact that a second mixed outbreak was originated by the grandson of the incriminated cowman by direct transmission of the infection at school. It is also worthy of note that whilst there can be no reasonable doubt as to the identity of the majority of the cases with true scarlet fever, there appeared to have been an unusually large proportion of sore throats without rash—or, at any rate, without reported rash. The alleged absence of any rash in these cases may have been due to imperfect observation, or to the partial immunity conferred by a previous attack, or, of course, to infection by allied streptococci.

On January 17th, I was asked to see what proved to be a mild case of scarlet fever, and on January 18th, to see two other cases with practically simultaneous onset in another house. The latter were typical cases, and my help was sought more on account of the mystery attached to the origin than from doubts as to the disease. Both families lived in large houses and had nothing in common except the milk supply. The next cases (although the onsets were on January 17th and 18th respectively) were not notified until the 21st, and on finding that the milk supply in these instances was also derived from the same source, I visited the farm the same day. The following suspicious circumstances were found:—

(1) The man who took the milk round (W.C.) had an oedematous and somewhat congested throat, with a history of a cold and sore throat about three weeks previously, which, however, had not incapacitated him from work. He showed no peeling on any part of his body. His wife, moreover, had a sore throat about the same time, and one of his children, aged three, had malaise on December 21st, and a rash on December 22nd, which the mother stated lasted about two days, but no doctor was called in. The rash was described as patchy, and except for the fact that it followed the period of malaise, it could not

have been said to have been suggestive of scarlet fever. There was no sickness, no swelling of glands, but there was some thirst and a little difficulty in swallowing. The child showed no peeling on the 21st. It had not been exposed to known infection, but had accompanied the mother to the local hospital on December 18th, when she took another boy aged four for treatment on account of bad teeth. The mother's sister, however, who lived in London, had recently had scarlet fever in her family, and there had been some correspondence between them.

(2) One of the two cowmen (J. D.) who assisted in the milking, owned to a recent slight cold, and one of his daughters had been at home for a fortnight to recuperate after having been in an isolation hospital for three weeks with diphtheria.

(3) One of the cows in the milking herd had sores on her teats. On one teat was a partly separated brown scab about half-an-inch in diameter, and having underneath a raw and moist but not depressed surface. At the side of it was a vesicle of about the same diameter containing clear fluid. Each quarter of the udders of the cows in the herd, thirty in number, were milked separately into a white saucer with a view to the detection of purulent or discoloured milk, but no abnormality was detected except the presence in two instances of slight ropiness in the first milk obtained.

As it was impossible at the time to determine which of these possible sources of infection had been at work, it was decided, with the ready concurrence of the farmer, to remove any further risk by forthwith excluding both men from participation in the handling of the milk, and by separating the cow from the herd and using her milk separately. The source of infection was evidently included in one of the three mentioned, as, allowing two days for the incubation of scarlet fever, no further primary cases were infected after this date, whereas altogether fourteen cases (one of fatal diphtheria) were notified up to the 23rd. In addition there were at least eight houses where cases of sore throat without rash were reported.

Dealing further with the three possible sources, nothing corroborative subsequently transpired in the case of the milkman (W. C.); neither he nor any of his family showed any peeling. He had not assisted in the milking, but was employed entirely on the round, and

distributed the milk from the milk cart by means of cans. The round was a good one and consisted almost entirely of large houses. Although this man appeared at first to be the most suspicious source, the difficulty presented itself of the improbability that mere handling of the milk in the open air was sufficient to infect the milk to such an extent, that at least twenty-two households out of fifty-three supplied, became infected within a few days. It appeared more probable that the contaminating matter entered the milk in considerable quantities, and this seemed more likely to occur from the exudation from the sores on the teats being washed into the milk during the process of milking. Moreover, whilst the milkman (W. C.) first complained of sore throat about December 21st, the first case of scarlet fever did not occur till January 17th.

Returning to the sores on the cow's teats—on January 25th, the sore under the scab had apparently healed, and a thin scab had formed on the site of the vesicle. A similar scab was found on the 24th on another teat, but this had disappeared on the 26th, leaving an oval moist surface about one-half by three-quarters of an inch, the longer axis being vertical. The cows were examined on behalf of the farmer by a veterinary surgeon, who reported he had "found two cows suffering from the very common eruption of their teats, known to dairy-keepers as pimpley or scabby teats. In this condition there are first a crop of papules; in a few days these soften, the epithelium covering them is pulled off in the process of milking, leaving a superficially ulcerated surface, the irritation being kept up by the milking twice daily. In dry cows, the subjects of this eruption, the papules are not broken, and in a few days a scab forms, and in a few days more the scab comes off, leaving a healthy surface underneath already covered with a new epithelium. I do not think there can be any possible connection between this condition and scarlet fever."

Samples of the milk from each teat, and swabs from the sores, and also from the throats of three of the cases and the milkman (W. C.), were sent on February 1st to an expert bacteriologist, who found the milk free from streptococci, although one quarter (not the one with sore teat) showed a very high leucocyte count. The growth from the teat ulcer yielded two kinds of colonies only—streptococci and staphylococci. The strepto-

cocci were long chain forms, and were all, or nearly all, alike. The only one then tested was highly pathogenic to a mouse; and this organism was practically identical in cultural characters with the organism prevalent in the growth from the throat of the milkman (W.C.) (this was, however, also pathogenic to a mouse), and of one of the patients (G. P.). Different forms were found in the swabs from the two other patients.

Reverting now to the third possible source, viz., the cowman (J. D.), there was nothing suspicious about the man himself, and he only owned to having had a cold in the head a little time previously. The grown-up daughter, who, as previously mentioned, had been at home since January 7th, after having been in hospital for three weeks with diphtheria, was due to return to her situation next day, and after an examination which revealed no abnormality of the throat, and no peeling, she was allowed to return. No swab was taken from her throat, as at that time there was no suspicion that the milk was conveying the germs of diphtheria. Questioned as to having any rash whilst in hospital, she stated that she had had only the usual nettlerash following the injection of antitoxin, and the short period of her detention proves that any cross infection with scarlet fever was not suspected. The medical officer of the hospital informed me that she had not had scarlet fever whilst in hospital, and that she was free from infection when discharged, although apparently no bacteriological examination was made. The cowman denied that any illness of any sort had recently occurred in his family, and his wife and two grown-up daughters appeared to be perfectly well.

So far, only cases of scarlet fever have been mentioned, but on January 20th, a severe case of diphtheria was notified on the same milk round. The diagnosis was confirmed by bacteriological examination, and the case proved fatal. The patient was a young girl, who, being somewhat of an invalid, had not been outside the premises for some weeks, so that any other source of infection was extremely unlikely. Several cases of sore throat without rash were reported, but in only two instances, other than the fatal case, did the signs appear sufficiently suggestive of diphtheria to warrant the taking of swabs by the doctors in attendance, and in these no Klebs-Löffler bacilli were found.

Coming now to the second outbreak of

mixed cases, I received on February 4th, notifications of two cases of scarlet fever in one cottage, in a village in a neighbouring district, and not far from the dairy farm. On visiting the house it was found that four other children had been confined to bed with sore throats without rash, during the preceding fortnight, and these had shown no peeling. The school attended by the children was then visited, and the children examined. A boy aged seven was found with a suspicious sore nose, and who on further examination showed some peeling on the upper arm and in the axillae. A swab taken at the time from the nose showed Klebs-Löffler bacilli in great numbers. He was at once excluded, and it then transpired that he was a grandson of the cowman (J. D.) and lived with him, although I had not previously been made aware of his existence, and he had happened to be at school during my visits to the cottage. Reference to the school registers proved that this boy was absent during the school week, January 13th to 17th, and again absent from January 24th to 31st. Three suspicious cases of scarlet fever (not notified) occurred among the school children during the week following the days on which he returned to school, viz.: January 20th to 24th. Further cases of scarlet fever were notified among the school children on February 5th and 7th, and cases of Diphtheria on the 7th and 9th. Two boys living next door to the cowman (J. D.), but who attended another school were notified as suffering from scarlet fever on February 6th. It was now admitted by the cowman and his wife, that the boy suffered from a cold a few days subsequent to the return home of the daughter from hospital on January 7th, and he was at any rate unfit to attend school on the 13th. They also now admitted that the two other grown-up daughters had colds in the head about this time. One of these had left by February 4th, but the other showed suspicious peeling on the hands and feet on February 5th. Next door neighbours stated that they saw very little of the family for the week or so following the return home of the daughter, and altogether there is little doubt that every effort at concealment was made. Swabs were taken from the cowman's throat on February 5th, and diphtheria bacilli found by the bacteriologist to whom the other specimens had been submitted, although I was myself unable to detect any.

The probabilities, therefore, are that the

cowman became infected with the germs of scarlet fever and diphtheria (possibly whilst suffering from a cold in the head) directly or indirectly from the grown-up daughter returned from hospital. It is interesting to note that the cowman was subject to colds in the head, and that whilst so suffering, drops of clear mucus constantly formed at the tip of his nose. (The information as to this peculiarity was volunteered to me by a fellow workman.) Obviously, if these were infected, they would by dropping into the pail during milking, supply that substantial amount of infective matter, which it appears reasonable to assume must have found its way into the milk. It should be added that the milk was not cooled before distribution.

The cowman asserts he never milked the cow with the sore teats, otherwise there would remain the possibility of these sores becoming inoculated, and acting as breeding grounds for the specific germs of the two diseases.

It may be added that any doubts that were originally entertained as to the identity of the disease with scarlet fever were subsequently removed by the occurrence of several secondary cases (no less than four cases having occurred at considerable intervals in each of three houses), and by the sequence of free desquamation, and the common complications of the disease.

Of the primary milk cases two were under five years of age, three were from five to ten, four from ten to fifteen, one from fifteen to twenty-five, and four from twenty-five to thirty.

MILK POISONING OUTBREAK AT YOULGREAVE.—On Friday, August 28th, upwards of thirty persons were seized with violent sickness and diarrhoea. There was also much headache and depression. The temperature varied from 102 to 104. No death occurred. On investigation it was ascertained that all the persons seized had their milk from the same dairy, and that a cow calved on the previous Sunday (August 23rd.) had her milk added to the usual supply on the Wednesday and Thursday, and that all the cases occurred within the next day. The cow had been sold, as I am informed, previous to calving, but was not delivered until the Thursday evening. No fresh outbreak occurred after her removal to Elton, from where she was taken to Bakewell Market on the following Monday and re-sold, when she was lost sight of. The cow was believed to be healthy by the dairyman, for he not only partook of the milk, but also his wife and child, with a similar result. Unfortunately we were unable to have a bacteriological examination, as no sample of the milk could be obtained.—*Special report by Dr. John Knox, Medical Officer of Health, Bakewell Rural District.*

COUNTRY SCHOOLS, SCHOOL CAMPS, AND OPEN AIR SCHOOLS.

By H. L. P. HULBERT, M.B., D.P.H.,

School Medical Officer, Northamptonshire, late Assistant
Medical Officer to the Manchester Education
Committee.

Ludi Magister, parce simplici turbae.

* * * * *

Ferulaeque tristes, sceptrum paedagogorum

Cessent et Idus dormiant in Octobres:

Æstate pueri si valent, satis discunt.

M. Val. Martialis, x. lvi.

IT was the privilege of the present writer in the early summer to see hundreds of the poorest school children from the towns on the Lake of Geneva, scattered over the Elysian fields above Les Avants, picking the *Narcissus poeticus*; to watch a large Jesuit boys' school climb the Dent de Zaman with their masters, and glissade down the snow slopes on their descent; to dine with the cosmopolitan scholars of an Armenian school who were taking their annual week's tour on the Alps. Such holiday excursions are worth much schooling, and might well have their counterpart more often in England; but the object of the present paper is to show how much can be done by means of schools to secure for English town children a more free and open, and therefore a healthier life, during part of the year at all events. Two Manchester examples will be taken first, and will show how this may be combined with great educational advantages.

I. *The Manchester Country School for town children.*—A detailed account and plan of this school will be found in a paper read at the recent International School Hygiene Congress. Only the main facts concerning it need here be stated.

The school provides a fortnight's education in the country, with board and lodging, for selected groups of children from the Manchester elementary schools during the summer months.

It is situated at Knoll's Green, in Cheshire, sixteen miles from Manchester, in the midst of well-wooded pastoral country. It is built on five acres of land, acquired at a peppercorn rent through the David Lewis Trustees, and is surrounded by gardens.

In addition to the absolutely necessary accommodation for children, their teachers