ENTERIC FEVER HISTORY OF THE 2ND BATTALION ROYAL FUSILIERS FOR THE YEAR 1906.

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This regiment left Darjeeling, India, on November 5, 1905, for Secunderabad. While at Lebong two cases of enteric fever had occurred simultaneously, both imported, in men who had just returned from a course of mounted infantry training at Allahabad. On arrival at Secunderabad, on November 16, 1905, the regiment was placed under canvas, and remained so until February 15, 1906.

The first case of enteric fever was admitted to hospital on February 1, and the second case on February 6, 1906. They had lived in different tents. As soon as the cases were diagnosed, these two tents were struck and disinfected, while the other occupants of the tents were segregated, first at the rear of the main camp, afterwards, when the regiment moved into barracks, they were kept still under canvas, with latrine, wash-house and cook-houses separate from those used by all other men, at the spot marked B in the sketch-plan of the barracks. The third case was admitted to hospital on February 28, i.e., twelve days after leaving camp, so that probably this infection also occurred in camp.

On looking round for a cause of infection in these three cases, it seems highly probable that the materies morbi was derived from a trenching ground lying about 2,000 yards south-east of the camp. During January and February flies were very numerous, and it is at least possible that they acted as the carriers. The trenching is done on the system of foot-wide and foot-deep trenches, filled to the top, and is unsatisfactory. The fourth case occurred among the men who were segregated at the spot marked B, in consequence of the occurrence of the first case, twenty days after removal from camp to barracks, so that it may have been either a case of infection by direct contact with Case 1, or infection in camp by means similar to those in Cases 1, 2 and 3.

I wish to direct particular attention to this Case 4, as I consider it highly probable that he formed the enteric connecting link between camp and barracks, the channel by which the infection was first introduced into barracks. This point will be referred to later.

Case 4 was admitted to hospital early in March. Three more
cases occurred in the same month. In April there was one case, in May three, in June one, in July three, in August five.

During this time all the precautions laid down in regulations and orders as to vacation of barrack rooms, segregation of men, disinfection of barracks, disinfection of clothing, &c., had been carried out whenever a case occurred, but without effect, for in the next month, September, there were no less than sixteen cases. The cases are shown in the sketch plan on the bungalows in the numerical order of their occurrence. It was obvious that the precautions hitherto taken had been of little or no avail. Suspicion then fell on the latrines as the source of infection, and especially on the latrines numbered 29, 30, and 31, in the bungalows nearest to which it will be seen that most of the cases occurred.

The worst of these three latrines was No. 30. It is a large one, serving three companies, and is placed on a space surrounded by six bungalows. It is, moreover, in close proximity to two cook-houses (marked C C on plan) which supply the same three companies, is old, of bad pattern and construction, and the so-called dry-earth system was in use. All the latrines in the lines suffer from the same defects.

It is at this point, I think, that the importance of Case 4, referred to above, is manifested. The large latrine is the one situated nearest to the tent in which Case 4 was segregated whilst incubating the disease. In all probability he used this latrine and infected it. It became a centre of infection from which, in time, most, if not all, of the latrines in barracks became infected; how, I am not prepared to say, but probably through the medium of the guard-room latrine, No. 33. But that this is not assumption, but almost completely proved fact, will, I think, be seen from the following. Acting on the assumption that latrines were the source of infection, the following experiment was carried out.

Early in October, the actual date varying somewhat, each latrine in turn was scraped and limewashed, and new pans were taken into use. Two or three pints of a solution (1 in 1,000) of corrosive sublimate were put into each pan before use, and subsequently all excreta, urine and fæces were boiled, a separate boiling place being established at the back of each latrine. No nuisance is caused by the boiling, and the well-known "latrine smell" has to a large extent disappeared, while flies are conspicuous by their absence from the latrines. Special European supervision was exercised over these processes, which are all still going on.

Taking the maximum incubation period of enteric fever as
twenty-eight days, if the assumption were correct that latrines were the main source of infection, a marked diminution in the number of cases ought to show itself, beginning from the end of October.

Cases 1 and 2 occurred in standing camp prior to occupation of barracks.
Case 4 in tents containing contacts of Case 1 and marked thus ☐ B
Case 11 contracted in hospital.
Cases 8, 9, two attached men. Onset about same time as Case 21.
Case 35, brigade clerk living some miles from barracks.
Case 41, in all probability not contracted at barracks.

Roman numerals = I-Company
B = Bungalows.
C = Cookhouses.
L = Latrines.

The result was as follows: Three cases occurred in October, one on the 5th, the other two on the 22nd, all well within the maximum incubation period, and, therefore, probably infected
before these sterilising processes were begun. Consequently they
are negligible from the point of view of the experiment. From
that time until the present date, two and a half months, only two
cases, Nos. 41 and 42, have been admitted, and of these one can
be almost excluded from latrine infection, since he only spent one
night in barracks from the time of his arrival in the country up to
the day he was admitted to hospital with enteric fever. In his
case a much more obvious cause exists in the fact that he lived
for some time in a segregation camp, where he mixed with con-
valescent enteric patients. The other case is a doubtful one. He
is a twice inoculated man, who was admitted to hospital at the
time that a number of malignant tertian malarial cases were
occurring. His blood was examined for the malarial parasite, and
found negative. The Widal reaction was positive in a dilution of
200, which is, in my opinion, too high for even a twice inoculated
man, whose last inoculation had been done a year previously.
Subsequently, he began to have evening rises of temperature, and
the blood was again examined for malaria, with negative results;
and yet, when quinine was exhibited, the evening rises of tem­
perature stopped at once. It cannot be said, therefore, that the
diagnosis in this case has been definitely established. An attempt
to cultivate an organism from the blood stream was unsuccessful.

I think, therefore, we may fairly say that in this instance we
have an example of infection derived mainly, if not wholly, from
latrines. It is not simply a case of an epidemic dying out, for
cases are still cropping up among other corps in the station where
this method of latrine disinfection is not in use. No other pre­
cautions beyond those in daily use were taken at the time.

The lesson to be learnt from this experience would also appear
to be clearly indicated, viz., the introduction of a water-carriage
system of removal of excreta with subsequent bacteriological
treatment. It is probably no exaggeration to say that with such a
system the number of cases of enteric fever in the station might
be reduced by about 90 per cent. in a very few years' time. The
question of how exactly the infection is conveyed from the latrines
to the intestinal canals of the men is another matter, and one that
do not appear to be easy of solution. The usual "dust and flies
theory" scarcely seems to meet all the requirements of the case,
but the subject is one which requires very careful investigation.
There are at least two advantages of this sterilisation system which
may be appropriately mentioned here, viz.:

(1) The excreta can be removed to the trenching ground during
the day time, for the boiled excreta cause no nuisance, and possible "splashing" of the contents of the Crowley carts is not so important. Everyone is agreed that the day is the best time for removal when it can be done.

(2) Convalescent enteric patients, who are such a potent cause of spreading the disease, can be returned to their barracks with much greater safety when their excreta will be all sterilised.

I have thought it desirable to put this experience on record, for when knowledge of the causation of the spread of enteric fever in India is so much "in the clouds," as it still is, any little evidence of a fairly definite nature, such as this appears to be, must be of some value.