A RAPID AND PRACTICAL METHOD OF DIAGNOSING TYPHOID FEVER.

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In an article by Lieutenant-Colonel R. H. Firth in the Journal of March, 1904, the suggestion was made that with a view to differentiating fevers of the type of typhoid, and clearly classifying their causal agents, whether typhoid or paratyphoid, cultures should be made from the blood. I cannot remember having seen the suggestion of routine examinations of the blood by culture as a rapid means of diagnosing typhoid fever put forward.

Drs. Coleman and Buxton, of New York, in their report, based on 604 bacteriological examinations of the blood (reviewed in the British Medical Journal of November 21st, 1904), consider a bacteriological examination of the blood unnecessary in the majority of cases from the point of view of diagnosis.

My object is, if possible, to demonstrate the value of a routine examination of the blood by blood culture in every case of fever admitted to hospital in India or the Colonies where there is a reasonable suspicion that such case might develop into typhoid fever or one of its allies. It will generally be conceded that the earlier the diagnosis is established in a case of typhoid fever, the better from a sanitary point of view, because less time will then have been lost in taking the necessary precautions to prevent the spread of the disease.

At present, we can look for a certain diagnosis on the eighth day of the disease, and even then, our minds are occasionally thrown into doubt by an equivocal or negative Widal reaction. Of course, the undoubted case with typical book symptoms stands revealed from the first, but unfortunately the majority of cases are by no means so straightforward. In the Punjab, at any rate, a large number of cases are admitted which, after presenting the symptoms of mild typhoid, clear up completely after nine or ten days. Such cases are found not to give the Widal reaction and cannot be diagnosed typhoid fever. The possibility of a case being of the type just described holds the hand of the disinfecter till the arrival of the eighth day, when a Widal reaction may be tried for, and during the interval, if the case prove to be one of typhoid fever, valuable time has been lost. A method, then,
which promises a certain diagnosis on the second day in hospital, particularly one so simple as that about to be described, will be admitted to have advantages over methods in vogue at present.

Coleman and Buxton obtained positive results in 93 per cent. of cases where a culture was made during the first week of the disease, and the proportion of successful results decreased progressively in the second, third and fourth weeks, probably on account of the bactericidal substances which develop in the blood as the disease progresses and, being withdrawn with the blood, inhibit the growth of the contained bacilli. It may fairly be argued from this that the earlier in the progress of the disease the blood culture is made, the more likely is a successful result to be obtained, and by taking cultures regularly on the day of admission, i.e., generally before the fifth day of the disease, there is every reason to hope that the above quoted 93 per cent. of successful results may be improved upon.

I have ventured to bring forward the results of such a small number as twelve cases in which a blood culture was made, without waiting to collect more, because material at Sialkot has now become very scarce, and I am convinced, from my results and those above quoted, that in the systematic taking of blood cultures in cases suspicious of typhoid fever we have in our hands the means of making early diagnosis in the great majority of cases, and so of checking at its outset the spread of this disease. Of the twelve cases from which I have taken blood cultures, three rapidly cleared up on the fourth or fifth day in hospital and were in no way cases of typhoid fever. Of the remaining nine, which were clinically and by Widal reaction cases of typhoid fever, successful results were obtained in six. The positive results were obtained in cultures taken on the second day in hospital in one, on the fourth in one, the fifth in two cases, and on the eighth in one. The negative results were obtained from cultures taken on the fifth day in hospital in two cases, and on the twelfth day in one.

The first case from which a culture was made by me was in December, 1903. Private X., 2nd Gordon Highlanders, was admitted to hospital with a temperature of 103.8° F. His blood on examination showed the presence of crescents fairly abundantly, and a diagnosis of ague might have been made. The temperature, however, remained persistently high, and the case began to present the clinical features of typhoid fever. His medical history sheet, however, showed an admission for typhoid earlier in the year. It
was clear then that a Widal reaction would be of no assistance in clearing the diagnosis, because the presence of agglutinins could be accounted for by the earlier attack. I took a blood culture and obtained a motile bacillus which was at once agglutinated by a 1 in 200 dilution of a goat's serum which had a maximum agglutinating power for typhoid bacilli of 1 in 300. The bacilli did not retain the stain by Gram's method. Unfortunately, the lamp of my incubator set on fire during the night and cooked my culture, so further investigation was stopped, but the bacillus had stood the crucial test of agglutination by specific serum, was motile, looked like typhoid, and might fairly be classed as typhoid.

The positive result described as obtained on the eighth day in hospital, should be described as obtained on the second of a typical relapse; the man was ill for fourteen days previous to admission, and his temperature dropped to normal on the seventh day in hospital. It, however, commenced to rise again almost at once in typical staircase fashion and dropped definitely to normal by lysis on the twenty-fifth day in hospital.

Of the other four cases from which a positive result was obtained, one had double pneumonia, which would have accounted for his symptoms in the early part of his illness, and the rest were ordinary cases.

The technique which I have employed is as follows: The patient's arm, at the bend of the elbow, is cleaned with soap and water, turpentine, 1 in 1,000 solution of perchloride in rectified spirit, and ether rubbed on; ether is then dropped on from a drop-bottle every few seconds till the puncture is made. The vein is made prominent, as for venesection. During this time an antitoxin syringe of 10 cc. capacity is being sterilised by filling with oil at 160° C. As soon as the syringe has cooled down to the temperature of the hand, the needle is given a final dip in the oil to destroy any germs which might have fallen on its point during the cooling of the syringe barrel, and is then, almost at once, run into the vein.

The puncture of the vein is very simple: the needle is kept almost parallel with the vein, the point is run through the skin and pushed steadily on; the eye of the needle should look upwards and the point is bound to enter the vein. The syringe is filled by withdrawal of the piston and the needle withdrawn from the vein. A flask of 500 cc. of broth is opened in the usual manner, and after expressing a few drops of the blood to wash off any germs which might have fallen on the eye of the needle during the
necessary interval between withdrawal of the needle and opening of
the flask, the whole of the 10 cc. of blood is forced into the broth
and the flask replugged. The flask of broth with the patient's
blood is then put into an incubator and kept at a temperature of
37° C. In a successful result, after twenty hours, the broth is often
found to be turbid, particularly if the culture is made early before
agglutinins and bactericidal substances have developed in the blood.
A loopful of the turbid broth is put out on a slide, covered with a
slip, and examined with an eighth-inch objective. If motile bacilli
are seen, a portion of antityphoid serum, of which the maximum
agglutinating power has previously been ascertained, is suitably
diluted with distilled water, a loopful of the diluted serum placed at
the edge of the slip, and the effect watched. If agglutination occurs,
one is in possession of the information that a patient admitted with
fever has a motile bacillus circulating in his blood, which bacillus
is agglutinated by a suitable dilution of antityphoid serum.
I think the information is sufficiently strong to justify a
diagnosis and the consequent sanitary precautions.
I use a single flask of 500 cc. broth as against a number contain­
ing smaller quantities, because it simplifies the technique if only one
flask has to be opened, though accidental contamination of the one
flask might ruin the result. So far, I have not had a contamination
in making the first culture. I think it is important to use a large
quantity of broth, so as to well dilute any bactericidal substances
which may be present in the blood and hinder the growth of the
bacillus in its new environment.
It will be seen from the above that, given the possession of the
simplest bacteriological outfit, and a very elementary knowledge
of bacteriological technique, we have the means in our hands of
converting uncertainty into certainty in the majority of cases at that
early date when it is so important, from a sanitary point of view,
that we should be certain. I know, of course, that one essential,
the simple bacteriological outfit, is not at the disposal of every
medical officer in India, and, in fact, I have had to make the above
experiments with my own apparatus, which, being small, has been
the cause of my often not having flasks of broth available to make
cultures on the days of admission of the cases to hospital. One of
my objects in writing this note is to provide another argument for
all station hospitals in India being provided with a sufficient
bacteriological apparatus to make these investigations.
The possession of a microscope with a few simple stains is
acknowledged to be essential in all Indian and Colonial military
stations. Without them diagnosis is necessarily uncertain, statistics are worthless, and the results of sanitary procedure uncertain in value. The addition of an outfit to ensure that a few flasks of broth are always available for making blood cultures and for their subsequent investigation would involve a very small additional outlay. I venture to say that Rs. 150, carefully spent, would provide a very useful outfit in India, and after that an expenditure of Rs. 15 a month would keep the small laboratory running.

Against this expenditure we have the saving which must result from nipping typhoid epidemics in the bud, and that ensuing from treating cases on sure and certain lines.

I have made no mention of the advantages, in making blood cultures, of being able to differentiate typhoid from paratyphoid infections; those were more ably advocated by Lieutenant-Colonel Firth in his article above quoted.