ENTERIC FEVERS IN EGYPT

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Enteric fever occurs in both temperate and tropical countries, and its spread depends mainly on the sanitary conditions prevailing, on the degree of purity of the drinking water, particularly in the country districts where no general water supplies exist, and on the degree of efficiency of the sewage disposal systems.

It is caused by certain members of the salmonella group of bacilli, notably the *Bact. typhosum* and the *Bact. paratyphosum* A and B. Other members of the group, especially the so-called *Bact. paratyphosum* C with its three varieties (the western and eastern European and the American types), have been incriminated at various times by different workers at different localities. During the last World War cases of enterica due to *Bact. paratyphosum* C were reported from the Salonica front. Similarly, in America, small epidemics due to the closely allied American type of *Bact. paratyphosum* C (*B. suipestifer*) were described amongst American troops returning from Mexico. The whole story of the invasion, and rise and fall of the paratyphoid infections amongst the various belligerent armies in that war makes most instructive reading and is worthy of perusal.

It has also been noted that the incidence of the various salmonellas as a cause of enteric fever differs according to locality and time. Thus, whereas *Bact. paratyphosum* A infections are prevalent in India, they are scarce in England. As a matter of historical interest, *Bact. paratyphosum* A was largely introduced into Egypt by the Indian troops during the last World War and came to be a close second to *Bact. typhosum* as a cause of enteric fever in that country.

In 1939 Nabih reported the separation of *Bact. paratyphosum* C from the stools and urine of some native patients. Later, Lami (1940) and Tabet (1944) confirmed his findings. Previously Khaled (1923) had reported the existence in this country of typhoid-like cases due to the *Bact. asiaticum*.

The following investigation was undertaken to determine (1) whether any members of the salmonella group other than the well-known typhoid and paratyphoid A and B bacilli were responsible for enteric-like fevers in Egypt; (2) whether it would be worth while including any of these organisms in the Widal tests as carried out in the Public Health Laboratories; (3) whether it would be advisable to include these organisms in the mixed typhoid-paratyphoid vaccine prepared in these Laboratories and used all over the country; (4) and lastly, the incidence of the various infecting salmonellas responsible for enteric fever in Egypt.

The method of approach in this investigation was by blood culture. It is less liable to misinterpretation although it has got its own shortcomings; for unless the blood is taken early in the course of the fever, the positive findings tend to diminish. As we were not concerned with the relative merits of the various diagnostic procedures in the enteric fevers but only in analysing and comparing the positive results, this objection does not stand. In analysing these results it has to be borne in mind that intestinal organisms sometimes find their way into the blood stream during the course of protracted fevers and other exhausting diseases as secondary invaders.

The blood samples for this investigation were taken from patients suffering from 'fever' all over the country. Many of these patients proved later on to be suffering from influenza, malaria, smallpox, typhus, etc. Some of the samples were taken as early as the second or third day of the disease, others as late as the thirtieth day, and the remainder between these dates. These facts account for the comparatively low percentage of positive results.

TECHNIQUE

Owing to the lack of the necessary venules containing the appropriate culture media, due to disturbances caused by the war, 25 c.c. vaccine bottles were used instead for collecting the blood. The medium used was pure ox bile. After filtration it was distributed in 10 c.c. lots into these bottles and sterilized at 100° C. on three successive days. Sterile rubber caps were then fitted to the bottles and waxed as in the bottling of vaccines. This method proved to be safe for delivering the samples by mail. About 3–5 c.c. of blood taken aseptically from a vein with a sterile syringe were injected into each bottle by piercing the rubber cap with the needle of the syringe after adequate sterilization of its exposed surface.

On arriving in the Laboratory every sample was given a preliminary incubation at 37° C. for 24 hr., after which a few drops, taken aseptically, were inoculated on to the surface of one McConkey agar plate. The plates were then incubated at 37° C. for 24 hr., and the bile medium replaced in the incubator

for the same time. Negative specimens were never disposed of until plating on four successive days proved sterile.

Organisms from suspicious colonies were examined in detail for their morphological characters, staining reactions, motility, indole and H_2S production, and finally by agglutination. The fermentation reactions were tested on lactose, glucose, saccharose, mannite, dulcite, xylose, arabinose, raffinose and maltose. A tube of litmus milk was also put up in every case. The sera used for the agglutination tests were those supplied by the Oxford Laboratories; exceptionally, locally prepared sera were used.

When further tests were required, as in the differentiation between the *Bact. coli* and the *Bact. lactis aerogenes*, the Vosges Preskauer and the methyl-red tests and Koser's citrate media were made use of.

RESULTS

Of the 435 blood cultures examined, ten were found to be highly contaminated and were discarded. Of the remaining 425 specimens, seventy gave positive results and the rest proved to be sterile.

The seventy positive cultures contained the following organisms: *Bact. typhosum* in 46, *Bact. paratyphosum* A in 13, *Bact. paratyphosum* B in 5, *Bact. coli* in 3, *Bact. asiaticum* in 1, *Bact. typhi-murium* in 1 and *Bact. faecalis alcaligenes* in 1.

DISCUSSION

It is apparent from these results that enteric fever in Egypt is mainly due to the *Bact. typhosum*, while *Bact. paratyphosum* A is responsible for about one-fourth of the cases and *Bact. paratyphosum* B about one-fourteenth. *Bact. paratyphosum* C was conspicuous by its absence. The other organisms encountered may have been the real cause of the fever in their respective patients, or, more probably, were secondary invaders of the blood stream during the course of other diseases.

CONCLUSION

(1) Enteric fevers in Egypt, as shown by blood cultures, are due to *Bact. typhosum* and to a much less extent to *Bact. paratyphosum* A and B. *Bact. paratyphosum* C, in any of its three varieties, was not encountered in this series of blood cultures.

(2) It seems there is no need to include emulsions of *Bact. paratyphosum* C in the routine Widal test in Egypt, or to include this organism in the preparation of the mixed T.A.B. vaccine.

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