LOCAL INFLUENCES IN ENTERIC FEVER, AND THEIR INVESTIGATION.

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Much has already been written on enteric fever by officers of the Royal Army Medical Corps: these writings fall under one of two main classes: first, those descriptive of the conditions obtaining over a comparatively large area, and of which one would specially call attention to the papers by Surgeon-General Kerr-Innes, C.B., and by Brigade-Surgeon Marston in the A.M.D. Reports for 1878 and the following year, and to that by Major McCulloch in the A.M.D. Report for 1900. Those of the second class are descriptive of special epidemics in certain stations, and of these there is a large number.

Both forms contain many important observations and much valuable information. But the time has certainly arrived when we should have more detailed information regarding what one may call the natural history of this disease. The broad outlines were filled in many years ago, as can be seen by reference to the paper by Surgeon-General Kerr-Innes referred to above, and on many points our knowledge has hardly advanced from that stage.

We cannot expect to get this detail when the area under consideration is large; the local variations which have so important an influence on the prevalence of the disease and on many of its.
peculiarities are lost, and we merely obtain a statement of the average result over the area in question. On the other hand, the local epidemic is largely the sport of circumstances, and is often an expression of extreme possibilities rather than of the average condition in that one station.

The more one enquires into the prevalence of enteric fever, the more one is impressed with the idea that it is only by the consideration of those cases where every detail can be reviewed that any real progress can be made. Hence the line of advance appears to be through the investigation of the prevalence of enteric fever (including simple continued fever also) in individual stations over a period of years. The object of this note is to point out in what direction further information is desirable, and to induce officers to collect the available information and supply it in the form of an article for publication in this Journal. A complete record for individual stations can be compiled without undue labour by officers interested in the subject.

The bacteriological aspect of the question is in no danger of being neglected. The chief points on which information is wanted are the following:

I. **The Influence of Climate.**

Enteric fever is not, as formerly described, a "climatic disease," but there is no doubt that its prevalence, which is almost invariably influenced by season, or perhaps one should say, varies with the season, has some relation to climatic conditions. It is as important to know why enteric fever is not prevalent at one period of the year as to know why it is prevalent at another season. This may resolve itself into a question of the life history of the bacillus, or, on the other hand, of the varying influence of modes of propagation of the infection. The important elements are:

1. **Temperature.**—Certainly the mean monthly temperature, and probably the mean maxima and minima and the diurnal variation are important. Ground temperatures would be most valuable.

2. **Rainfall.**—This is important, first in connection with the possibility of direct pollution of the water supply, and secondly, with the life history of the bacillus. The mean monthly amounts are important, also excessive or diminished amounts, either throughout the year, or from year to year. The information should be so recorded as to be easily comparable with the admissions.

3. **Wind.**—The direction and force of the wind are important in connection with the possibility of infection from dust. Where it is possible to obtain a record of the occurrence of dust-storms, this
would be valuable, but in many cases one can only infer the dust movements from those of the air.

II. Susceptibility and Immunity.

(1) The Natural Susceptibility of the Soldier.—We have at present no measure of the degree to which a unit or an individual is susceptible. We know that a unit recently arrived in India is more susceptible than one that has been some time in the country, we can also ascertain the number of individuals attacked, but we cannot, from the ordinary statistics, discover the actual number of men who escape, as we have only the average strength. In many stations it would be possible to investigate this as follows:

(a) At the beginning of the observation examine all the medical history sheets, and note all those men who have at any time suffered from enteric fever, or from a severe attack of simple continued fever, distinguishing between the two diseases.

(b) Do the same with all Drafts or Transfers Joining the Battalion.—One then has the whole divided into two classes, those who have been attacked and survive, who are therefore probably protected to some extent, and those who have no recorded attack and who are presumably unprotected. The possibility of an attack before enlistment, of course, must be considered, but the incidence rate in civil life in the United Kingdom is so small that in a large number of men it may almost be neglected, and in any case, if it could be arranged to see the men, a careful cross examination might eliminate this.

(c) Note the Attacks in Each Class, Date, and if Possible, Severity. —It would be necessary to obtain the assistance of the commanding officer, in order to make certain that all arrivals were reported, and, more important, all departures. Transfers to other battalions, men on detachment, and all casualties of like nature could then be noted and followed up, and enquiry made from the officer in charge of the hospitals at the station to which the man was transferred, so as to ensure the record being complete.

(d) All Men Leaving the Battalion on Discharge should have this Fact with the Date noted against their Names.—At the expiration of two years (or three years might be possible in some cases), one would have record of a large number of men who had been “exposed to infection” for varying periods, and the next stage would then be the classification of the records showing, for like periods of exposure, the attacks among those presumably protected and among those presumably not protected, and, in the last class, also those
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who have escaped. If the records were kept up on the card system, the labour of collection and comparison would not be overwhelming. But the observation would require to be carried out with interest, and not as a routine record, otherwise there is not only the probability of error creeping in, but all special circumstances connected with the prevalence of enteric fever, either at the station or at other stations to which detachments went, should be recorded.

If observations of this nature were carried out in, say, a dozen stations we should be able to form a very good idea of (a) the number of men at each age who, within the period of observation have escaped altogether, and (b) the actual facts as to the supposed lessened susceptibility with increasing age. At present this is obscured by the fact that men who have been attacked and survive are not distinguished in each succeeding age group which they enter from those who have never been attacked at all. (c) This would also give an accurate record of second attacks, and (d) it might explain the observed lesser prevalence in the age group "under 20," than in the succeeding age group, a fact which is not observed among the civil population.

(2) The Limitations of Acquired Immunity.—As noted above, the present results leave it uncertain whether there is a real diminution of susceptibility with increasing age, or whether the observed result can be explained otherwise. Hence, it is important to note any unusual prevalence in the older age groups, either when there is an unusual prevalence in the younger groups, or in those rare cases where the older men seem to suffer most. Here it is important to ascertain whether this breaking down of the immunity of the older age group is associated with second attacks among the men composing it, or among the younger men, or whether it is the result of attacks among the older men, who have previously been exposed to infection but escaped.

III. Variations in Annual Prevalence.

At times a good deal of stress is laid on these variations, especially where sanitary improvements are supposed to be the cause of a diminution. It must be remembered that no comparison between two years or other periods is of value unless the enteric history of the units composing the garrison for each period is known and recorded. This is an obvious result of the observed facts as regards diminished incidence with increased age and service in an infected area, but it is too often forgotten, and should be recorded in all cases where the annual variations are important.
The usual information on sanitary conditions should, of course, be added to any report dealing with the points noted above, and essential features should be dwelt on, rather than an attempt made to complete a routine scheme of report.

As to the method of working out these results, even when ratios are used, the actual figures should invariably be given from which the ratios are calculated. All these compilations take time, and the results should be available for the use of other investigators in the same field, who may be working on different lines, but to whom the bare figures will often be most valuable. Graphical methods are usually sufficient for the demonstration of the relations between the phenomena recorded, especially when the actual figures are also given. But even where the author is not prepared to spend the time and labour for the work of computation, always a troublesome task, the actual numerical results are always worth recording, if they are accurate, as they can be worked out by others interested in the subject.

Much of what has been said above deals with matters which may seem to be only of academic importance and of no practical value. This, no doubt, would be true if our knowledge of the causation of enteric fever were as complete as is desirable, but at the present moment we appear to be still in that stage at which it is impossible to say that any information may not be of practical value; in any case it is of extreme interest to trace out variations in the process of infection and its results.