SALMONELLA AND SHIGELLA INFECTIONS IN AFRICA*

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A comparative survey of salmonellosis and shigellosis in Africa is at present impossible. It would require consideration of the clinical picture, including mortality, with regard to age, race, socio-economic structure, climate and locality; the morbidity should be ascertained and its influence on working capacity should be estimated; finally, it should give some information on the prophylactic measures which have been adopted in the prevention of the propagation of the infections.

Such comprehensive information is not available. During the last 40 years authors from different parts of Africa have reported on various aspects of salmonellosis and shigellosis; they have dealt with local findings. Pan-african reports on enteric fevers, as far as I know, have not yet been published. The vast dimensions of the task make this understandable. The very same reason forces me to consider the position in a small part of the continent, for which I have chosen the Union of South Africa. The review will be based on the fragmentary knowledge available in this country.

The relative importance of *S. typhi* infections as compared to the other salmonella organisms, makes it desirable to deal separately with the former and consider the rest under one heading.

The clinical picture of typhoid fever in South Africa seems to correspond to the classic description. The more severe cases are commonest among the non-Europeans, who seek medical attention at a more advanced stage. In most cases there is an excellent response to chloromycetin, but as a whole the prognosis is more serious in the non-European.

It is not known what proportion of the cases is diagnosed entirely on clinical grounds, in what proportion use has been made of the Widal reaction, and how often the diagnosis has been bacteriologically confirmed. The annual reports from the South African Institute for Medical Research[1] (SAIMR) reveal that in recent years about 8,000 Widal tests have been performed annually. If the prevalence in the rest of the Union were similar to that at the Witwatersrand, it might be estimated that the total number of Widal tests per year in South Africa would be 50,000-70,000; but the number of patients they represent is unknown. It emerges from the same reports, that *S. typhi* is isolated from about 400 specimens annually, which would correspond to 2,400-3,200 for the whole of the Union. Of these, 52% are from blood cultures. More than 90% of the strains isolated at the SAIMR ferment xylose. On antigenic analysis Lewin,[2] in 1937, found that 90·4% of the strains possessed both O- and Vi-antigens, that 7·9% were Vi-agglutinable and O-inagglutinable and that 1·9% were devoid of the antigen Vi. Crocker,[3] in 1953, showed that approximately 65% of the strains belonged to phage type A and 10% to E_1 and that the types B_1, D_1, D_4, D_6, F_1, F_2, G, L_2, N, O, T and 28 occurred occasionally; 20% of the strains were not typable. Phage typing, ever since its introduction into the Union in 1942, has been centralized at the University of Pretoria. Although the services are free, many laboratories do not submit their strains regularly. This, of course, reduces the value of typing; but besides that it also appears that the epidemiologists of South Africa are reluctant to take advantage of the technique, so that presently it is merely of academic interest.

Typhoid fever is notifiable in South Africa. During the last two decades, according to official sources,[4] there have been approximately 4,000 cases annually in urban areas. This corresponds to an average notification rate of 25 per 100,000 population. The death rate is now about 1·88 per 100,000 and the case mortality varies between 3 and 7%. These figures are the best available, but they are considered to underrate the actual morbidity.[2] Firstly, no account has been taken of the rural districts; secondly, the reliability of the diagnoses is obscure; and, thirdly, the number of missed cases is unknown. Nevertheless, the figures indicate that the disease is fairly common and in spite of prophylactic measures the incidence has remained constant. This is contradicted neither by the increase in number of blood cultures at the SAIMR yielding a growth of *S. typhi* (1955, 114; 1956, 227; 1957, 258),[1] nor by the reduced number of *S. typhi* cultures submitted to phage typing during 1956 and 1957.[5]

We are still more ignorant of the carriers of *S. typhi*. It was estimated that 2% of the Bantu population were carriers.[6] The figure is disputable. All that is known is that 20,000 Vi-tests—immensely popular in tracing typhoid carriers—are performed annually at the SAIMR,[1] and 3-5% of them are positive in a dilution of 1 : 10 or more. The proportion of carriers among the reactors has not been established, but judged on theoretical speculations[7] it is probable that they constitute about 5% of the reactors, or 0·1% of the Bantu population.

Large-scale prophylactic inoculation of typhoid endotoxoid has been used in the prevention of the disease, but although there is no statistical proof of its effect, it is the general impression that it is beneficial.

It is usually maintained that salmonella infections other

* Paper read at the VI International Congress on Tropical Medicine and Malaria, Lisbon, September 1958.

than typhoid fever are comparatively mild; but fatal cases have been described.[8, 9] In human pathology about 95% of the strains are recovered from excretions and 5% from blood and cerebrospinal fluid.[1] A recent survey at the SAIMR[10] showed that during 1957 we identified 59 different types; that *S. adelaide*, *S. labadi*, *S. typhi murium* and *S. london* were particularly frequent; and that 32 blood samples proved to contain salmonella, which were of 12 different types. On 2 occasions samples of cerebro spinal fluid yielded a growth of *S. typhi murium*.

As mentioned already, this type of infection is not notifiable, which renders the morbidity an unknown quantity. At the SAIMR[1] we have noticed a steady increase in the annual number of identified salmonella (1955, 244; 1956, 385; 1957, 515), but whether this reflects an increase in incidence or merely an expansion of bacteriological services remains uncertain.

The sources of salmonella infections in South Africa have been surveyed by Henning.[9, 11] He found that salmonellosis was very common among calves, but that cattle, horses, sheep and pigs were also infected. Moreover, he recorded salmonella epizootics among pigeons, canaries, ducks, turkeys and fowls, but not as yet among geese. Nor is there any reference to salmonellosis among fur-bearing animals, reptiles or arthropods. Neser *et al.*[8] recently reported a sample of biltong—salted, dried flesh of cattle or buck—to be heavily infected with *S. newport*.

Our ignorance of shigella infections is almost complete. As far as I know, from South Africa nothing has been published on their clinical aspects. Many shigella organisms are probably missed in the laboratories because of the duration of transport. Boardman *et al.*[12] in a recent survey on bacillary dysentery among African children found that 7% were infected with *Sh. sonnei* and 7% with *Sh. flexneri*. The latter was not classified in sub-groups. It is also my impression that the mentioned organisms are the most frequent, but at the SAIMR we frequently isolate *Sh. boydii*, occasionally *Sh. Schmitzii* and very exceptionally *Sh. shiga*. The latter is so rare that its existence in South Africa has been doubted.

Shigellosis is commoner in summer than in winter.[12] It is not notifiable *per se*; no information about the morbidity can be extracted from the reports of the Union Health Department, partly because all clinical dysentery, independent of aetiology, is classified together, and also because the non-European cases are not recorded. The annual number of identified shigella cultures at the SAIMR is increasing (1955, 169; 1956, 157; 1957, 259).[1]

It emerges from this review on enteric infections in Africa, and particularly in South Africa, that there are still many open questions. Much directed research is required before we can form a fairly accurate opinion on salmonellosis and shigellosis in Africa; in fact, it would be useful—and probably good economy too—if the health authorities appointed personnel with the sole duty of studying and combating these infections.

SUMMARY

Salmonellosis and shigellosis in South Africa are reviewed. Attention is drawn not only to our inadequate knowledge of the infective organisms and their distribution throughout Africa, but also to our ignorance of morbidity and mortality.

Notwithstanding the importance of individual observations as well as those of the health authorities, it is clear that much additional information is required. Some of it will undoubtedly be furnished by individual workers, but, for the bulk of the work, it will be necessary to call upon the health authorities.

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