Septicaemia due to an anaerobic organism was the tentative diagnosis.

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ROBERT J. KERNOHAN, M.D., M.R.C.P.,
M.R.C.P.I., D.P.H.,

Physician, Mid-Ulster and Mid-Antrim Group of Hospitals,
Northern Ireland.

Treatment of Typhoid Carrier with Penicillin and Sulphamerazine

The successful treatment of a typhoid carrier, who had resisted combined sulphonamide-penicillin and caronamide, and chloramphenicol, was eventually achieved by sulphamerazine and penicillin in dosage similar to that employed in our earlier case (Rumball and Moore, 1949).

CASE REPORT

A boy aged 9 contracted typhoid fever in Egypt in July, 1948, and came under our care six months later as a chronic persistent and profuse faecal carrier. His agglutinations were: typhoid O, 1 in 20; typhoid H, 1 in 250; and typhoid Vi, 1 in 10 standard agglutination and 1 in 20 partial agglutination. *In vitro* sensitivity tests showed: sulphathiazole—insensitive at 25 mg. per 100 ml., sensitive at 50 mg.; penicillin—insensitive at 1 unit per ml., sensitive at 5 units; sulphathiazole and penicillin combined—no demonstrable increase in sensitivity.

Over a period of nine days beginning on February 12, 1949, 19,000,000 units of crystalline penicillin, 75 g. of caronamide, and 39.75 g. of sulphatriad were given. Serum penicillin assay showed a range of 0.08 to 0.3 unit per ml., and sulphonamide concentration from 9.2 to 18 mg. per 100 ml., these levels being obtained immediately before the four-hourly doses of the combined drugs. A scanty growth of *Salmonella typhi* continued throughout treatment, but a profuse growth returned within a few days afterwards, even though the patient's serum on February 18 had inhibited the isolated organism.

Chloramphenicol was considered as a second method of treatment, based on the findings of Smadel *et al.* (1948), Woodward *et al.* (1948), and Murgatroyd (1949) that this drug was active in the acute disease, though at the time no literature was available regarding its effectiveness against the carrier state. The isolated organism was found to be extremely sensitive *in vitro* to chloramphenicol at a dilution of 2.5 mg. per ml. A course of treatment, using 0.25 g. of chloramphenicol four-hourly for seven days, to a total of 10.5 g., was therefore given from April 12 to 18. This dosage, equivalent to 10 mg. per kg. body weight, was based on half the adult dose given in acute cases. Positive stool cultures were obtained consistently during and after this course. A further course, using a threefold increase in dose to a total of 32.25 g., was given from April 25 to May 2, and was also unsuccessful. During the latter course serum sensitivity levels from 0.02 to 0.04 mg. of chloramphenicol per ml. were obtained, and faeces were negative. Apparently inhibition of the organism occurred while there was a high concentration of the drug in the bowel, but with the cessation of treatment the organism reappeared in profusion. In view of the outbreak of typhoid fever in Crowthorne, Berkshire, at the time (April, 1949) the unsuccessful use of the drug in this particular carrier was regarded as an important though disappointing clinical result.

Finally a 10-day course of 29.5 g. of sulphamerazine and 32,200,000 units of penicillin, comparable to that successful in our earlier case, was given in May, during which serum penicillin levels rose to 1 unit per ml., sulphamerazine concentration ranged from 15.8 to 36 mg. per 100 ml., and the patient's serum inhibited the organism in dilutions of 1 in 16. Faeces became negative early in this course of treatment and have remained

negative consistently throughout the nine months' follow-up. The Vi titre had also returned to negative. Cure is therefore presumed probable.

COMMENT

It is stressed that cure of a second case with this method warrants no special claim being made of its superior value over other reported successful methods of treatment, but this case again serves to impress the fact that high and sustained blood levels are essential for success. In this case repeated failure with other methods, and success with the third course of treatment, may also be explained on the findings of Fry *et al.* (1948) that intermittent courses of treatment may be more successful than a continuous attack. The advent of chloramphenicol has considerably reduced the clinical complications and hastened recovery in acute cases of typhoid, in which the organism is more accessible to its action, but the treatment of the carrier state is a very different problem. Before abandoning hope in the treatment of carriers it is considered that the combined use of penicillin and sulphamerazine is worth a trial.

Since submitting this article a chronic urinary and faecal carrier of *Salmonella kottbus* has come under our care. Treatment similar to that detailed above was successful. *Salm. kottbus* belongs to the food-poisoning group of organisms. A summary of the case history is appended.

A 21-year-old aircraft hand was notified to us from a military hospital, to which he was admitted in December, 1949, suffering from diarrhoea and vomiting. His stools and urine gave a pure growth of *Salm. kottbus*. He was transferred to our care on January 31, 1950, symptomless and well. The organism was isolated and found to be sensitive to chloramphenicol, and a course of 25 g. was given. Subsequent cultures showed that the urinary infection had been eradicated, but the bowel infection persisted. At the end of February he was given a seven-day course of penicillin, 400,000 units four-hourly, night and day, together with a course of 27 g. of sulphamerazine. On completion of this the faeces were free from *Salm. kottbus*. He has remained under bacteriological surveillance, and during the three months since completing treatment both stools and urine remain free from *Salm. kottbus* infection. This case demonstrates the susceptibility of urinary infection to chloramphenicol and the resistance of bowel infection, which, however, responded to combined sulphamerazine and penicillin.

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L. G. MOORE, M.B., B.Ch., B.A.O.,
Squadron Leader, R.A.F.

C. A. RUMBALL, M.R.C.P., D.P.M.,
D.T.M.&H., K.H.P.,
Group Captain, R.A.F.

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The British Standards Institution has issued a draft British Standard for linen textiles for use by local authorities and hospitals. The draft is being circulated to interested organizations so that they may comment on it before August 15. It is based on proposals made by the Local Authority Standards Advisory Committee in collaboration with the Hospital Equipment Standards Advisory Committee.