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FACTORS AFFECTING THE OUTCOME OF TREATMENT OF PULMONARY TUBERCULOSIS IN SUB-OPTIMAL CONDITIONS:

An 18-month Follow-up of 224 Patients

By

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Meningitic Anthrax

BY

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INTRODUCTION

Anthrax in humans in many parts of the world is largely an occupational disease and is acquired by entry of the infecting agent through the cut or abraded skin or by inhalation of dusts containing sufficient numbers of spores. The cutaneous type in such circumstances is by far the commonest; pulmonary anthrax is much less common. Described cases of anthrax meningitis are few. This would at first seem surprising, as the disease in animals is so often and dramatically septicaemic, but is probably accounted for by the fact that the organism is less pathogenic to man than to animals.

This paper presents brief clinical details of a case of anthrax meningitis who came under the clinical care of one of us (D.J.D.).

CASE HISTORY

A 35-year-old African male was taken ill with severe headache, malaise, mild stiffness and pain in the limbs, and fever. He became mentally confused and about six hours after the onset of symptoms he became irritable and aphasic, but still able to move. The following day he was admitted to the Gunderson Horness Mission Hospital.

Physical examination showed a well-nourished patient. He was semi-comatose and his temperature was 104° F. The skin was hot and dry and the breathing stertorous. There was marked nuchal rigidity. The pupils reacted equally to light. He responded to painful stimuli and the limb tone was increased. The pulse was rapid and the blood pressure was 120/80. There was no cutaneous lesion suggestive of anthrax.

Lumbar puncture yielded a cloudy, slightly bloodstained CSF under slightly raised pressure. On the assumption that this might be cerebral malaria, treatment was commenced forthwith using an intravenous infusion of 5 per cent. dextrose containing 500 mg. chloroquin base, 100 mg. of the base having been given initially straight into the tubing. No additional quinine was given at this stage, and it transpired shortly afterwards that the blood smear was negative for malaria and that a gram stain of the CSF showed it to contain large numbers of polymorphs and of *B. anthracis*. CSF was plated directly on to blood agar for culturing and the identity of the organism seen on the gram film thus confirmed.

By this time the patient had lapsed into deep coma and he died within four hours of admission, before any potentially effective definitive therapy could be instituted. Permission for *post-mortem* examination was refused.

Further enquiry into the history could establish no contact with sick animals or infected meat, although his fellow villagers stated that he had made visits to neighbouring villages shortly before admission.

DISCUSSION

Meningitic forms of anthrax presumably only occur by blood spread and the condition usually presents in man in conjunction with a primary site and systemic spread of the infection. According to Shanahan *et al.* (1947), the incidence of the meningeal form in humans is approximately 5 per cent., an estimate which seems rather too high. Gold (1955) and Brachman and Fekety (1958) state that about 95 per cent. of cases in the U.S.A. are of the cutaneous type which is not associated with a high incidence of systemic involvement. Ellingson *et al.* (1956), for instance, found two cases with positive blood cultures out of 25 cutaneous cases.

Infection by the pulmonary route generally results in much more severe disease, which may remain localised to the thorax or may result in more generalised lesions (Poland, 1886; Plotkin *et al.*, 1960). As already mentioned, the mechanism of pulmonary infection is by inhalation of spores. These may persist for up to 100 days in the lungs of monkeys (Henderson *et al.*, 1956), then germinate and spread via lymphatics to gain access to the bloodstream via the thoracic duct or by direct entry into small blood vessels (Widdicombe *et al.*, 1956), thus producing the septicaemia.

Ingestion of infected material would seem to be the main route of infection in animals and perhaps this represents a situation analogous to the inhalational one. It seems likely that in those parts of the world where this route of infection of humans is more common, e.g., ingestion of infected meat, that generalised anthrax, including meningitic forms, might be more often encountered.

The average number of anthrax cases seen in a year at the Gunderson Horness Mission Hospital is two. However, during a ten-month period, during which the present case presented, there were 18 cases, of which 17 were cutaneous. Twelve of these were situated on the head and

neck. In 11 cases no history of contact was elicited and in the remainder contact was with dead or sick cattle. In three cases meat from a suspect dead animal was ingested.

The significant point about the case described here is that the primary presentation was that of the meningitis, the earlier symptoms of the illness presumably relating to a septicaemic phase. In this way the course corresponds to that of the more usual forms of septic meningitis.

Hodgson (1941) described therapy of 93 cases of anthrax in the pre-antibiotic era when the mortality from all forms of the disease was high. Fortunately, however, *B. anthracis* is sensitive to a wide range of antibiotics, neomycin and polymixin being notable exceptions (Gold, 1955); and Plotkin *et al.* (1960) suggest that a combination of penicillin and streptomycin is the most efficacious.

Harris-Smith *et al.* (1958) described a short-lived oedema producing toxin to which they attributed the main pathogenicity, along with the inhibition of phagocytosis by the glutamyl polypeptide in the capsule of the organism. Plotkin *et al.* (1960) suggest that when large quantities of toxin have been released, that antibiotics may not save the patient and this could at least in part explain the poor results in more generalised cases or those presenting late for treatment.

If this is so, then it is obviously desirable to kill off the bacilli as soon and as extensively as possible, and in this rare form of the disease intrathecal therapy is logically indicated and both penicillin and streptomycin are suitable for intrathecal administration. Owing to the rarity, however, it is unlikely that controlled trials of therapy will be possible.

SUMMARY

A fatal case of anthrax meningitis is described. Modes of infection leading to a septimaemic spread are discussed. Antibiotics in the therapy of anthrax are briefly mentioned.

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