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A fatal case of cutaneous anthrax

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SUMMARY

A fatal case of cutaneous anthrax, presenting many unusual features, is reported. No evidence of occupational or domestic exposure to the risk of infection was found.

INTRODUCTION

Anthrax is primarily a world-wide disease of domestic animals affecting cattle, horses, sheep, goats and pigs although infection of many other species has been reported (Christie, 1969). Man is infected through his contact with animals or animal products, person-to-person spread being virtually unknown (Brachman, 1970). Glassman (1958) has estimated the world incidence of human cases to be between 20,000 and 100,000 annually, the vast majority being in countries with a warm climate where pasture land is permanently infected and where the population live in close proximity to domestic animals. Anthrax in humans is rare in this country, eight cases, on average, being reported annually since the disease was made generally notifiable in December 1960. We report here a case of human cutaneous anthrax which was unusual in several respects.

CASE REPORT

The patient was a 68-year-old Irishman, resident for many years in this country. He was in good health until 12 February when he began to feel vaguely unwell. At this time his wife noticed a small swelling below his right ear. During the next 48 hr. the swelling and inflamatory reaction increased and on 14 February he was seen by his family doctor who prescribed lincomycin. However, the swelling progressed and the patient, who was becoming increasingly distressed and anxious, was admitted to an Infectious Diseases Unit on 15 February. On admission he was seen to have extensive subcutaneous oedema extending from the right submandibular area to the anterior chest wall and the left side of the jaw, obliterating the suprasternal notch. On the right side of the neck, over the area of greatest swelling,

there was a well demarcated indurated zone of intense erythema. This area which was slightly elevated and irregular in outline measured approximately 10 cm. by 6 cm. Within this area were several small and one large vesicle, the latter being about 3 cm. in diameter. There was no sign of a developing eschar, nor did one form later. In spite of its appearance, the lesion was remarkably painless. No other abnormality was found, apart from some tachycardia (88/min.) and a temperature of 101° F. Laboratory findings at this time were w.b.c. 6500/mm.^{3} (62 % neutrophils), Hb 17·06 g./100 ml., ESR 4 mm. in 1 hr. (Westergren). A provisional diagnosis of erysipelas was made at this time although it was noted that the oedema was excessive and the lack of tenderness atypical. Three blood cultures, collected at 15 min. intervals, and a swab from the skin lesion were taken before treatment was begun with benzyl penicillin, 2 megaunits six-hourly by intramuscular injection. During the next 24 hr. the patient's condition deteriorated, the oedema extending into the throat and palate and he was unable to speak or swallow. As stridor and respiratory distress were increasing the patient was started on hydrocortisone 100 mg. six-hourly. At this time the results of the three blood cultures taken the previous day were reported as yielding large gram positive aerobic bacilli, provisionally identified as *B. anthracis*. As a result of this report the dose of penicillin was increased to 12 megaunits daily. The immediate concern, however, was for the maintenance of the patient's airway, and the opinion of a consultant in throat surgery was sought. In his hands indirect laryngoscopy revealed marked oedema of the glottis and ulceration of both false and true vocal cords. The surgeon considered a tracheostomy impracticable in the presence of the massive oedema. As it was not possible in the opinion of the anaesthetist to pass an endotracheal tube, a nasopharygeal tube was passed and oxygen administered intermittently in this way, resulting almost immediately in considerable relief to the patient. His condition improved during the next 48 hr., his temperature falling to normal and the oedema subsiding. Results of laboratory tests at this time were w.b.c. 19,900 (neutrophils 75 %) Hb 19·0 g./100 ml., serum urea 240 mg./100 ml. Improvement continued gradually and by 20 February the patient was able to talk a little and to take fluid by mouth. At this time the nasopharyngeal tube was removed and the hydrocortisone was discontinued. However, the white cell count had risen to 38,100/mm.^{3} although all blood cultures (incorporating penicillinase) taken after the onset of treatment did not yield any bacterial growth and a chest X-ray showed clear lung fields.

On the evening of 22 February, one week after admission, at a time when the patient appeared much better, he suddenly became dyspnoeic, collapsed and died within a few minutes. On the instructions of the Coroner an autopsy was not held.

EPIDEMIOLOGICAL INVESTIGATIONS

At work

Mr M. worked in a factory which manufactured cardboard containers. The company appeared to be well run; the buildings were well maintained, the working conditions satisfactory and each worker had his own locker. Since there was only one major manufacturing process the number of raw materials involved was re-

latively small and none was of animal origin. The patient operated a mixing machine which prepared a starch paste, the main adhesive used in the manufacturing process. This paste was made from cornflour, borax, formaldehyde, caustic soda and aluminium sulphate. The cornflour, claimed to be of edible quality, was manufactured in Holland from American yellow maize. It was transported to this country, in sacks by the manufacturers in their own ships which carried no other cargo. In the factory the sacks were stacked near the mixing machine and a forklift truck was provided to lift them. The sacks themselves were made from paper and had not been previously used. Enquiries concerning the shipment of the bulk maize did not reveal any source of contamination with products likely to contain anthrax spores.

Another form of adhesive used on a much smaller scale was stored in another part of the factory. This was a glue made from vegetable materials. However, it came from a factory where other products of animal origin were manufactured and therefore contamination of the vegetable glue or the exterior surface of its container with anthrax spores might have occurred. Apart from this item no other material likely to be exposed to contamination with anthrax spores could be found. There were, however, several piggeries sited close to the factory and these were inspected by district veterinary officers. Evidence of anthrax among the livestock was not found.

At home

The patient lived about one mile from the factory in a small semidetached house in a surburban area. This he shared with his wife, son, daughter and son-in-law. None of these people was in an occupation known to be associated with exposure to anthrax and none had been abroad in the previous 12 months or received gifts from abroad. Mr M. had no pastime or hobby which seemed likely to be relevant, neither had he acquired or borrowed clothing in recent months. There was little family interest in gardening and fertilizer was not found in the house or garden. He travelled to work either by motorscooter or by company minibus through an area where no industrial risk of anthrax was known to the local health authority.

Samples of flour from individual sacks together with flour from the environment and from the patient's boots, were examined by the P.H.L.S. reference expert for anthrax. Further specimens of flour, specimens of the vegetable glue and scrapings from the external surface of its container were examined by us by the method advised by the reference expert. None of the material yielded *B. anthracis*.

DISCUSSION

Three forms of human anthrax, cutaneous, pulmonary and gastro-intestinal are described (Christie, 1969). Pulmonary anthrax is almost invariably fatal but is now exceedingly uncommon, only one case having been reported since 1956 (Dr J. R. H. Berrie, personal communication). The gastro-intestinal form results from eating infected meat and is said not to occur in Britain (Report of the Com-

mittee of Inquiry on anthrax, 1959). The cutaneous form is therefore the only type of anthrax likely to be encountered in this country.

The lesion in cutaneous anthrax arises as the result of the implantation of anthrax spores under the skin. Thus the exposed parts of the body, the face, neck and arms are most frequently affected although statements on how frequently the hand is involved are somewhat contradictory (Christie, 1969; Brachman, 1972). After germinating, the spores multiply locally and produce toxin; in about 5% of cases there is bacteraemia (Brachman, 1970). The severity of cutaneous anthrax varies considerably and the term 'malignant oedema' is used to describe the more severe type of illness characterized by massive progressive oedema, multiple bullae and severe generalized toxaemia (Brachman, 1972). However complete recovery is to be expected in nearly all cases in this form of the disease provided that treatment is prompt and adequate (Report of the Committee of Inquiry on anthrax, 1959).

The case we describe here was bacteraemic and had the features of malignant oedema. Although clinically atypical and with no occupational exposure to anthrax to alert suspicion the provisional diagnosis of erysipelas resulted in prompt, if fortuitous, treatment with adequate doses of the appropriate antibiotic (Christie, 1969; Garrod & O'Grady, 1971). Nevertheless, although the blood was rapidly cleared of the anthrax bacilli, the patient's condition deteriorated for at least a further 24 hr. Indeed the patient's initial response coincided more clearly with the administration of cortisone which has been reported to be of value in malignant oedema (Doust, Sarkarzadeh & Kavoossi, 1968; Tahernia, 1967). However, his progress thereafter appeared satisfactory and his sudden death was totally unexpected.

The severe degree of malignant oedema in this patient presumably reflected the extent of toxin formation. Although prompt antibiotic therapy might be expected to terminate toxin production it would not neutralize the toxin already in the circulation. This would continue to be available to be fixed at the appropriate target sites, explaining the delay in initial response of the patient. It might therefore seem more rational to treat anthrax with antitoxin in addition to antibiotics, and this practice indeed has its advocates and is stated to be the usual procedure in the U.S.S.R. (Lincoln *et al.* 1964; Klein *et al.* 1962). On the other hand Christie (1963, 1969), with considerable experience in treating anthrax, does not think antiserum of value in cases likely to be met in this country and it is evident that antibiotics alone have been effective in most of such cases. Whether the administration of antiserum would further reduce the very small number of fatal cases occurring in this country, is debateable.

The marked polymorpholeucocytosis and haemoconcentration which developed several days before the patient's sudden collapse were perplexing features for which no cause was found. However, it is of interest that these two features are among the pathophysiological changes which develop in rats injected with anthrax toxin (Fish *et al.* 1968).

As an autopsy was not permitted the cause of death in this patient must remain a matter for speculation but it is worthy of note that sudden and unexpected death is a well-documented phenomenon in anthrax (Klein *et al.* 1968; Christie, 1973).

Anthrax in Britain is considered to be almost exclusively an occupational disease, virtually all cases being contracted during the course of industrial, horticultural or agricultural exposure (Report of the Committee of Inquiry on anthrax, 1959). However, in the case reported here we were unable to establish an occupational exposure to materials likely to be contaminated with anthrax spores. Nor was there evidence of domestic exposure, for example, to bone meal fertilizer. This is the only material commonly anthrax-infected to which the general public is likely to be exposed (Jamieson & Green, 1955; Green & Jamieson, 1958; Report of a Working Party of the PHLS, 1959).

The site of the lesion on our patient suggested infection from something carried on the shoulder and we strongly suspected the sacks of cornflour. However, we were unable to isolate the anthrax bacilli from the flour and the patient himself denied carrying the heavy sacks. Furthermore, cornflour is not an animal product and we were unable to obtain a history of any association during shipment or storage with products likely to contain anthrax spores. Such associations of course may be difficult to establish; for example, the cornflour may have been ground in contaminated equipment previously used for grinding bones for bone meal (Dr P. S. Brachman, personal communication).

In the last 3 years two other cases of anthrax have been reported in this country in which the source of infection could not be established. One of these was a foundry worker with fatal meningitis and the second a housewife with cutaneous anthrax who recovered (P.H.L.S. unpublished). Several unexplained cases have also occurred in recent years in the United States (Dr P. S. Brachman, personal communication). Thus while it is most important that occupational exposure should arouse a high index of clinical suspicion of anthrax (Report of the Committee of Inquiry on anthrax, 1959), the absence of such an assocation is no bar to the acquisition of this potentially lethal infection.

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