

INVESTIGATIONS AND CONTROL MEASURES FOLLOWING A CASE OF INHALATION ANTHRAX IN EAST LONDON IN A DRUM MAKER AND DRUMMER, OCTOBER 2008

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We discuss the investigations and control measures undertaken following the notification of a fatal case of inhalation anthrax in East London. The patient is believed to have acquired the infection from making animal hide drums. Environmental investigations identified one drum and two pieces of animal skins contaminated with anthrax spores.

Introduction

Anthrax is predominantly a disease of livestock. Naturally acquired infection in humans occurs as a result of contact with infected animals or animal products contaminated with spores of *Bacillus anthracis*. The most common form of the disease in man is cutaneous anthrax. Other forms, including inhalation and gastrointestinal anthrax, are less common.

The incubation period for inhalation anthrax is between two and 43 days, but may be up to 60 days or as short as one day [1]. An initial prodromal stage may include symptoms such as fever, malaise, fatigue and anorexia followed by sudden increase in fever, severe respiratory distress, excessive sweating and shock. The case fatality can be as high as 92% in sporadic cases where the diagnosis is usually only made during the fulminant stages [2].

B. anthracis spores are considered as one a potential biological weapon [3] and deliberate release of anthrax spores has occurred in the United States (US) in 2001 [4].

Anthrax is now a very rare disease in the United Kingdom (UK). Between 1981 and 2006, 18 possible cases of cutaneous anthrax were notified in England and Wales, with *B. anthracis* isolated in only one case and serological confirmation in another two. The last case of pulmonary anthrax in England and Wales was reported in 1974, and the last case before that was in 1965 [5].

A death from anthrax occurred in Scotland in 2006; this was a case of disseminated anthrax following exposure to imported animal hides in a drummer and drum maker [6]. One case of naturally

acquired inhalation anthrax was also reported in the US in 2006 in a drum maker who used imported animal skins [7].

The case reported below is the first case of inhalation anthrax reported in England and Wales in more than 30 years [8].

The case

On 21 October 2008, the patient presented to a London hospital with a two-day history of fever, night sweats and rigors. He rapidly deteriorated during early hours of 23 October and was transferred to the intensive care unit with respiratory failure. Multiple organ failure developed the following day. The admission chest X-ray showed some basal shadowing and a widened mediastinum.

On 22 October, admission blood cultures had become positive and Gram-positive rods were seen on microscopy. On 23 October, the organism produced pure growth on media plates. A preliminary diagnosis of *B. anthracis* was made on 24 October.

The results were reported to North East and North Central London Health Protection Unit on Friday 24 October, and an incident was declared immediately. The sample was couriered to the Health Protection Agency's (HPA) laboratory for Novel and Dangerous Pathogens (NADP) in Porton Down, where the identity of the organism was confirmed on the same day as *B. anthracis*. Further molecular and microbiological investigations on the next day confirmed the identification of the organism and drug sensitivities.

The patient commenced on oral and intravenous antibiotics immediately after admission. Antibiotic treatment was changed to rifampicin, ciprofloxacin and clindamycin following diagnosis of anthrax on 24 October. Following consultation with the US Centers for Disease Control and Prevention (CDC) in Atlanta, anthrax immunoglobulin (Cangene Corporation), was flown in from the US and administered on 27 October. The patient remained in

critical condition requiring multi-organ support until he died on 2 November,

A *post mortem* examination was carried out on 5 November to confirm the diagnosis and to clarify the circumstances of death. The *post mortem* report is awaited after the inquest in March 2009 but the preliminary results confirm the primary cause of death as pulmonary anthrax.

Although cremation is the preferred disposition method [9] the body was buried in a sealed coffin according to the family's wishes.

Epidemiological investigation

When the diagnosis had been made, the patient was in a critical condition and unable to communicate. Therefore all information about his activities was provided by his family and friends. The family was interviewed in depth in order to identify the potential source of infection. However, they were not able to provide all the required information about his activities during the incubation period. Some of his friends, colleagues and clients were also interviewed.

The patient made and played animal hide drums. All drum making activities in the two months preceding the onset of disease took place in a studio flat in East London, while the family lived at a different address.

A supplier of animal skins, who had been reported to have supplied skins to the patient, was also interviewed and reported importing hides from Gambia; however, it was also reported that the patient made and repaired drums for clients who brought him animal skins from various sources. Based on the available information and evidence from previous cases [6,7,10-12] a working hypothesis was formed that he possibly acquired the infection while making the drums in his studio flat.

Environmental investigation

The studio flat was investigated and environmental samples were collected by staff from the NADP laboratory. Samples included five drums, animal skins left in the property, drum making equipment, surfaces, and air samples. The remaining skins from the same batch supplied to the patient by the main supplier of animal skins were also tested, as were a further six drums kept at the family's home.

Of the samples taken from the studio flat one drum and two pieces of leftover animal skins proved to be contaminated with *B. anthracis*. All other samples from the studio flat were negative. Neither the animal hides belonging to the main supplier, nor the drums kept at the case's family home showed any evidence of contamination with anthrax spores.

Control measures

Prophylaxis

The HPA started a risk assessment as soon as the incident was declared to identify individuals who might have been present when the case was making drums in the 60 days before onset of symptoms. The patient's immediate family, the main supplier of the skins, and a person who assisted him with drum making were offered prophylaxis with ciprofloxacin. A staff member at the hospital was also concerned about potential exposure to aerosolised

spores and started prophylaxis on 24 October. No one else had been identified as being at risk.

All contacts started the recommended course of prophylaxis with ciprofloxacin (500 mg oral, twice daily for 60 days) [13] on 24 October or as soon as they were identified. Due to reported minor side effects including gastrointestinal upset, the treatment was switched to doxycycline (100 mg oral, twice daily) in one contact and to amoxicillin (500 mg oral, three times daily) in another. The latter stopped taking antibiotics after three weeks. All other contacts were still taking antibiotics at the time of publication of this report (more than seven weeks after start of prophylaxis).

Decontamination

None of the surfaces at the studio flat were positive for anthrax. It was therefore decided that extensive decontamination of the flat would not be necessary. However, the contaminated drum was removed and the area surrounding it was decontaminated using 10,000 ppm hypochlorite solution [14]. It was agreed that the skin from this drum should be removed and incinerated but that the base of the drum could be returned to the family following decontamination. Other animal skins found at the property were also incinerated.

Advice to drummers

During interviews with the case's friends and colleagues they were informed about the possible risks of handling untreated animal skins and were advised to avoid importing skins from uncertified sources. Based on evidence from previous cases they were advised that the risk from playing drums was minimal and the main risk would be during the process of making drums, particularly shaving hair from animal skins as this could result in aerosolised anthrax spores being inhaled [7]. The HPA is now working on information leaflets on anthrax to be distributed to drummers through existing drumming networks and websites. Advice for drum makers on manipulation of animal hides is available on HPA website [15].

Discussion

Inhalation anthrax continues to be a rare event but this case illustrates the need for rapid diagnosis and treatment. In the anthrax letters in the United States in 2001 the mortality of inhalation of anthrax was reduced from 92% to 45%. This reduction in case fatality rate was associated with factors including rapid instigation of treatment. [12].

Following the identification of one contaminated drum and two animal skins at the patient's workshop we are continuing our investigations about his activities in relation to these objects in more detail. However, we are aware that retrospective information gathering about his exposure may not yield reliable and conclusive information due to several factors including recall bias, vested interest and fear of legal challenges regarding imported animal skins by his clients and work associates.

Inhalation anthrax is very rare. The above case is the first reported in England and Wales in more than 30 years and the second case in the UK after a patient died in Scotland in 2006 [6]. Both of these UK cases, as well as a case reported from US in 2006 [7], were drum makers. The microbiological evidence and epidemiological investigations into the Scottish case concluded that the infection was linked to drumming activities, although the exact nature of the exposure is unknown. It is believed that the most likely source

of infection in the case in London was the imported hides he used to make the drums.

Despite the popularity of African drums and drumming in many countries, there are few documented cases of anthrax associated with these activities. According to an internet search for English and French reports, the case reported here is the sixth case in the literature. In four cases there was a known exposure via manipulating skins in drum making, and for two the exposure was thought to be handling or playing the drums [6,7,10-12].

To prevent future similar cases it is important to raise public awareness, in particular amongst drum makers and drummers about potentially contaminated animal skins, the risks of particular sources of these animal products, and the early signs of anthrax so that they can seek professional advice in a timely manner. This should be available through websites such as the HPA site, and supplied to the drumming community for dissemination.

References

1. Heymann, DL, editor. Control of Communicable Diseases Manual. 18th edition. Washington: American Public Health Association; 2004.
2. Holty JE, Bravata DM, Liu H, Olshen RA, McDonald KM, Owens DK. Systematic review: a century of inhalational anthrax cases from 1900 to 2005. *Ann Intern Med*. 2006;144(4):270-80.
3. Bossi P, Tegnell A, Baka A, van Loock F, Hendriks J, Werner A, et al. Bichat guidelines for the clinical management of anthrax and bioterrorism-related anthrax. *Euro Surveill*. 2004;9(12):pii=500. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=500>
4. Centers for Disease Control and Prevention. Update: investigation of bioterrorism-related anthrax-Connecticut, 2001. *MMWR* 2001; 50: 1077-9
5. Health Protection Agency. Epidemiological Data. Human Anthrax in England and Wales. Available from: www.hpa.org.uk/webw/HPAweb&Page&HPAwebAutoListDate/1191857565963?p=1191857565963. [Accessed 12 December 2008].
6. Riley A. Report On The Management Of An Anthrax Incident In The Scottish Borders; July 2006 to May 2007. Melrose: National Health Service Borders; 2007 Dec. Available from: www.nhsborders.org.uk/uploads/18645/anthrax_report_131207.pdf
7. Centers for Disease Control and Prevention (CDC). Inhalation anthrax associated with dried animal hides--Pennsylvania and New York City, 2006. *MMWR Morb Mortal Wkly Rep*. 2006;55(10):280-2. Available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm5510a4.htm
8. A single case of inhalation anthrax in a drum maker in London. Health Protection Report. 2008;2(44). Available from: <http://www.hpa.org.uk/hpr/archives/2008/news4408.htm>
9. Center for Infectious Disease Research & Policy (CIDRAP). Anthrax: Current, comprehensive information on pathogenesis, microbiology, epidemiology, diagnosis, treatment, and prophylaxis. Minneapolis: CIDRAP; 2008 Nov 3. Available from: <http://www.cidrap.umn.edu/cidrap/content/bt/anthrax/biofacts/anthraxfactsheet.html>
10. Centers for Disease Control and Prevention (CDC). Cutaneous anthrax acquired from imported Haitian drums - Florida. *MMWR Morb Mortal Wkly Rep*. 1974;23:142, 147.
11. Kumor L, Bates L, Stephens S, Canadian Food Inspection Agency. 2005 Anthrax Outbreak in Manitoba. Manitoba: Manitoba Agriculture, Food and Rural Initiatives; winter 2005-2006. Available from: www.gov.mb.ca/agriculture/livestock/anhealth/pdf/jaa02s00c.pdf
12. Centers for Disease Control and Prevention (CDC). Cutaneous anthrax associated with drum making using goat hides from West Africa - Connecticut, 2007. *MMWR Morb Mortal Wkly Rep*. 2008;57(23):628-31. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5723a3.htm>
13. Health Protection Agency. Current Recommended Antibiotics and Schedule for Prophylaxis and Treatment of Deliberate Release Agents. HPA Review of Antibiotics for DR Agents V1.2. HPA; 2007 April 11. Available from: http://www.hpa.org.uk/web/HPAwebFtle/HPAweb_C/1194947396662
14. Health Protection Agency (HPA). Environmental Decontamination. HPA; 2008 Nov 6. Available from: www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1204186180817?p=1201265869780

15. Health Protection Agency (HPA). Anthrax, hides and drums: Q&As. HPA; 2008 Nov 19. Available from: http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733752819

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