



Public Health
England

Guidance on assessing risk of anthrax on building land

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through advocacy, partnerships, world-class science, knowledge and intelligence, and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

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Executive summary

1. The UK has an exceptionally low rate of anthrax, and nearly all cases since 1981 have been associated with imported material. Of the 19 cases reported, in England & Wales between 1981 and 2009, all but one were cutaneous, and only two cases were confirmed bacteriologically. Two others were positive by antibody tests; the evidence for the remaining cases is doubtful.
2. There are no records since 1981 of any person being infected as a result of disturbing soil for building or any other purpose.
3. The incidence in animals fell steadily throughout the twentieth century, and cases are now less than per year, implying that the risk of exposure to anthrax even for grazing animals is exceptionally low.
4. There is no evidence of any worker or member of the public being infected with anthrax as the results of development of brownfield sites including abattoirs and tanneries, areas traditionally associated with anthrax, or greenfield sites previously used for livestock.
5. If building work is to take place in areas for which there is documented evidence of a confirmed case of anthrax in livestock, the site can be sampled and specimens sent for analysis for anthrax spores as detailed in the main text.
6. Advice on dealing with areas shown to be contaminated can be obtained from Public Health England or the Health and Safety Executive.

Background

Bacillus anthracis is a spore forming bacterium that causes anthrax disease. The disease is primarily a disease of herbivores, but humans can be infected through contact with spores from contaminated sources such as contaminated meat, animal hides, horse hair plaster and contaminated bone meal. Anthrax disease in humans is very rare in the UK and is associated with imported animal products and infected animals. The last reported case of inhalational anthrax in the UK (before July 2006) was in 1904. Anthrax is known as Woolsorters' or Bradford disease due to its association with woollen mills in the north of England.¹ Anthrax in textile workers was not known before 1837 when alpaca and mohair were imported into the UK from Peru and Asia Minor. Despite the number of workers who had potentially been exposed, the level of inhalational anthrax was low. After 1904, all hides were disinfected using steam formaldehyde decontamination and this contributed to the drop in the number of reported cases. Vaccination of mill workers was introduced in the 1950s. This led to a further drop in the number of reported cases, although it is not known if this was as a direct result of vaccination or due to increased awareness of the routes of exposure and measures introduced to reduce exposure.

Anthrax became a notifiable animal disease in 1887 and the records from this time show that anthrax infection in animals in the UK has steadily declined and is now rare. Since 1997, there have been two outbreaks of infection involving three animals.² Foci of contaminated grazing land, from tanneries or previous burial sites remain in the UK. Sporadic outbreaks occur when the earth on these sites is disturbed by natural activities such as flooding or by other activities such as ditching. Live anthrax spore vaccines are used to immunise livestock in areas with known contamination. An animal vaccine is available in the UK; the dosing is arranged on a case-by-case basis through communication with the Department for Environment, Food and Rural Affairs.

Risk

Between 1981 and 2009, 21 possible cases of anthrax were notified under the Public Health (Control of Diseases) Act.⁴ There was one death. Two cases subsequently had alternative diagnoses, thus nineteen cases are considered to remain on the register. All but one case was cutaneous anthrax, the remaining case was a fatal case of inhalational anthrax. Confirmation by culture of *Bacillus anthracis* occurred for only two patients, one in 1995 and one in 2008. Serological confirmation was obtained in two cases, in 1982 and 2001. In all other cases, diagnosis was made on clinical grounds only. In five, bacteriological and/or serological tests were known to be negative. The table below summarises the cases and likely source of contamination.

Table 1 Notified cases of human anthrax infection from 1981-2009 in England and Wales⁴

Occupation/ source of infection	Number of cases
Slaughterman / butcher / fellmonger	5
Factory worker / imported wool (wool +ve)	1
Factory worker / bonemeal fertiliser	1
Factory worker / imported cotton/wool/leather	1
Labourer / leather bales	1
Leather worker	1
Engineer / animal skins in Zambia	1
Worked with horses	1
Builder	1
Farm worker	1
Animal hide drums	1
Not determined	4
Total	19

No cases of anthrax from exposure to contaminated ground were recorded during either of the world wars, despite the incidence of other diseases from environmental exposure to spore-forming organisms, such as *Clostridium tetani* and *Cl. perfringens*. This suggests that the risk of contracting anthrax from contaminated areas is very low and that other factors may be important for exposed people to become ill. These may be:

- exposure to high concentration of spores
- intense or prolonged contact
- susceptibility of individuals

Development of potentially contaminated sites, such as old tannery sites, comes under building regulations. There is a legal requirement under the COSHH regulations to consider the possibility of anthrax contamination on these sites before work commences. This may include testing the site for spores (see below) but the possibility of low residual contamination has to be borne in mind and suitable procedures to protect workers put in place. If the site tests positive, additional precautions or clean up procedures may be necessary. Advice can be obtained for the Health and Safety Executive or PHE Rare and Imported Pathogens Laboratory (RIPL).

Sampling and guidance

The World Health Organisation guidance “Anthrax in Humans and Animals, Fourth Edition” provides a very comprehensive overview on sampling and related procedures.⁵ Specifically, Annex 1: Laboratory procedures for diagnosis of anthrax, and isolation and identification of *Bacillus anthracis*, Annex 7: Sampling plans for environmental testing of potentially contaminated sites and for decontamination and disposal of waste, Annex 3: Disinfection, decontamination, fumigation, incineration. This is recommended for areas where there is documented evidence of anthrax contamination, with laboratory-confirmed cases in animals within the last thirty years. Additional guidance can be found in “Anthrax: Safe Working and the Prevention of Infection”.⁶

For day to day practice over virtually all sites in England and Wales, the following guidelines should be followed.

Required sample collection kit includes:

- leak-proof specimen containers, wide-mouth in the case of environmental samples
- secondary containers for “double-bagging”
- secure carrying containers (eg good quality cool box, metal box, plastic mailing pots etc)
- sterile swabs, forceps, scissors, spatulas or spoons
- sterile water and/or saline
- ‘sharps’ disposal containers
- labels and markers or pens
- adhesive tape
- autoclavable discard bags for disposables
- autoclavable discard bags for tools, clothing, boots, etc
- stock hypochlorite solution and water to make up working solution (5,000–10,000 ppm) and handwashing facilities (eg large water container and basin)
- paper towels

Required personal protective equipment

1. Disposable coveralls and thick kitchen-type rubber gloves should be worn and incinerated after use.
2. Cuts and abrasions should be properly dressed before coveralls, gloves and boots are put on.
3. Boots should be washed down with 10% formalin¹ or strong hypochlorite² (household bleach will suffice at recommended concentration >10,000ppm) after use and the disinfectant itself should be left overnight before being discarded.

4. In exceedingly dusty conditions, or where dust is being collected (for example, around the inside of a disused tannery or bone processing plant), dust masks should be worn.

Labelling of samples

The following information should be recorded in indelible ink on the container:

- a reference code or number

The below details should be noted either on the container or on a sample documentation sheet:

- the date and time of sampling
- the location of the sampling point
- the type of sample
- the reason for sampling
- the identity of the person taking the sample

Sampling protocol

1. Exposed surfaces are swabbed with moistened swabs, which are “double-bagged” (see below) and sent to the laboratory.
2. Water is collected by means of a syringe without needle and double-bagged.
3. Soil samples are collected with sterile spoons or other suitable sterilised tools into sterile, sealable containers (eg specimen cups with screw-on lids) and double-bagged.
4. Dust samples. For most purposes, swabs or sterile gauze “wipes”, premoistened with sterile water, are best. Dry swabs may be used if there is special reason not to use wet ones, but they will only collect small amounts of sample. The swabs are transferred to an appropriate container and double-bagged. It may also be possible, depending on the circumstances, to transfer dust to a sterile container with a sterile spatula; this should obviously be done carefully so as not to create aerosols. If vacuum collectors, purpose-designed to collect these types of sample into Hepa filter collectors, are available, then these should be the method of choice.
5. Less than 500g is needed for testing, an estimate of which is: SOIL: Approximately the amount that would fill a soft drinks can. PLASTER: The length and breadth of a credit card.
6. If the sample is needing to be tested at more than one establishment, please take duplicate samples at source as samples will not be forwarded or returned once they have been tested.

Containment for transport (‘double bagging’)

1. The specimens should be collected into sterile containers using aseptic techniques.
2. The containers should be wiped down with hypochlorite (10,000 ppm) and, with outer gloves changed first, put into an outer, secondary container (double-bagged). If the secondary container is a plastic bag, then this should be of good quality. It should, in turn,

be sealed and, for transport, be put into a good-quality cool box or a strong plastic or metal container with a lid that can be made secure.

3. The secondary and outer containers should bear the relevant hazard labels. Generally, specimens should be stored at 2–8 °C. Preferably they should be transported in cool boxes, especially in hot weather and when the time interval between collection and delivery to the laboratory is likely to be more than 1–2 hours.
4. For shipping of samples by mail or courier, the appropriate procedures with relevant paperwork must be followed.

Sampling

See Annex 7 of the WHO guidelines for detailed sampling strategies. The British Standards Institute (2011) suggests that the minimum number of sampling points should be 15 for 0.5 hectares, 25 for one hectare and 85 for five hectares.⁶ Samples should be taken from the top 0.25 m; a decision might be taken to test the sediment in drains that are found at a later stage. In areas where there is known burial of carcasses with laboratory confirmed anthrax, please contact the Rare and Imported Pathogens Laboratory (details below) for specialist advice.

Packaging and sending samples

Samples should be securely sealed and packaged using the guide below:

- samples should be securely sealed inside a suitable container (strong plastic bag for plaster or lidded plastic pot for soil) and wiped down with disinfectant, and then securely sealed inside another strong plastic bag and disinfected again
- please do not use glass containers as this poses a severe hazard to our staff if breakages occur
- once all samples have been collected and packaged, they should be placed inside of a strong box; a strong 'Jiffy Bag' (padded mailing envelope) can be used as an outer container for a small number of plaster samples
- the box should then be packed to ensure the samples remain intact during transit and adequate absorbent material (eg paper towelling) should be used to absorb any potential spills
- the box should then be packed to ensure the samples remain intact during transit and adequate absorbent material (eg paper towelling) should be used to absorb any potential spills

The package should then be taped up and clearly labelled 'Microbiological specimen' and 'Only to be opened in laboratory', as well as with both receiver's and sender's names and addresses on the outside of the envelope.

Collected specimens should be sent to a suitable laboratory. These include:

Rare and Imported Pathogens Laboratory, PHE Porton
Environmental Samples
Rare and Imported Pathogens Laboratory
Microbiology Services
PHE Porton
Manor Farm Road
Porton Down
Wiltshire
SP4 0JG.

For all enquiries, telephone 01980 612348, or e-mail ripl@phe.gov.uk.

Health and Safety Laboratory, Buxton
Contact: Darren Whitehouse
Darren.whitehouse@hsl.gsi.gov.uk
+44 (0)1298 218407

Decontamination

In the event that a positive sample is found, please contact the Rare and Imported Pathogens Laboratory (details above) for specific advice on decontamination and disposal of contaminated waste.

DEFRA Foot and Mouth Order and Animal Health Act 1981

It is illegal to dig up any cattle carcass or part of a carcass under the Animal Health Act 1981, irrespective of concerns regarding diseases such as anthrax. If a carcass is found, work should be stopped immediately and the local office of the Animal Health and Veterinary Laboratories Agency (AHVLA) notified (www.defra.gov.uk/ah). An officer from AHVLA will then visit the site and advise on the safe disposal of the remains and issue a licence to authorise this. Advice will also be given on the cleansing and disinfection of any machinery used. No carcass should be touched by hand unless protective clothing is worn.

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