**Ministry of Higher Education and Scientific Research**

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**College of Veterinary Medicine**



Anthrax in man and sheep

**الجمرة الخبيثه في الانسان و الاغنام**

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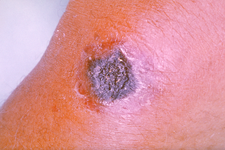
المرحلة الرابعة2014-2015

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| --- |
| **Anthrax** |
| *Classification and external resources* |
| [Bacillus anthracis Gram.jpg](http://en.wikipedia.org/wiki/File:Bacillus_anthracis_Gram.jpg)  [Photomicrograph](http://en.wikipedia.org/wiki/Photomicrograph) of a [Gram stain](http://en.wikipedia.org/wiki/Gram_stain) of the bacterium *Bacillus anthracis*, the cause of the anthrax disease |

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**Anthrax** is an [acute](http://en.wikipedia.org/wiki/Acute_(medicine)) disease caused by the bacterium [*Bacillus anthracis*](http://en.wikipedia.org/wiki/Bacillus_anthracis). Most forms of the disease are lethal, and it affects both humans and other animals. Effective vaccines against anthrax are now available, and some forms of the disease respond well to antibiotic treatment.

*B. anthracis* bacterial spores are soil-borne. Because of their long lifespan, spores are present globally and remain at the burial sites of animals killed by anthrax for many decades. Disturbed grave sites of infected animals have caused reinfection over 70 years after the animal's interment.[11]

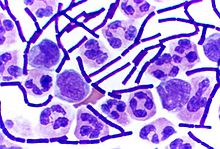
[](http://en.wikipedia.org/wiki/File:Anthrax_PHIL_2033.png)[](http://en.wikipedia.org/wiki/File:Skin_reaction_to_anthrax.jpg)Skin reaction to anthrax A skin lesion caused by anthrax

Cutaneous anthrax, also known as **Hide porter's disease**, is the [cutaneous](http://en.wikipedia.org/wiki/Cutaneous" \o "Cutaneous) (on the skin) manifestation of anthrax infection in humans. It presents as a[boil](http://en.wikipedia.org/wiki/Boil)-like [skin lesion](http://en.wikipedia.org/wiki/Skin_lesion) that eventually forms an [ulcer](http://en.wikipedia.org/wiki/Ulcer) with a black center ([eschar](http://en.wikipedia.org/wiki/Eschar" \o "Eschar)). The black eschar often shows up as a large, painless [necrotic](http://en.wikipedia.org/wiki/Necrotic) ulcer (beginning as an irritating and itchy skin lesion or blister that is dark and usually concentrated as a black dot, somewhat resembling bread mold) at the site of infection. In general, cutaneous infections form within the site of spore penetration between two and five days after exposure. Unlike [bruises](http://en.wikipedia.org/wiki/Bruise) or most other lesions, cutaneous anthrax infections normally do not cause pain.[[15]](http://en.wikipedia.org/wiki/Anthrax#cite_note-CDC-Anthrax-15)

**Bacteria**[[edit](http://en.wikipedia.org/w/index.php?title=Anthrax&action=edit&section=6" \o "Edit section: Bacteria)]

[](http://en.wikipedia.org/wiki/File:Anthrax_color_enhanced_micrograph.JPG)

Color-enhanced [scanning electron micrograph](http://en.wikipedia.org/wiki/Scanning_electron_microscope) shows [splenic tissue](http://en.wikipedia.org/wiki/Spleen" \o "Spleen) from a[monkey](http://en.wikipedia.org/wiki/Monkey) with inhalational anthrax; featured are rod-shaped [bacilli](http://en.wikipedia.org/wiki/Bacilli) (yellow) and an [erythrocyte](http://en.wikipedia.org/wiki/Red_blood_cell) (red).

[](http://en.wikipedia.org/wiki/File:Gram_Stain_Anthrax.jpg)

Gram-positive anthrax bacteria (purple rods) in [cerebrospinal fluid](http://en.wikipedia.org/wiki/Cerebrospinal_fluid)sample: If present, a Gram-negative bacterial species would appear pink. (The other cells are [white blood cells](http://en.wikipedia.org/wiki/White_blood_cell)).

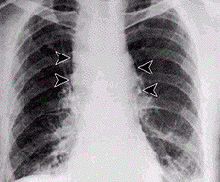
*Main article:*[*Bacillus anthracis*](http://en.wikipedia.org/wiki/Bacillus_anthracis)

*Bacillus anthracis* is a rod-shaped, [Gram-positive](http://en.wikipedia.org/wiki/Gram-positive), aerobic bacterium about 1 by 9 μm in size. It was shown to cause disease by [Robert Koch](http://en.wikipedia.org/wiki/Robert_Koch) in 1876 when he took a blood sample from an infected cow, isolated the bacteria and put them into a mouse.[[19]](http://en.wikipedia.org/wiki/Anthrax#cite_note-pages_277-310-19) The bacterium normally rests in [endospore](http://en.wikipedia.org/wiki/Endospore" \o "Endospore) form in the soil, and can survive for decades in this state. Herbivores are often infected whilst grazing, especially when eating rough, irritant, or spiky vegetation

**Exposure**

Occupational exposure to infected animals or their products (such as skin, wool, and meat) is the usual pathway of exposure for humans. Workers who are exposed to dead animals and animal products are at the highest risk, especially in countries where anthrax is more common. Anthrax in [livestock](http://en.wikipedia.org/wiki/Livestock) grazing on open range where they mix with wild animals still occasionally occurs in the United States and elsewhere. Many workers who deal with wool and animal hides are routinely exposed to low levels of anthrax spores, but most exposure levels are not sufficient to develop anthrax infections. The body's natural defenses presumably can destroy low levels of exposure. These people usually contract cutaneous anthrax if they catch anything. Throughout history, the most dangerous form of inhalational anthrax was called woolsorters' disease because it was an occupational hazard for people who sorted wool. Today, this form of infection is extremely rare, as almost no infected animals remain. the deceased was transported to UCLA in a sealed plastic body bag within a sealed metal container for autopsy.[[22]](http://en.wikipedia.org/wiki/Anthrax#cite_note-Suffin1978-22)

**Mode of infection**

[](http://en.wikipedia.org/wiki/File:Anthrax_-_inhalational.jpg)

Inhalational anthrax, [mediastinal](http://en.wikipedia.org/wiki/Mediastinum" \o "Mediastinum)widening

Anthrax can enter the human body through the intestines (ingestion), lungs (inhalation), or skin (cutaneous) and causes distinct clinical symptoms based on its site of entry. In general, an infected human will be quarantined. However, anthrax does not usually spread from an infected human to a noninfected human. But, if the disease is fatal to the person's body, its mass of anthrax bacilli becomes a potential source of infection to others and special precautions should be used to prevent further contamination. Inhalational anthrax, if left untreated until obvious symptoms occur, may be fatal.

Diagnosis

Various techniques are used for the direct identification of *B. anthracis* in clinical material. Firstly, specimens may be[Gram stained](http://en.wikipedia.org/wiki/Gram_stain). *Bacillus* spp. are quite large in size (3 to 4 μm long), they grow in long chains, and they stain Gram-positive. To confirm the organism is *B. anthracis*, rapid diagnostic techniques such as [polymerase chain reaction](http://en.wikipedia.org/wiki/Polymerase_chain_reaction)-based assays and [immunofluorescence microscopy](http://en.wikipedia.org/wiki/Immunofluorescence" \o "Immunofluorescence) may be used.[[28]](http://en.wikipedia.org/wiki/Anthrax#cite_note-28)

.Prevention

**Vaccines**

*Main article:*[*Anthrax vaccines*](http://en.wikipedia.org/wiki/Anthrax_vaccines)

Vaccines against anthrax for use in livestock and humans have had a prominent place in the history of medicine, from Pasteur's pioneering 19th-century work with cattle (the second effective vaccine ever) to the controversial 20th century use of a modern product ([BioThrax](http://en.wikipedia.org/wiki/BioThrax" \o "BioThrax)) to protect American troops against the use of anthrax in [biological warfare](http://en.wikipedia.org/wiki/Biological_warfare). Human anthrax vaccines were developed by the [Soviet Union](http://en.wikipedia.org/wiki/Soviet_Union) in the late 1930s and in the US and UK in the 1950s. The current FDA-approved US vaccine was formulated in the 1960s.

Currently administered human anthrax vaccines include [acellular](http://en.wikipedia.org/w/index.php?title=Acellular_vaccine&action=edit&redlink=1" \o "Acellular vaccine (page does not exist)) (United States) and [live spore](http://en.wikipedia.org/w/index.php?title=Live_spore_vaccine&action=edit&redlink=1) (Russia) varieties. All currently used anthrax vaccines show considerable local and general [reactogenicity](http://en.wikipedia.org/wiki/Reactogenicity" \o "Reactogenicity) ([erythema](http://en.wikipedia.org/wiki/Erythema" \o "Erythema), [induration](http://en.wikipedia.org/wiki/Induration" \o "Induration), [soreness](http://en.wikipedia.org/wiki/Soreness" \o "Soreness),[fever](http://en.wikipedia.org/wiki/Fever)) and serious adverse reactions occur in about 1% of recipients.[[30]](http://en.wikipedia.org/wiki/Anthrax#cite_note-30) The American product, BioThrax, is licensed by the FDA and was formerly administered in a six-dose primary series at 0, 2, 4 weeks and 6, 12, 18 months, with annual boosters to maintain immunity. In 2008, the FDA approved omitting the week-2 dose, resulting in the currently recommended five-dose series.[[31]](http://en.wikipedia.org/wiki/Anthrax#cite_note-31)

TreatmentAnthrax cannot be spread directly from person to person, but a person's clothing and body may be contaminated with anthrax spores. Effective decontamination of people can be accomplished by a thorough wash-down with [antimicrobial](http://en.wikipedia.org/wiki/Antimicrobial" \o "Antimicrobial)soap and water. Waste water should be treated with bleach or other antimicrobial agent. Effective decontamination of articles can be accomplished by boiling them in water for 30 minutes or longer. Chlorine bleach is ineffective in destroying spores and vegetative cells on surfaces, though formaldehyde is effective. Burning clothing is very effective in destroying spores.

**First vaccination**]

*Further information:*[*Anthrax vaccines*](http://en.wikipedia.org/wiki/Anthrax_vaccines)

[](http://en.wikipedia.org/wiki/File:Pasteur_inoculating_sheep_against_anthrax._Wellcome_L0003758.jpg)

Louis Pasteur inoculating sheep against anthrax

In May 1881, [Louis Pasteur](http://en.wikipedia.org/wiki/Louis_Pasteur) performed a public experiment to demonstrate his concept of vaccination. He prepared two groups of 25 sheep, one goat, and several cows.

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