On December 8th, 2023, the World Health Organization announced that Zambia had reported its largest anthrax outbreak for a decade. The anthrax outbreak was reported to the WHO on November 1st, 2023 by the International Health Regulations National Focal Point of Zambia. As of November 20, 2023, 684 suspected human cases, including four deaths were reported from 44 /116 districts in 9/10 of Zambia's provinces.

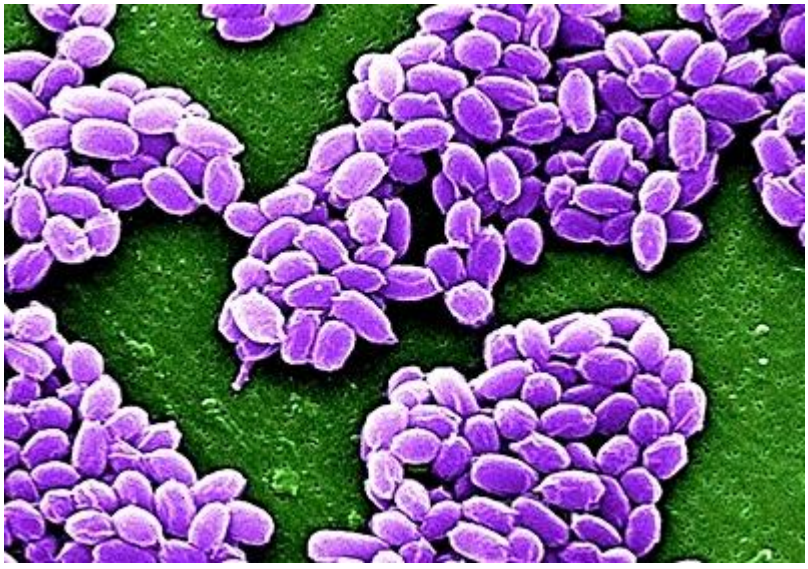
Anthrax is a zoonotic disease (a disease transmissible from animals to humans), caused by a spore-forming, Gram-positive bacterium *Bacillus anthracis* that typically affects ruminants (such as cows, sheep, and goats). Humans can develop the disease from infected animals or contaminated animal products. Infections are initiated by the entry of spores into the host *via* the respiratory system, the gastrointestinal tract, or cuts/wounds in the skin. When anthrax spores enter the body, they can germinate, multiply, and produce toxins.

Depending on the type of exposure, individuals may present one of the three clinical forms of anthrax within a few hours to three weeks.

The most common form of anthrax is cutaneous or skin anthrax with an itchy bump on the exposed area rapidly developing into a black sore. Some people then develop headaches, muscle aches, fever, and vomiting. More than 95% of human anthrax cases take the cutaneous form and are caused by handling infected carcasses or hides, hair, meat, or bones from such carcasses.

Cutaneous or skin anthrax

Gastrointestinal anthrax causes initial symptoms similar to food poisoning, but it can worsen and produce severe abdominal pain, vomiting of blood, and severe diarrhea.
Pulmonary anthrax is the most severe form, with the initial symptomatology of a common cold and rapid progression to severe breathing difficulties and shock.
Among the three forms of anthrax infections, the inhalational form has the highest mortality rate. Inhalational anthrax is characterized by the ability of spores to persist in the host lungs for a long time, but the underlying mechanisms are not well understood. BclA, a major surface protein of *Bacillus anthracis* spores, was found to have immunomodulatory properties. It mediates the direct binding of complement factor H to spores and dampens antibody response to spores in a complement C3-dependent manner. Wang Y, et al. *Bacillus anthracis* Spore Surface Protein BclA Mediates Complement Factor H Binding to Spores and Promotes Spore Persistence. PLoS Pathog 2016; 12(6): e1005678. https://doi.org/10.1371/journal.ppat.1005678



Spores of *Bacillus anthracis*

Anthrax is an endemic disease in Zambia, typically occurring between May and January, with a peak near the end of the dry season (between October and November). Zambia reports sporadic cases of anthrax on an annual basis. From September 2022 to January 2023, 42 suspected cases of anthrax in humans were reported. Anthrax outbreaks in both

humans and animals were reported in the Western Province in 2017 and in Eastern Province in 2016 and 2011. Since 2011, when 511 suspected human cases were reported, there haven't been any large-scale outbreaks.

In this anthrax outbreak, the first human case was reported on 16 June 2023 and it was laboratory-confirmed by the culture at the Lusaka Central Veterinary Research Institute. As of November 20, 2023, 684 suspected human cases, including four deaths were reported from 44 /116 districts in 9/10 of Zambia's provinces. Most symptomatic cases were epidemiologically connected to confirmed cases and were not tested. The most affected were the Southern (370 cases; 54 %), Western (88; 13%), Lusaka (82; 12%), Eastern (66; 10%), and Muchinga (47; 7 %) provinces.

Regarding the animal aspect, as of November 21, 2023, a total of 568 domestic and wild animal cases were reported across 11 districts in the Eastern, Southern, and Western provinces. Cattle and goat specimens tested by culture at the Lusaka Central Veterinary Research Institute returned positive for anthrax on July 17, 2023.

The WHO advised that the public should avoid handling and consumption of meat from animals that died suddenly, meat obtained through emergency slaughter, and meat of uncertain origin. Veterinarians, agricultural and wildlife workers, or workers who butcher animals or process meat, hides, hair, or wool should wear protective clothing, gloves, or personal protection equipment.

In healthcare settings, screening procedures should be enhanced, particularly in areas with a known epidemiological risk of anthrax. Diagnosis can be made through polychrome methylene blue-stained blood smears, polymerase chain reaction, or enzyme-linked immunosorbent assay.

It is imperative to promptly implement infection prevention and control measures when cases are suspected. Individuals who might have been exposed to anthrax spores should get prophylactic treatment. Hospitalization is mandatory for all human cases identified. The use of antibiotics, especially penicillin, is effective against this disease. Prompt treatment can reduce the case-fatality rate to less than 1%. Vaccines are also available in limited quantities for both, livestock and humans. Human vaccines are limited to those that have possible occupational exposure.

Reference

World Health Organization (8 December 2023). Disease Outbreak News; Anthrax in Zambia. https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON497