# A One-Health lens for anthrax

Outbreaks of deadly zoonotic diseases with epidemic potential have plagued humans for centuries. While global attention is currently focused on the WHO Blueprint list of priority diseases, which include Crimean-Congo haemorrhagic fever, Ebola, Marburg, Lassa fever, Middle East respiratory syndrome, Rift Valley fever, Nipah and henipaviral diseases, there are other, neglected, zoonoses,[1] which also need attention. A good example of this neglect is anthrax,[2] caused by the bacterium *Bacillus anthracis*. Anthrax is frequently fatal in domestic and wild animals and large outbreaks can occur in both groups.[2] Anthrax can also be lethal in humans, causing overwhelming gastrointestinal or pulmonary disease.[2]

*B anthracis* is ubiquitous and can survive as a viable spore under extreme weather conditions in the soil for a 100 years,[3] and thus cannot be eradicated. Anthrax remains a severely under-reported disease in Africa, Asia, and South America, where humans frequently butcher and eat animals infected with *B anthracis*.[4,5] It is unlikely that this situation will change in the medium-term because public health services in these regions are inadequately prepared and resourced to address the recurrent, widespread, sporadic anthrax outbreaks according to best public health practice.[6] In livestock-dependent communities, survival is closely linked to the health of their animals. When sickness prevails, decisions on disposing of animals are sometimes in conflict with the need to use or consume this precious resource, putting the community at risk of anthrax exposure. Anthrax in wildlife is neglected because of the absence of legal or economic incentives to promote wildlife health.

WHO recommendations[6] for disposal of carcasses do not fully appreciate practical context and resource barriers to employ these measures in anthrax-endemic communities. Destroying carcasses by burying or incineration is costly, and frozen, flooded, treeless, or rocky ground can make this virtually impossible. Consequently, carcasses are often left to rot or are discarded into flooding rivers.[5] Billions of *B anthracis* spores are released into soil and the environment as a result. Furthermore, domestic animals now dominate the global mammal biomass[7] on a shrinking rangeland. This dominance is leading to high densities of livestock in some regions, and persistent anthrax hotspots.

The sequence of events leading to clinical expression of anthrax in animals and humans remains poorly understood. If progress is to be made, especially in high anthrax-risk environments, where there is frequent animal–human contact, the focus needs to shift to reducing environmental contamination in a more practical and effective way. Owners of domestic livestock populations and wildlife managers could easily be trained in the detection and control of suspect cases. Where burning or burial is not feasible, and fencing off the site will not stop epidemics, due to vectoring blow flies, vultures, and other scavengers, a possible solution is the use of animal body-bags made from heavy-duty sealable plastic. These could be made available from health extension offices, stamped with a warning "suspect anthrax—do not touch or move", with a phone number to the public health and veterinary authorities and smartphone app QR codes on the bags to record automated spatiotemporal data. This method should isolate the carcasses and, in many cases, heating in the sun and rapid putrefaction would in time destroy the vegetative bacteria.[8] If this was to occur, then the carcass would no longer pose a threat as spores would not form and subsequent exposure would allow the forces of nature, such as scavengers to clean up and at no cost or risk of further spread of infection. With large carcass counts this method would be particularly appropriate and could reduce the burden of anthrax on people, domestic animals, and biodiversity, and in time even the exposure risk from soils in high density livestock communities.

Effective control and management of human anthrax outbreaks are well described and there is low risk in countries where there are sufficient resources available to follow WHO operating procedures and protocols.[6] For example, in 2016, in Yamal autonomous region, Russia, there was an anthrax outbreak among migratory Nenet indigenous peoples.[9] This outbreak resulted from thawing and exposure of old anthrax burial sites, in unprecedented hot weather, leading to a reindeer anthrax outbreak. Rapid prophylaxis and control measures were able to prevent spread to humans. For medical science to break the cycle of anthrax and other zoonotic outbreaks, increased investments into One-Health—an approach that promotes communication between different disciplines

For the **WHO Blueprint list of priority diseases** see https://www.who.int/blueprint/priority-diseases/en/

For more on **One-Health** see http://neoh.onehealthglobal.net/

to achieve optimal health of people, animals, and the environment—are required.[10] Scrutinising anthrax through a One Health lens is long overdue. More integrative approaches are needed to show that the environment is a key neglected area for control and prevention of Anthrax.

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