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Anthrax Outbreaks in Kyotera District, Uganda: Implications for Public Health Emergency Preparedness

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ABSTRACT

Introduction: In late 2023, Uganda's Ministry of Health declared an anthrax outbreak in the Kyotera district, Masaka region, following reported animal and human fatalities. This article outlines the initial outbreak characteristics and the multi-sectoral response initiated by national and international stakeholders.

Methodology: This article presents a descriptive account of the anthrax outbreak in Kyotera district based on preliminary investigations, surveillance data provided by the Ministry of Health and collaborating partners (WHO, Infectious Disease Institute, Public Health Fellowship Program, Masaka Regional PHEOC), and a review of the unfolding events up to October 31, 2023.

Results: The anthrax outbreak in Kyotera district significantly impacted both human and livestock populations, leading to confirmed human cases, fatalities, and the death of 24 animals by October 31, 2023. The outbreak disrupted community livelihoods and strained the healthcare system, particularly as Uganda continues its recovery from the COVID-19 pandemic. Preliminary observations suggest a potential link between the outbreak and the rainy season, consistent with previous anthrax occurrences in East Africa. Economic consequences included potential job losses in the local meat industry and increased demands on healthcare resources.

Conclusion: The recent anthrax outbreak in Kyotera district underscores the ongoing threat of zoonotic diseases and the importance of a swift, coordinated, and multi-sectoral response. The findings highlight the need for strengthened interministerial cooperation, proactive health education campaigns targeting at-risk communities, consideration of prophylactic interventions, and the adoption of a comprehensive One Health approach for effective prevention and control of future outbreaks in Uganda.

1 | Introduction

Anthrax is a significant zoonotic disease, posing a public health threat. It is caused by *Bacillus anthracis*, a gram-positive, aerobic, spore-forming bacterium from the Bacillaceae family, transmitted directly from animals or animal products to humans [1, 2]. Notably, there are no documented instances of human-to-human transmission of anthrax. Individuals typically contract the disease through contact with infected animals or occupational exposure to contaminated animal products, such as hair, wool, hides, and bones [3]. The spores of *B. anthracis* can persist in soil for extended periods under favorable conditions, contributing to recurrent outbreaks.

Human anthrax infection manifests in four primary forms, each varying in severity and incubation period, depending on the route of exposure: cutaneous (1–12 days), inhalational (1–60 days), gastrointestinal (1–6 days), and injectional (1–10 days) [4]. Cutaneous anthrax is the most prevalent form, accounting for over 95% of human cases, and results from direct

contact with infected animals or contaminated animal products [5]. It typically presents as a localized skin infection, often occurring on the face, neck, arms, or hands. Globally, approximately 2000–20,000 human anthrax cases are reported annually, with a significant proportion (75%) occurring in African countries with low livestock vaccination rates [6].

2 | Recent Anthrax Outbreak

Uganda has historically experienced sporadic anthrax outbreaks across various sub-regions [7–10]. These outbreaks predominantly occur in areas where livestock rearing is common, particularly in western, eastern, and northern Uganda [9]. Recently, the Ministry of Health (MoH) declared an anthrax outbreak in three sub-counties (Kabira, Kasasa, and Lwnkoni) of the Kyotera district in the Masaka region. Preliminary investigations suggest that the outbreak may have originated in Kyotera district in June 2023, following the consumption of a deceased cow from a farm in Kkyamayembe Sub-County. Affected individuals presented with symptoms including itchy rash, swelling, and skin lesions. The first human fatality was reported in early July, and by October 31, 2023, 24 animal deaths had been recorded. Despite these fatalities, the consumption of meat from dead animals persisted, leading to three additional human cases.

Following the onset of symptoms, including skin rash, fever, swelling, and skin lesions, the initial human death occurred in early July 2023. Subsequent animal deaths prompted the involvement of the district veterinary team, which initially attributed the deaths to East Coast fever. Despite treatment, animal mortality continued, reaching 24 cows by October 31. Meat from the deceased animals was reportedly consumed by local residents.

On October 17, 2023, a joint team from the Masaka district surveillance unit, led by the focal person and the World Health Organization field coordinator, conducted field investigations in the affected villages of Kyotera district. Samples (blood and swabs) were collected from two suspected cases and sent to the Uganda Virus Research Institute for viral hemorrhagic fevers testing, which returned negative results. On November 17, 2023, the Kyotera district surveillance team, in collaboration with the Uganda Virus Research Institute, collected additional samples from Kabiira, where multiple alerts had been received. These samples tested positive for anthrax, leading the Ministry of Health to declare an anthrax outbreak in Kyotera district on November 29, 2023.

Furthermore, according to Lawrence Tumusiime (2024), 68 suspected cases of animal anthrax were reported across three farms (A, B, and C) located in Kidda, Kyamayembe, and Kifambi villages in Bwamiija and Ndolo parishes, Kabira subcounty. These farms share a common water source, with farms A and C sharing a specific drinking point. The first animal death occurred on farm B on June 10, 2023, and the carcass was sold to the local community at trading centers in Kyanika, Kyamayembe, and Kifambi. Farm B subsequently lost 22 cattle, all of which were sold to the community. According to the farm manager, the cattle deaths coincided with heavy rains. Investigations revealed an organized network involved in selling meat from cattle that died suddenly in Kabira Sub-county, Kyotera District [11].

The response to the outbreak has included reactive vaccination of susceptible herds, treatment of affected animals, enhanced surveillance, quarantine measures, proper disposal of carcasses, and disinfection of contaminated areas. This outbreak occurred in a region with no prior reports of anthrax, suggesting a potential link to prolonged rainfall or soil disturbances associated with anthrax outbreaks.

3 | Diagnosis, Prevention, and Control of Anthrax

Diagnostic efforts in Kyotera district involved the collection of human blood and animal meat samples, which were sent to the national laboratory for analysis. Human samples tested positive, while animal samples returned negative results. Key strategies for controlling animal outbreaks include enhanced case surveillance, prophylactic measures, vaccination, quarantine, limiting access to potential sources, proper disposal of carcasses, prompt diagnosis and treatment, and disinfection [12]. Human outbreak control measures include rapid identification of the source, exposed individuals, and human cases. Treatment of cutaneous cases can be managed in outpatient settings. Systemic cases require antibiotics and supportive care [12].

4 | Impacts

The anthrax outbreak has significant social, economic, and public health consequences, affecting both livestock and human populations. By March 30, 2024, 68 cattle had died, with many others critically ill, exhibiting symptoms such as sudden death, fever, loss of appetite, swelling, respiratory distress, bloody discharge, abdominal pain, and diarrhea [11]. The outbreak's association with the rainy season is notable, aligning with observations from previous outbreaks, such as the one in Kenya in 2017 [2, 13]. Uganda, like many countries recovering from the COVID-19 pandemic, faces additional challenges due to its developing healthcare infrastructure. The anthrax outbreak has strained Uganda's healthcare system, necessitating quarantine measures and causing economic disruptions, including job losses in the meat industry. The outbreak has also increased the burden on healthcare resources.

5 | Future Directions

To enhance preparedness and mitigate future anthrax outbreaks, a multi-faceted approach is imperative. First, sustained and targeted health education campaigns are crucial for raising awareness among livestock farmers and communities about anthrax transmission, prevention, and safe handling practices. These campaigns should emphasize the importance of proper carcass disposal and the risks associated with consuming meat from dead animals. Second, strengthening veterinary services to implement rigorous animal inspections before slaughter and

ensuring widespread preventive vaccination of livestock are essential. Prophylactic antibiotic administration in high-risk areas during outbreaks should also be considered. Third, enforcing strict quarantine measures, including movement restrictions for animals and animal products, is vital to contain the spread of the disease. Fourth, enhancing interministerial collaboration between the Ministries of Health, Agriculture, and Environment is necessary for a coordinated and effective response. Finally, adopting a "One Health" approach, which recognizes the interconnectedness of human, animal, and environmental health, is paramount. This approach necessitates a multidisciplinary effort, involving veterinarians, public health professionals, environmental scientists, and community leaders, to develop and implement comprehensive strategies for anthrax prevention and control. Future research should focus on understanding the environmental factors that contribute to anthrax outbreaks, as well as developing more effective diagnostic tools and treatment protocols.

6 | Conclusion

The recent anthrax outbreak in Uganda's Kyotera district serves as a stark reminder of the persistent threat posed by zoonotic diseases, particularly in regions with close human-animal interactions. The outbreak's impact, spanning livestock losses, human illness, and economic disruption, underscores the critical need for robust public health strategies. The rapid response by Ugandan authorities, along with the collaborative efforts of international partners, demonstrated the importance of coordinated action in containing such outbreaks. However, the emergence of anthrax in a previously unaffected area highlights the unpredictable nature of these events and the necessity for continuous vigilance. The correlation observed between the outbreak and the rainy season also suggests that environmental factors play a significant role in disease transmission, requiring a holistic approach to prevention and control.

Author Contributions

Majani Edward: conceptualization, investigation, writing – original draft, writing – review and editing, supervision, software. **Francis Ogwang:** writing – original draft. **Samuel Ojera:** writing – original draft. **Francis Obaa:** writing – original draft.

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The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data are available within the article.

Transparency Statement

The lead author Majani Edward affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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