



Strengthening Specimen Tracking and One Health Investigations During an Anthrax Outbreak in Kazo District, Uganda, March, 2026

Authors: Caroline Musubika^{1,2*}, Samuel Gidudu¹, Florence M Nambaziira¹, Joshua Kayiwa³, Alisen Ayitewala³, Isaac Ssewanyana³, Godfrey Ekuka⁴, Herbert Kwitonda⁵, Benon Dusabimana⁵, Winfred Nakaweesi¹, Alfred Nabimanya⁵, Stephen Ngero⁵, Naphatali Nomwesigwa⁵, Ivan Amanyanya⁵ and Susan Ndidde Nabadda³

Institutional affiliations: ¹Uganda National Institute of Public Health, Ministry of Health, Kampala, Uganda, ²Makerere University Biomedical Research Centre, Kampala, Uganda, ³National Health Laboratory and Diagnostics Services, Ministry of Health, Kampala, Uganda, ⁴Department of Integrated Epidemiology Surveillance and Public Health Emergencies, Ministry of Health, Kampala, Uganda, ⁵Kazo District local government, Kazo, Uganda

***Correspondence:** musubikacarol@uniph.go.ug; +256 784 752853

Summary

Background: Anthrax is zoonotic disease that requires integrated human, animal, and environmental investigations, supported by effective specimen referral and documentation systems. Effective documentation supports coordination between human, animal and environmental health sectors, facilitates specimen tracking and case follow-up, provides timely information for public health decision-making and outbreak response. During the 2026 outbreak in Kazo District, the extent of specimen documentation across the referral pathway and the implementation of animal and environmental investigations alongside human case investigations had not been systematically assessed. We assessed specimen documentation throughout the testing and referral pathway and evaluated the integration of One Health investigations during the anthrax outbreak in Kazo District, Uganda

Methods: We assessed specimen documentation at Kazo Health Centre IV, Rwemikoma Health Centre III, and Kazo Veterinary Laboratory by reviewing laboratory and referral records for documentation of specimen collection, referral, testing, and receipt of results. Five Key informant interviews were conducted with One Health stakeholders to identify barriers to animal and environmental investigations. The One Health stakeholders were purposively selected including veterinary officer, crop and animal husbandry officer, veterinary and human laboratory technician and environmental officer. The interview transcripts were coded line-by-line with coding independently reviewed by two co-authors for consistency. Findings informed corrective actions, including strengthening specimen documentation and initiating animal and environmental sample collection and testing.

Results: Documentation of specimen collection, referral, testing, and receipt of results was absent for 20 specimens reviewed at Kazo Health Centre IV and Rwemikoma Health Centre III. No animal or environmental investigations had been conducted alongside laboratory-confirmed human anthrax cases. Interviews identified poor reporting of sick animals by farmers, limited anthrax awareness, inadequate laboratory capacity, and weak coordination among human, animal, and environmental sectors

Conclusion: Following the assessment, we customized a laboratory referral register to document all referred specimens and their corresponding test results. We also initiated animal and environmental sample collection to support anthrax investigations.



Background

Anthrax is a zoonotic disease caused by the spore-producing Gram-positive rod-shaped bacterium *Bacillus anthracis* (1). Anthrax is one of the priority zoonotic diseases in Uganda with the cattle corridors having frequent outbreaks that pose severe public health and economic risks. Anthrax primarily affects herbivorous animals, but also infects humans through direct or indirect contact with infected animals or their products (1).

Kazo District has experienced recurrent anthrax outbreaks. In late 2024, 22 human cases, including three deaths, were reported alongside hundreds of suspected animal deaths. Between January and February 2026, 25 human specimens were tested for anthrax, of which 16 (64%) were positive.

Effective specimen management during outbreak investigations requires complete documentation throughout the testing pathway, including specimen identification and type, date and time of collection, referral details, receipt at the testing laboratory, and test results. Incomplete documentation and weak referral systems can compromise specimen traceability, delay testing and result communication, and limit the ability to construct the laboratory response. Assessment of specimen documentation is therefore important for identifying weaknesses that may affect the quality, timeliness, and continuity of diagnostic services during an outbreak (2).

Because anthrax is a zoonotic disease, outbreak investigations also require coordination across human, animal, and environmental health sectors. Following identification of a laboratory-confirmed human case, investigations may need to assess potential animal exposures, animal illness or deaths, and relevant environmental sources or conditions. Such coordinated investigations can help identify possible sources of exposure and inform control measures (3).

During the 2026 outbreak in Kazo District, the extent of specimen documentation across the referral pathway and the implementation of animal and environmental investigations alongside human case investigations had not been systematically assessed. We therefore assessed specimen documentation and referral practices and the application of the One Health approach during the anthrax outbreak and implemented corrective actions to address identified gaps.

Methods

The assessment was conducted in March, 2026 in Kazo District. The district health system comprises of one Health Centre IV, 10 Health Centre IIIs, and 10 Health Centre IIs. Laboratory services are available at Health Centre III level and Health Centre IV. For anthrax investigations, specimens are collected and transported through the national specimen referral and transport system to designated national reference laboratories for testing. Human specimens are referred for testing through the National Health Laboratory and Diagnostic Services, while animal and environmental specimens are referred to the National Animal Disease Diagnostics and Epidemiology Centre.

We purposively selected three laboratories including Kazo Health Centre IV, the district laboratory hub, Rwemikoma Health Centre III, a high-volume sample



collection facility and Kazo Veterinary Laboratory, the district's only veterinary health laboratory. We conducted an assessment at Kazo Health Centre IV, Rwemikoma Health Centre III, and Kazo Veterinary Laboratory using a World Health Organization (WHO) laboratory assessment tool 2012 together with the National Laboratory Guidelines for Preparedness and Response to Public Health Emergencies 2023. Laboratory records and referral documentation were reviewed to assess documentation of specimens collected, referred, tested, and results received throughout the testing and referral pathway.

Five Key informant interviews were conducted with a purposively selected veterinary (01) and human laboratory technician (01), veterinary, crop and animal husbandry and environmental officers. The interviews were conducted to explore the implementation of animal and environmental investigations, intersectoral coordination, and barriers affecting one Anthrax health investigation. The interviews also assessed whether animal and environmental investigations were conducted alongside investigations of laboratory-confirmed human anthrax cases. Interview transcripts were coded line by line with coding independently reviewed by two co-authors to ensure consistency. Findings informed corrective actions, including strengthening specimen documentation and initiating animal and environmental sample collection and testing.

This investigation was part of a public health emergency response and was therefore determined to be non-research. The Ministry of Health (MoH) gave permission to conduct the investigation. This activity was reviewed by the US CDC and was conducted consistent with applicable federal law and CDC policy. §§See, e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. Informed verbal consent was obtained from all participants. All investigation results were securely stored by the investigation team in locked cabinets and password-protected computers to ensure participants confidentiality.

Results

Specimen documentation and referral practices at Kazo Health Centre IV, Rwemikoma Health Centre III, and Kazo Veterinary Laboratory, Kazo District, March, 2026

The assessment revealed that of the 20 specimens reviewed at both Kazo Health Centre IV and Rwemikoma Health Centre III. There was no documentation of specimen collection, referral, testing, and receipt of results. The online sample tracking system lacked anthrax in its dropdown menu, limiting electronic tracking of suspected cases.

The veterinary laboratory maintained documentation of sample collection and result reporting for the previous anthrax outbreaks but had not documented any samples in the current 2026 outbreak. Sample referral mechanisms were in place and functional, and all assessed facilities complied with triple packaging requirements for specimen transport.

One Health application in anthrax investigation, Kazo District, March 2026

No animal or environmental investigations had been conducted alongside laboratory-confirmed human anthrax cases. We identified facilitators of and barriers to One Health application in anthrax investigation. Facilitators included availability of staff



across the sectors, *“We have staff in the different sectors, and when there is a suspected anthrax case, we are able to work together”*—KII01.

Another facilitator included, *“We have an established One Health platform which provides a structure for bringing together the three sectors during an outbreak response. Although the platform is not currently active but its existence provides a foundation for joint response when needed”*—KII02.

Barriers to the One Health approach included difficulty obtaining investigation reports and animal and environmental samples, *“Sometimes farmers do not report sick or dead animals because they are afraid of losing money. They prefer to sell the animal cheaply rather than report it to the authorities”*—KII03.

Another barrier was similarity of anthrax signs to those of other diseases, limited awareness among farmers of how to identify sick animals promptly, *“In other cases, the farmers do not know what caused the animal to die, so they may not see the need to report it. This makes it difficult for us to get timely reports and samples for investigation”*—KII03.

The other barrier was absence of rapid diagnostic kits for anthrax testing, *“We currently do not have rapid diagnostic kits for anthrax. The last time we had them was in 2018, when they were provided as part of a study”*—KII04

Absence of environmental investigation, *“The last time we conducted environmental sampling was about five years ago, when the water was visibly discoloured and we collected water samples for investigation. Since then, we have not collected any soil or water samples for investigation”*—KII05

Discussion

There was no documentation of specimen collection, referral, testing, and receipt of results and animal or environmental investigations had not been conducted alongside laboratory-confirmed human anthrax cases. Weak documentation may compromise continuity along the testing pathway and limit timely linkage of laboratory findings to public health action. Strengthening standardized specimen tracking and result-feedback mechanisms could therefore improve accountability and coordination across the referral pathway (3).

The findings of no animal or environmental investigations being conducted alongside laboratory-confirmed human anthrax cases despite the presence of personnel from multiple sectors and an established One Health platform indicate the need for a more functional and routinely activated One Health response. Strengthening collaboration among human, animal, and environmental health teams, including engagement of farmers and private veterinary practitioners, could improve early detection, investigation, and control of future anthrax outbreaks (4).

Study limitation: The assessment was conducted at three purposively selected laboratories and may therefore not reflect specimen documentation practices across all facilities handling anthrax specimens in Kazo District. This was mitigated by selecting the high-volume facilities with key roles in the anthrax response. Findings from the key informant interviews may have been influenced by participants' recall and perceptions when describing barriers to animal and environmental investigations and intersectoral coordination. To mitigate this, we included key informants from,



human, animal, and environmental sectors and triangulated interview findings with available laboratory and referral records.

Conclusion: Assessment findings revealed deficiencies in specimen tracking and One Health coordination. Implementation of corrective actions strengthened documentation practices and enhanced integration of human, animal, and environmental sectors during anthrax outbreak investigations.

Public health actions: The District laboratory focal person (DLFP) and laboratory staff were mentored on proper documentation of samples collected, samples referred, and results returned. A sample referral register was jointly designed to facilitate sample tracking of the referred samples. We supported DLFP to engage the Result Dispatch System (RDS) developers to include anthrax in the online sample tracking system to improve electronic tracking of suspected anthrax cases.

Specimens, including skin lesion swabs from 20 suspected human cases and blood samples from 10 affected cattle, surface soil and water from affected farms were collected following standard biosafety procedures. *Bacillus anthracis* was detected in 14 (70%) human and 6 (60%) animal samples, while all soil and water samples tested negative.

Continuous mentorship and support supervision across the human, animal, and environmental health sectors could sustain the One Health response.

Conflict of Interest: The authors declare no conflict of interest.

Author contribution: CM led the study conceptualization, data collection, analysis, and article drafting. FMN, AA, IS, HK, BD, AN, WN, SN, NN, IA SNN, JK contributed to data collection and writing. SG, GE provided supervision and article review. All authors read and approved the final article.

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