

“Anthrax in the Mountains of Uganda” Facilitator’s Guide

Using an eLearning Case Study in an
Established Field Epidemiology Training Program

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I. Purpose of the facilitator’s guide

“Anthrax in the Mountains of Uganda” is an interactive, self-study eLearning exercise (a case study) that focuses on outbreak investigation. As designed, students with the necessary prerequisites can learn from and complete the case study on their own without outside support.

The case study can be used to advance the training goals of an established field epidemiology training program for the following reasons:

- The case study focuses on topics relevant to and already a part of many field epidemiology training programs.
- In contrast to other forms of training, the case study allows students to apply knowledge and practice skills in outbreak response before they must do so in the field.
- The case study illustrates the realities and challenges of outbreak response in ways that other forms of training cannot.
- Due to its interactive nature, the case study engages students, resulting in a more meaningful learning experience and increased transfer of skills to future professional settings.

This Facilitator’s Guide has been developed to help instructors and/or course managers from established field epidemiology training programs make decisions about how this case study can be integrated into their curricula and help students get the most from the training experience.

II. Description of the case study

A. Context and content

“Anthrax in the Mountains of Uganda” is an interactive eLearning case study developed to teach (and reinforce) knowledge and skills in outbreak investigation. It also promotes One Health principles and practices.

The case study is based on a real-life outbreak investigation that was undertaken by the Uganda Public Health Fellowship Program in 2018 (Kisaakye, 2020 and Monje, 2020). To support the learning objectives, facts and events from the original investigation have been altered.

The case study comprises six parts plus an introduction, each taking 45-60 minutes to complete. Students can complete the case study in one session (which takes on average 5-6 hours) or spread it over several sessions. If students complete the case study over multiple sessions, their progress is saved to their computing device, allowing them to resume the case study where they left off when they return. If they change to a different computing device, the case study starts from the beginning. Students can use a menu tool to return to their previous stopping point.

In “Anthrax in the Mountains of Uganda,” students work through the response to a suspected outbreak of anthrax in a rural community from beginning to end – from outbreak detection and hypothesis generation to hypothesis testing and implementation of control measures. Information about the outbreak and response is slowly revealed through written text. Photos and investigation artifacts (e.g., maps, epidemic curves, and data analyses) serve to immerse the student into the storyline and bring the case study to life.

For the case study to progress, students must intermittently answer questions that the eLearning will judge as correct, partially correct, or incorrect. Question format includes multiple choice questions (single and multiple answer) and true/false questions. Students can access hints before answering questions. After

submitting their answer(s), students are given detailed feedback explaining why certain answers are correct (or are the best choice) and others are not.

Scattered through the case study are special lessons on selected epidemiologic and One Health topics. These lessons support the learning objectives of the case study and are comprehensive (i.e., standalone) in nature. The content of the lessons will help students answer subsequent case study questions.

The following topics are covered in the special lessons:

- One Health Principles (Introduction)
- Anthrax in Humans (Part 1)
- Hypothesis Generation (Part 2)
- Anthrax in Animals (Part 3)
- Calculating Attack Rates and Risk Ratios (Part 4)
- One Health Team Practices (Part 6)

Students can choose to review these lessons when they appear in the case study (or skip them). The special lessons can also be accessed through the menu tool by scrolling to the bottom of menu (after Part 6) and selecting “Special Lessons.”

B. Learning objectives

“Anthrax in the Mountains of Uganda” focuses on selected steps in the investigation of a zoonotic disease outbreak and the coordinated One Health response. After completing the case study, students should be able to

1. Characterize cases associated with an outbreak by time, place, and person.
2. Develop and refine hypotheses about the source of an outbreak.
3. Analyze and interpret findings from a cohort study.
4. List examples of how concurrent investigations of a zoonotic disease in animals and in humans can inform disease detection, investigation, and control measures.
5. Describe team practices that facilitate a collaborative One Health response to an outbreak.
6. Describe the signs and symptoms, transmission, and control of anthrax in humans and animals.

C. Target audiences

The primary target audience for “Anthrax in the Mountains of Uganda” is participants and graduates of Field Epidemiology Training Programs (FETP)-Intermediate. FETP-Intermediate trainees/graduates are not only likely to have completed the prerequisites for the case study (see below) but will need mastery of the relevant topic areas for satisfactory performance in future work assignments.

Other audiences, however, may benefit from completing the case study including

- FETP-Advanced fellows,
- FETP-Frontline trainees,
- Students in Master of Public Health programs, and
- Anyone else interested in learning about outbreak investigation in the One Health context.

When used with these secondary target audiences, facilitators may need to modify the training experience to better support the educational goals of those audiences and/or not overwhelm (or bore) the student.

D. Prerequisites

To get the most out of this case study, students need to have completed basic training in public health surveillance, descriptive epidemiology, hypothesis generation, analytic epidemiology, and outbreak investigation. They should also be familiar with the epidemiologic triad (i.e., the disease-causing agent, a susceptible host, and an environment that brings the host and agent together) and the necessary interactions between these components for development of disease.

Although this case study focuses on a particular infectious disease, students do not need to be familiar with this disease prior to undertaking the case study. Necessary disease-specific information is provided in the case study through two special lessons.

The case study is written in English and requires good reading comprehension of English. Students can access definitions for key epidemiologic and public health terms while working through the case study. They also can access these definitions through a glossary at any time.

E. Equipment and software requirements

The eLearning is compatible with most browsers and works with desktop computers, laptop computers, smart phones, and tablets.

Users have the option of accessing the case study online or downloading it to their device. If students access the case study online, a minimum internet speed of 10 Mbps is desirable. If students choose to download the case study to their device, at least 50 Mb of storage space is required.

III. Possible approaches to using the case study in an established training program

An instructor or course manager familiar with the case study and program training goals will be able to identify creative ways to use “Anthrax in the Mountains of Uganda” as part of their curriculum. The following strategies might be appropriate in some settings.

A. A self-study experience with minimal use of group time

In this approach students complete the eLearning as a self-study assignment (i.e., homework). Students complete the case study parts in sequential order according to a schedule.

Soon after completion of each part (or group of parts), a short amount of group time is spent answering questions submitted by the students and troubleshooting difficulties students are having with the technology.

This approach is recommended for students who are members of the primary target audience who have completed the prerequisites and are comfortable using computers, motivated to learn on their own, and familiar with the case study approach to learning.

B. A self-study experience with synchronous or asynchronous group follow-up activities

As with the first option, students complete the eLearning as a self-study assignment following a set schedule. With this approach, however, group activities are undertaken at certain points in the case study schedule.

The advantage to this approach is that it allows the facilitator to reinforce knowledge and skills most relevant to program training goals, highlight local practices (which may or may not be consistent with practices promoted in the case study), and build on topics of interest. The intermittent group activities also will motivate students to complete the case study according to the planned schedule.

This approach is recommended for students who are members of the primary target audience in a training program that is sufficiently flexible to accommodate the group activities.

Group activities can be undertaken in a synchronous (e.g., an in-person or online class) or asynchronous (e.g., online forums or discussion boards) manner. Group activities might include

- Review of selected case study content or questions,
- Group discussions,
- Follow-up questions (see “Topics for follow-up group discussion”), or
- Specific epidemiological tasks undertaken in small groups.

For example, the facilitator could provide a line list of cases and ask small workgroups to perform the descriptive epidemiology for the outbreak or pair off students to practice hypothesis-generating interviews.

C. Synchronous group experience (in-person or online)

In this approach, the entire case study is completed as a synchronous group experience either in-person or online. Together, the group works through the case study screen by screen.

Ideally, case study screens are projected for all students to see; the facilitator or selected students then read the case study text out loud for the others to follow along.

Questions included in the case study can be posed to the group at large before the correct answer and feedback are revealed. To engage more students in answering the questions, the following tactics can be used:

- The facilitator can ask volunteers to share and explain their answers.
- If technology allows, students can be polled (or a hand-count can be taken) to get a sense of the prevailing answer. Facilitators can ask students with different answers to defend their answers.
- The facilitator can reveal the answer to a question and ask students to critique the answer.

The synchronous group experience approach is recommended for students both in and outside the primary target audience because it allows the facilitator to have more control of (and even modify) the learning experience. Facilitators can pass quickly over content that is not relevant to students or course training objectives. Conversely, facilitators can choose to dive into topics of value that are unfamiliar to the audience, taking the time to explore the topics in more detail.

Use of this approach, however, requires a substantial amount of group time. In addition, the facilitator will need to prepare for the training experience by reviewing the entire case study and selecting screens/questions on which to focus.

To ensure ongoing access to the eLearning case study during the synchronous group experience, the case study should be downloaded prior to the training and used offline.

D. Hybrid self-study and synchronous group experience

In this approach the student will complete selected parts of the case study as a self-study assignment. The remaining parts will be completed as a synchronous group experience (in-person or online). Facilitators can pick and choose which parts would most benefit students when undertaken as a group.

If a hybrid approach is taken to completing the case study, an effort should be made to complete the parts (whether self-study or as a group) in sequential order to maintain the continuity of the storyline.

IV. General guidance for use of the case study in an established training program

The following tips will improve the student's learning experience and help facilitators make the best use of limited training time regardless of how the case study is used in the curriculum.

A. Decide if the case study is appropriate for the course/curriculum.

Before using the eLearning in your training program, familiarize yourself with the product and its approach. Review the case study learning objectives and compare them with the goals of your training program. Consider the availability of the required computing devices and internet connectivity.

Determine if students have completed the prerequisites and if their knowledge base is adequate for successful completion of the case study. Think about the experiential nature of the training and the willingness/ability of students to take command of their own learning experience.

Consider the amount of time needed to complete the case study and available training time (in and outside class). Remember, any modifications to the case study experience (e.g., in-class discussions) will increase the amount of time necessary to complete the case study.

Finally, select the approach most appropriate for available training time, the level of the student, and program training goals.

B. Modify the case study experience to support program training goals.

“Anthrax in the Mountains of Uganda” has specific learning objectives and special lessons that support those learning objectives.

Decide if it is desirable to address all case study learning objectives. If not, consider skipping parts of the case study related to those learning objectives (or assigning those parts as self-study).

If you decide to skip one or more parts, for the continuity of the storyline, briefly summarize these parts for students (e.g., describe activities undertaken by the investigation team and/or pertinent findings). The final screen of each part “Progress of Outbreak Investigation” might be helpful in this effort.

If parts of the case study are desirable but beyond the level of training of the majority of students, be prepared to devote additional time to the case study to explore unfamiliar topics. The special lessons will be helpful.

For remedial and advanced students, consider replacing questions in the case study with questions more suited to the students' level of understanding or program training goals. To help in this regard, additional questions have been provided for each part of the eLearning. (See “Topics for follow-up group discussion.”)

C. Schedule the case study to ensure student success.

If you decide that the case study is appropriate for your students, schedule the assignment at a logical point in the curriculum (e.g., after modules on outbreak investigation or cohort study analysis) so that the effort builds on knowledge gained through other means (e.g., lectures and reading). “Anthrax in the Mountains of Uganda” offers a unique opportunity to apply and practice skills before having to do so in the field.

Because “Anthrax in the Mountains of Uganda” takes 5-6 hours to complete (if undertaken as designed), it is beneficial to break the case study into multiple assignments so as not to overwhelm the student. Consider assigning one or two parts at a time but do not allow too much time to lapse between assignments because students might forget critical investigation/storyline details. For continuity, the parts should be completed in sequential order.

D. Prepare students to undertake the case study.

Be sure that students have access to computing devices on which the eLearning can be run as well as reliable internet service to access the case study online or download the case study to their device. Walk students through the steps needed to access/download the case study or consider a “trial run” (i.e., having students access the case study before they need to run it) so any difficulties can be addressed. Identify IT support so that students can seek assistance if they have problems.

Describe the case study methodology to students. Encourage them to explore all components of the case study for the most meaningful learning experience. Emphasize that case study questions are tools for learning rather than tests of student knowledge. Encourage them to read the feedback to the questions as it summarizes important learning points.

Help students understand that although a great amount of detail is provided in the case study about the outbreak and investigation, many steps in the investigation have been treated superficially or even omitted. Students should appreciate that “Anthrax in the Mountains of Uganda” focuses on investigation activities that are relevant to the case study learning objectives.

Encourage students to think critically about the investigation described in the case study and how other approaches or activities might have been appropriate or better. Students need to appreciate the likely urgency with which most outbreak investigations are undertaken and that decisions often must be made based on incomplete information.

E. Reinforce key messages from the case study.

The case study is long and full of details related to the outbreak and the investigation. It is possible that students will lose sight of the training goals. Reinforce key points from the case study after each assignment so that all students have a common understanding of the investigation approach and activities. At a minimum, remind students what was covered in each part and solicit their questions. The final screen of each part, “Progress of Outbreak Investigation,” will be useful for this purpose.

F. Compare activities described in the case study to local investigation protocols and practices.

Some activities described and/or promoted in “Anthrax in the Mountains of Uganda” might be in opposition to local public health practices. Where appropriate and meaningful, highlight these differences or ask students to reflect on their understanding of what would be done locally. These comparisons will help students apply what they have learned to future work activities.

G. Introduce students to local One Health efforts.

One Health is an approach to designing and implementing programs, policies, legislation, and research in which multiple disciplines from multiple sectors work together to achieve optimal outcomes for the health of humans, animals, plants, and their shared environment.

Many countries have taken (or are taking) steps at the national level to promote One Health strategies. Efforts typically include

- An assessment of the country’s capacity to undertake collaborative One Health investigations,
- Prioritization of diseases that can be controlled more effectively through a joint response,
- Written agreements between relevant governmental departments and agencies to help mobilize resources, including personnel,
- Workgroups to guide and promote One Health practices,
- Coordinating offices to facilitate collaborations, and
- Designated staff to coordinate and support internal and external communications.

Before starting the case study, encourage students unfamiliar with One Health to view the special lesson “One Health Principles” that is included in the Introduction. Help students understand local One Health practices including the agencies that are notified when a One Health response is necessary, their roles and responsibilities, and the composition of the outbreak investigation team.

V. Questions for follow-up group discussion

When using the case study in an established training program, questions beyond those posed in the case study might help students explore selected topics more fully and better support program training goals. Facilitators can develop their own questions or use those provided below.

Introduction

One Health is a collaborative, multidisciplinary, multi-sectoral approach to designing and implementing programs, policies, legislation, and research with the goal of optimal health outcomes for humans, animals, plants, and their shared environment.

1. Can you give an example of a public health threat that would benefit from a One Health approach? Is there a place for One Health efforts beyond infectious diseases? Give examples.
2. What steps have been undertaken in your country/region/district to promote a unified One Health approach among governmental and non-governmental agencies and organizations?
3. If a decision is made to launch a One Health response to an outbreak, which governmental agencies in your country/district are likely to be involved? What is the likely composition of the investigation team?

Part 1: Outbreak Detection

In Part 1, the Kween District health officer learned about a cluster of patients with skin lesions suggestive of cutaneous anthrax. The health officer tried to verify the diagnosis and characterize the cases according to time, place, and person before deciding on the appropriate response.

1. How do public health officials commonly learn about outbreaks?
2. What actions are usually necessary to verify that a cluster of cases represents an outbreak?

3. What circumstances might lead public health officials to move forward with an investigation even if information is not available to establish the existence of an outbreak?
4. What are the typical steps in an outbreak investigation?

Part 2: Descriptive Epidemiology and Hypothesis-generating Interviews

In Part 2, the One Health investigation team met with local authorities from the community where the suspected outbreak of anthrax was found. Team members then took steps to verify the existence of an anthrax outbreak and generate hypotheses about the source.

1. What topics would you routinely include in discussions with community leaders about the investigation of a local public health threat? What steps might gain their support for an investigation or improve community cooperation?
2. The case definition used for human cutaneous and ingestion anthrax was based on signs and symptoms of these diseases and did not include laboratory confirmation of infection. What are advantages and disadvantages of this case definition? How would the investigation have been affected had laboratory confirmation been required?
3. Why is it important for investigators to develop hypotheses about an outbreak? What steps can be taken to support the generation of hypotheses early in an outbreak investigation?
4. Why is it important to identify as many cases associated with an outbreak as possible during an outbreak investigation?
5. If you were to undertake hypothesis-generating interviews during an outbreak investigation, what general types of questions would you ask?
6. Hypothesis-generating interviews require case-patients to remember specific exposures they had prior to development of disease. What steps might be taken to improve recall among case-patients? Can you think of exposures that might be difficult for case-patients to remember or even recognize that they had?

Part 3: Animal Investigations

In Part 3, the district veterinary officer and team investigated the farm where a cow died of unknown causes. The team confirmed that the cow likely died of anthrax, explored potential sources of infection of the cow, and characterized human exposures to the cow.

1. Why did the district veterinary officer take the time to examine local animal surveillance data prior to a site visit to the implicated farm?
2. What steps might team members take to improve cooperation of business/farm owners, managers, employees, and others at a site being investigated?
3. The investigation team prioritized confirmation of the cow's cause of death before implementing control measures against anthrax. Can you describe a situation where investigators might implement control measures before confirmation of the diagnosis?
4. Additional cows died of anthrax after the implicated cow. What evidence do you have to support or refute the hypothesis that the first cow was the source of infection for the other cows?

Part 4: Human Studies to Test Hypotheses

In Part 4, the investigation team epidemiologist with the assistance of the Uganda Public Health Fellowship Program conducted a cohort study that included all residents of the affected community to fully understand the anthrax outbreak.

1. Why did the epidemiologist decide to undertake a cohort study as opposed to a case-control study? What are the advantages and disadvantages of each? When is it best to use one versus the other?
2. What are the usual steps in analyzing a cohort study?
3. The epidemiologist calculated risk factors for cutaneous anthrax (alone or in combination with ingestion anthrax). Would you prefer to look at risk factors for those with cutaneous anthrax alone? Why?

4. A risk ratio of 5.6 (95% Confidence Interval [CI] 2.9– 10.7) was found for skin contact with the implicated cow during butchering and the development of cutaneous anthrax. A risk ratio of 0.5 (95% CI 0.3 – 0.9) was found for boiling meat/parts of the implicated cow (before eating *tehm*) and development of ingestion anthrax. Interpret these risk ratios in your own words.
5. The risk ratio for eating meat/parts from the implicated cow and ingestion anthrax was “not calculable” (Table 5.4). Why?

Part 5: Other Investigations

In Part 5, investigation team members reviewed results from multiple follow-up studies to better understand factors that contributed to the anthrax outbreak among livestock and humans in Kween District.

1. Describe the epidemic curve for anthrax-related livestock deaths in Kween District. Describe the geographic distribution of villages affected by anthrax-related livestock deaths in Kween District. Based on this information, what was the likely manner of spread of anthrax among cattle in Kween District? (e.g., point-source, continuous common source, intermittent common source, animal-to-animal, other)
2. What is a herd case-control study? Why would you do a herd case-control study as opposed to a case-control study? Can you think of an example of when you might use a methodology similar to a herd case-control study in the investigation of an outbreak among humans?
3. What role did the environment play in the occurrence of anthrax in the district?
4. Anthrax had not previously been reported from Kween District. How do you think anthrax was introduced among livestock in the district?

Part 6: Control and Prevention

After reviewing results of all studies, investigation team members considered long-term control measures to prevent future outbreaks of anthrax among humans and animals.

1. Annual vaccination of livestock against anthrax is expensive but often considered to be cost-effective. Define cost-effective. What information is needed to do a cost-effectiveness analysis? Is it possible that vaccination could be cost-effective in some settings but not others?
2. Inadequate surveillance of illnesses/death among animals hindered the recognition of the anthrax outbreak in Kween District. What steps can be taken to improve animal surveillance?
3. Have you ever participated in a One Health response? Who was involved (e.g., agencies, team members)? What steps did the team take to ensure a unified response? What difficulties were encountered?
4. What are some of the challenges to implementation of a One Health approach to outbreak investigation?

VI. Resources

Original Investigations

- Kisaakye E, Ario AR, Bainomugisha K, et al. Outbreak of Anthrax Associated with Handling and Eating Meat from a Cow, Uganda, 2018. *Emerging Infectious Diseases Journal* 2020; 26. Available at <https://doi.org/10.3201/eid2612.191373>
- Monje F, Kisaakye E, Ario AR. Anthrax Outbreaks among Domestic Ruminants Associated with Butchering Infected Livestock and Improper Carcass Disposal in Three Districts of Uganda, 2016-2018. (in review). Available at [https://www.researchgate.net/publication/340191448 Anthrax Outbreaks among Domestic Rumina](https://www.researchgate.net/publication/340191448_Anthrax_Outbreaks_among_Domestic_Rumina)

[nts Associated with Butchering Infected Livestock and Improper Carcass Disposal in Three Districts of Uganda 2016-2018](#)

Epidemiology

Principles of Epidemiology in Public Health Practice, Third Edition, An Introduction to Applied Epidemiology and Biostatistics. Third Edition. Published in 2006, updated in 2013. Available at <https://www.cdc.gov/csels/dsepd/ss1978/>

One Health

- Centers for Disease Control and Prevention. One Health. Available at <https://www.cdc.gov/onehealth/index.html>
- Food and Agricultural Organization. One Health: Food and Agriculture Organization of the United Nations Strategic Action Plan. Available at <http://www.fao.org/3/al868e/al868e00.pdf>
- World Organisation for Animal Health (OIE). One Health at a Glance. Available at <https://www.oie.int/en/for-the-media/onehealth/>

Anthrax

- World Health Organization (WHO). Anthrax in Humans and Animals. Fourth Edition. 2008. Available at <https://www.who.int/csr/resources/publications/AnthraxGuidelines2008/en/>
- World Health Organization. Guidelines for the Surveillance and Control of Anthrax in Humans and Animals. Third Edition. Available at https://www.who.int/csr/resources/publications/anthrax/WHO_EM_C_ZDI_98_6/en/
- Centers for Disease Control and Prevention (CDC). Anthrax. Available at <https://www.cdc.gov/anthrax/index.html>
- Merck Manual, Veterinary Medicine. Overview of Anthrax. Available at <https://www.merckvetmanual.com/generalized-conditions/anthrax/overview-of-anthrax>

Disease-specific Information

- Control of Communicable Disease Manual. 20th ed. Washington: APHA; 2017
- Red Book 2018: Report of the Committee on Infectious Diseases. 31st ed. Itasca, IL: AAP; 2018
- WHO Health Topics. Available at <https://www.who.int/health-topics>
- CDC Diseases and Conditions. Available at <https://www.cdc.gov/diseasesconditions>
- OIE-Listed Diseases, Infections and Infestations in Force in 2020. Available at <https://www.oie.int/animal-health-in-the-world/oie-listed-diseases-2020/>

VIII. Contact for inquiries or feedback about product

If you have questions about the development or content of “Anthrax in the Mountains of Uganda” or would like to provide feedback on this eLearning case study, please email learning@tephinet.org. Include the name of the eLearning, version, and screen title (where appropriate) with your question or comment.