Learning module on Anthrax transmission and control

Hiwot Desta, Biruk Alemu, Barbara Wieland and Mamusha Lemma

International Livestock Research Institute
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Module description

The Anthrax Learning Module is designed for men and women farmers in the highlands of Ethiopia. Farmers have limited knowledge about the cause, transmission pathways, and prevention and control measures for Anthrax.

In this module, farmers will learn about the cause and transmission pathways, clinical signs, and prevention and control measures for Anthrax.

Learning goal and objectives

The training course aims to prevent transmission of Anthrax to human, reduce livestock losses due to Anthrax infection through developing the knowledge, attitudes and skills of farmers about the cause, clinical signs, and prevention and control measures for Anthrax.

By the end of the module, farmers will be able to:

1. Describe the cause and transmission pathways of Anthrax
2. Identify clinical signs of Anthrax in affected sheep and goats and human
3. Apply measures to control and prevent Anthrax transmission
4. Avoid slaughtering or consuming Anthrax infected animals
5. Regularly vaccinate their animals

Module content

1. Anthrax and its importance
2. Cause and transmission pathways of Anthrax
3. Clinical signs of Anthrax
4. Prevention and control measures for Anthrax

Training approach and methods

Participants will be encouraged to define their own learning objectives and plan how to apply the learning.

Throughout the training course, active and collaborative learning methods will be applied. Learning activities will start from and build on women and men farmers’ knowledge and experiences with Anthrax.

Activities and exercises are arranged in a way that encourage participants to go through a process, whereby they first reflect on their own experiences and observations. Then they link these reflections to new information and how they can apply it.

Visualizations, group activities, practical demonstrations, video clips and role-play and reflective activities will be used to enhance learning and knowledge application.

It is recommended that a mixed training approach is adopted where male and female farmers, couples and community animal health agents are trained together to enhance collaborative learning, reflection and action.
Learning materials and resources.

The training course will use a variety of practical learning materials and resources to facilitate learning, reflection, and knowledge retention and application. Posters, leaflets, pictures, PPT presentations, stories, video clips, and sample collection and labeling materials will be used during the training.

Course duration

The learning course has both theoretical and practical sessions. A complete grasp of the course will take one day training time. It is best delivered in community centers to create easy access to all, including women, and for practical purposes.

It could be run over two consecutive days or sequentially in half-day sessions to allow participants time for reflection and cater for farm and household activities.

Learning assessment methods

Pre- and post-training assessments can be conducted in a participatory way to establish the baseline and measure learning by the end of the training.

A few True or False statements can be prepared to measure knowledge, attitudes and skills of men and women farmers in the training content before and after the training. The facilitator can read participants the statements and ask them to indicate their knowledge in the training course by standing in opposite sides of the training room. Farmers who agree or disagree to statements can be counted and disaggregated by gender, and the data can be used to analyses participants’ level of knowledge before- and after the training.

Participants will develop action plans by the end of the training to apply the learning. Interviews with some participants between three and six months after the training can help evaluate retention and learning application and capture changes because of the training. Based on the learning content, checklists for behavioral observation and interviews can be prepared to monitor learning application by participants.

Another way is using pictures that show transmission pathways, clinical signs and prevention and control measures for Anthrax. Facilitators can display different picture matchings and ask participants to agree or disagree to a picture matching. Number of men and women farmers who agree or disagree to a picture matching can be counted and used to measure level of farmers’ knowledge gain after the training.
Session 1: Anthrax and its importance

Session description

To increase animal production and income from animals, farmers must manage the health of their animals. The session aims to provide participants an overview of Anthrax. They will learn about what Anthrax is, what causes it, which animals it affects, and whether it is zoonotic or not.

Session objectives

By the end of the session, participants will be able to:

1. Explain what Anthrax is and what causes it
2. Identify which animals are most affected by Anthrax
3. Explain importance of Anthrax for animal and human

Session content

1. Anthrax and its importance
2. Cause of Anthrax
3. Affected animals and how it affects them
4. Economic importance of Anthrax
5. Role of Anthrax for public health

Learning methods and materials

1. Brainstorming
2. Storytelling
3. Reflection and sharing experiences

Duration

One hour and 30 minutes

Learning activities

1. Opening and introduction

   Warmly welcome and greet participants as they arrive to establish friendly relationship. Place posters relevant to the training (e.g. life cycle of Anthrax) to attract and motivate participants and to set the context for the training.
Observe local traditions and customs, have elders and/or community leaders welcome participants and open the training event. What happens in the welcome and start can set the tone for the rest of the training process.

Introduce the facilitation team

If participants do not know each other: please pair up with someone you don’t know. Interview each other for three minutes each to learn more about one another and your motivation for participating in this training. In six minutes, we will come back together and ask you to introduce your partner to the group.

2. Participant expectations

If participants already know each other: Please tell us why you think it is important to be here today.

Write down expectations on flipchart papers and place it in a visible place.

Go through the training objectives/agenda against participant expectations.

3. Establish ground rules

Tell participants that to achieve their training expectations, they must follow some agreements.

Read out ground rules written on a flipchart.

What do you think? Is there anything you want to add or subtract? Does anyone have any questions before we get started?

4. Assess pre-training knowledge, attitudes and skills of participants based on key content of the training

Ask participants to stand and come forward.

Display cards labeled “Agree” or “Disagree” on the ground. Make sure that there is enough space between the cards for people to stand.

Tell participants that you will read them out some statements. If they agree with the statements, they stand on the “Agree” card and if they disagree, they stand on the “Disagree” card and discuss why they agree or disagree with the statements.

Positions are likely to be influenced by others’ movements, so ask participants not to be influenced.

Make sure that they are clear with the task and demonstrate with examples.

Read out slowly and loudly the following statements:

1. Anthrax can affect only cattle.
2. There is no harm consuming meat from Anthrax affected animal.
3. Anthrax does not have clinical signs.
4. Anthrax can be transmitted to humans.
5. Carcass of Anthrax affected animals can be left for vultures and hyaenas to feed on.
6. Anthrax affected carcass can contaminate the environment and affect another animal.
7. Vaccination of animals can prevent Anthrax transmission.
8. Anthrax outbreak can happen during rains following long dry periods. For each statement, count the number of people agreeing or disagreeing.

5. Brainstorming activity

In plenary, discuss the following questions.
1. What do you know about Anthrax?
2. When does Anthrax outbreak often occur?

6. Make PowerPoint presentation, asking examples from participants.

Training notes

Anthrax is a bacterial disease caused by the spore-forming Bacillus anthracis (B. anthracis).

Anthrax is primarily a disease of cattle, sheep, goats, equine, pig and wild animals.

Anthrax is a seasonal disease. Typically, an outbreak of Anthrax follows a prolonged hot dry spell, which in turn was preceded by heavy rains or flooding, or with rain ending a period of drought—“the onset of a distinct rainy season when animals disperse to graze the newly emergent vegetation”.

The primary conditions affecting the seasonality of Anthrax in any one place would appear to be temperature and rains (or drought) and the associated humidity.
What is Anthrax?

- Anthrax is a serious infectious, zoonotic disease.
- Anthrax can be found naturally in soil and commonly affects domestic, ruminants and wild animals.
- Contact with anthrax can cause severe illness and mortality in both ruminants and in humans.

Causes of Anthrax and economic impact

- Anthrax is caused by the bacteria called bacterium Bacillus anthracis.
- This bacteria can form spores which can either be eaten in contaminated meat, breathed in, or simply infect the skin directly through human to animal contact.
- Anthrax has economic impact of direct losses due to mortality of small ruminants and reduced milk production in infected dairy herds.
Role of Anthrax in public health

- Anthrax is a zoonotic disease of animals that affects humans.
- People become incidental hosts through contact with infected animals (spores in a cut or scrape of the skin, contaminated animal products [e.g., fed that is contaminated with anthrax] or breathe in anthrax spores).
- Treatment with antiparasitic drugs such as albendazole or mebendazole may shrink or destroy the organism and prevent it from re-growing in humans.
Session 2: Anthrax transmission

Session description

To protect your animals from Anthrax infection, you must know how Anthrax transmits. The session deals with the causes and transmission pathways of Anthrax. Participants will learn about the life cycle of the spore-forming bacteria *Bacillus anthracis*, and how it affects small ruminants.

Session objectives

By the end of the session, participants will be able to:

1. Explain what causes Anthrax
2. Explain the life cycle of the spore-forming bacteria *Bacillus anthracis*
3. Identify which animals are affected and how
4. Explain how human can be infected

Session content

Life cycle of bacteria *Bacillus anthracis*

Learning methods and materials

1. Poster showing life cycle of the bacteria *Bacillus anthracis*
2. Illustrations
3. Anthrax leaflet

Duration

50 minutes

Learning activities

1. Introduce the session. You have learned that Anthrax is a zoonotic disease of herbivores animals such as sheep and goats caused by spore forming bacterium *Bacillus anthracis*. You will now learn about how Anthrax is transmitted.

2. Display a poster showing the life cycle of bacteria *Bacillus anthracis*. Discuss how Anthrax is transmitted, and how it affects sheep and goats and humans as well. Make the point that Anthrax can be transmitted through flies, grazing practices, climate effects and cattle trade.

   Ask people, “Is there a direct animal-to-animal transmission of Anthrax?” Get people’s views and explain.
Anthrax is a zoonotic disease which can be transmitted through contacts with sick animals and consumption of meat from Anthrax affected animals.

Ask participants, “Who is more exposed to Anthrax – men or women? Why?”

3. Ask participants to stand in a circle. In the middle of the circle, display illustrations of Anthrax contamination of environment, sheep and goats (grazing grass polluted with Anthrax bacteria), and human contamination through eating infected meat, inhaling contaminated air or contact with Anthrax infected animals.

Invite for volunteers to arrange the illustrations demonstrating the transmission pathways of Anthrax. Encourage questions from other participants and provide explanation to reinforce understanding.

4. Recap the session through PowerPoint presentation. Make the point that the age, sex and condition of animals may all influence the incidence of Anthrax at any one site.

Training notes

Cycle of infection

The bacterial spore is a resting form of the organism. When conditions are not conducive to growth and multiplication of the vegetative forms of B. anthracis, they start to form spores.

Sporulation requires the presence of free oxygen. The vegetative cycles occur within the low oxygen environment of the infected host and, within the host, the organism is exclusively in the vegetative form. The infected host sheds the vegetative bacilli onto the ground and these sporulate on exposure to the air. Once outside the host, sporulation commences upon exposure to the air and the spore forms are essentially the exclusive phase in the environment.

The spores, which can persist in soil for decades, wait to be taken up by another host, when germination and multiplication can again take place upon infection. Within the infected host the spores germinate to produce the vegetative forms which multiply, eventually killing the host, with death occurring when circulating bacilli reach a characteristic concentration which is directly correlated to the toxin level in blood.

A proportion of the bacilli released by the dying or dead animal into the environment (usually soil under the carcass) sporulate, ready to be taken up by another animal. The uptake by another host may happen at any time, from less than one hour to many decades later.

Humans acquire Anthrax through handling infected carcasses, hides, bones (spores in a cut or scrape of the skin) and eating contaminated animal products with Anthrax or breathe in Anthrax spores.

Anthrax spores persist in the soil and other environments for decades. They are markedly resistant to biological extremes of heat, cold, pH, desiccation, chemicals, irradiation and other such adverse conditions. The organism can persist in the spore state for long periods of time awaiting the moment when conditions favor germination and multiplication.
Influencing factors

The cycle of infection is influenced by factors that affect sporulation and germination, such as pH, temperature, water activity and cation levels and factors related to the season, such as available grazing, the health of the host, insect populations and human activities such as trade.

Animals generally acquire Anthrax by ingestion of spores while grazing closer to the soil in dry periods when the grass is sparse or enforced grazing at restricted sites when water becomes scarce. In dry hot conditions, the animal is forced to graze dry spiky grass close to the soil.

Transmission Pathways of Anthrax

PowerPoint presentation

Session 2: Transmission Pathways of Anthrax

- The spores of anthrax bacteria are extremely resistant and survive for years in soil, or on wool or hair of infected animals.
- Bacteria ingested or inhaled by an animal or human causes illness.
- The bacteria entering through cuts in the skin also can cause disease.
- Human can become infected by eating raw meat from an infected animal.
- Small ruminants become infected by ingesting spores while grazing from contaminated environment.
Session 3: Clinical signs of Anthrax

Session description

To control Anthrax transmission, you must recognize clinical signs. In this session, you learn about Anthrax clinical signs in affected sheep and goats drawing on your experience.

Session objectives

By the end of the session, participants will be able to:

1. Identify clinical signs of Anthrax in sick sheep and goats
2. Identify clinical signs of Anthrax in human
3. Identify seasonality of Anthrax incidence

Session content

1. Clinical signs of Anthrax in affected sheep and goats
2. Signs of Anthrax in human
3. Seasonality of Anthrax incidence

Learning methods and materials

1. Brainstorming
2. Presentation
3. Pictures of sick sheep
4. Video clips

Duration

50 min

Learning activities

1. Introduce the session. In the previous session, you have learnt the causes and transmission pathways of Anthrax. In this session, you will learn about the clinical signs of Anthrax.
2. In plenary, ask participants to brainstorm clinical signs of Anthrax in affected sheep and goats.
   
   Ask participants: “From your experience, what signs or behavioral changes have you observed in affected sheep and goats?”
Encourage participants to share experiences and tell stories of affected sheep and goats. Write responses on flipchart.

3. Make PowerPoint presentation on clinical signs of Anthrax in affected sheep and goats. Ask questions and comments from participants.

4. Ask participants to stand in a circle. In the middle of the circle, place a mix of pictures with descriptions of different clinical signs in affected sheep and goats.

   Invite literate volunteers to pick up picture cards which describe clinical signs of Anthrax in sheep and goats.

   Ask other participants to ask questions or comments.

5. Ask participants to identity clinical signs of Anthrax in human. Write responses on a flipchart paper. Go through the responses and then make PowerPoint presentation, asking examples or stories from participants.

6. Recap on the session and ask participants for any questions or comments.

Training notes

Anthrax clinical signs vary from species to species, presumably reflecting differences in susceptibility. First signs in the more susceptible livestock species are one or two sudden deaths within the herd or flock with retrospective recall of preceding mild illness. In more resistant species, signs such as swellings of the oral and pharyngeal region are seen.

Clinical signs of Anthrax in sheep and goats

1. Sudden death is the typical sign
2. High temperature, shivering or twitching
3. Harsh dry cough
4. Un-clotted or partially clotted blood in dung, nostrils, eyes and anal openings
5. Decrease or complete loss of milk in cows
6. Bright staring eyes
7. Dejection and loss of appetite
8. Being distressed, appear to have difficulty breathing and cease eating and drinking
9. Swellings in the submandibular fossa

Signs of Anthrax in human

Cutaneous Anthrax signs start within 1 week:

1. An itchy sore that is like an insect bite, the sore may blister and form a black ulcer (sore or eschar).
2. The sore is usually painless but is often surrounded by swelling.
3. A scab forms, then dries and falls off within 2 weeks; complete healing takes longer.
Gastrointestinal Anthrax

This form of Anthrax infection begins by eating undercooked meat from an infected animal.

Gastrointestinal Anthrax signs start within 1 week of exposure, consisting of abdominal pain, diarrhea (may contain blood), fever, mouth, headache, loss of appetite, nausea and vomiting (may contain blood).

Inhalation (pulmonary) Anthrax

Inhalation Anthrax develops when you breathe in Anthrax spores. It’s the deadliest way to contract the disease, and even with treatment, it is often fatal.

Inhalation Anthrax:

1. Begins with fever, malaise, headache, cough, shortness of breath, and chest pain
2. Fever and shock may occur later

As the disease progresses, you may experience:

1. High fever
2. Trouble breathing
3. Shock
4. Meningitis — a potentially life-threatening inflammation of the brain and spinal cord
Session 3: Clinical Signs of Anthrax

**Symptoms of anthrax in sheep and goats**

- High temperature, shivering or twitching
- Harsh dry cough
- Un-clotted or partially clotted blood in dung, nostrils, eyes and anal openings
- Decrease or complete loss of milk in cows
- Bright staring eyes
- Dejection and loss of appetite

**Symptoms of anthrax in human**

**Cutaneous anthrax signs start within 1 week:**
- An itchy sore that is like an insect bite, the sore may blister and form a black ulcer (sore or eschar).
- The sore is usually painless but is often surrounded by swelling.
- A scab forms, then dries and falls off within 2 weeks; complete healing takes longer.

**Inhalation anthrax:**
- Begins with fever, malaise, headache, cough, shortness of breath, and chest pain
- Fever and shock may occur later

**Gastrointestinal anthrax:** signs start within 1 week of exposure, consisting of abdominal pain, diarrhea (may contain blood), fever, mouth, nausea and vomiting (may contain blood).
Session 4: Prevention and control measures for Anthrax

Session description

To keep your animals healthy and productive, you must prevent and control Anthrax transmission. In this session, building on your knowledge about the cause and transmission pathways of Anthrax, you will learn how to prevent and control Anthrax infection in small ruminants and human.

Session objectives

By the end of the session, participants will be able to:

1. Identify measures for prevention and control of Anthrax in small ruminants and human
2. Routinely vaccinate animals once in a year before the occurrence of the disease
3. Immediately notify government veterinary officers when Anthrax is suspected
4. Properly follow safety regulations while working with sick animals
5. Correctly dispose infected dead animal carcasses

Session content

1. Disposal of affected animal carcasses
2. Safety regulations: wearing gloves, covering mouth and nose, wear shoes while working with animals
3. Reporting Anthrax cases
4. Regular vaccination of animals

Learning methods and materials

1. Brainstorming
2. Poster showing life cycle of Anthrax
3. Interactive presentation

Duration

45 min

Learning activities

1. Introduce the session. In the previous sessions, you have learnt the causes, transmission pathways and symptoms and clinical signs of Anthrax in sheep and goats. In this session, you will learn how you can prevent and control the transmission of Anthrax to keep your herd and yourself healthy.
2. In plenary, ask participants to brainstorm measures to prevent and control the transmission of Anthrax.
Discussion questions:

1. Do you regularly vaccinate your animals?
2. When do you report Anthrax cases to animal health officers? It is when you identify early signs or when many animals are dead?
3. What do you do with the carcass of affected sheep and goats? Do you give it to dogs? Or do you dispose of it? What method do you use to dispose it?
4. Do you wear protective clothes and dispose of these after the carcass disposal?
5. Is incineration of dead animals culturally prohibited? What could happen if we bury the dead animal?
6. What do you do when you see signs of Anthrax on human?
7. Make PowerPoint presentation on prevention and control of Anthrax transmission. Control measures consist of correct disposal of the carcass(es), decontamination of the site(s) and of items used to test and dispose of the carcass(es), and initiation of treatment and/or vaccination of other animals as appropriate.

Discuss advantages and disadvantages of burial or incineration of dead animal bodies.

Disturbance of burial sites brings the spores to the surface. Even without site disturbance, spores can work their way up to the soil surface. Scavengers may dig down to reach the carcass.

8. Feedback and action plan, evaluation and closing
9. Ask participants for feedback and action points for training transfer.
10. Repeat the process for the pre-training assessment.
11. Invite community leader or veterinary officer to close the training course.

Training notes

Sheep and goat can become infected when they breathe in or ingest spores in contaminated soil, plants, or water. In areas where animals have had Anthrax in the past, routine vaccination can help prevent the Anthrax.

Human get infected with Anthrax when Anthrax spores get into the body, through breathing in spores, eat contaminated food, or get spores in a cut in the skin while cooking or slathering.

Control measures are aimed at breaking the cycle of infection. Each of the following actions must be rigorously implemented:

1. Affected animal should be isolated, which should last until two weeks after the last case is confirmed.
2. Annual vaccination of animal with spore vaccine should be done.
3. Correctly disinfect, decontaminate and dispose of contaminated materials.
4. Wear protective clothes while disposing infected carcasses.
5. Clearly mark areas in grazing areas where an animal died of Anthrax as the area may have become contaminated with spores.
Guidelines on incineration procedures in a pit

1. Prepare a pit with enough depth for the carcasses (0.5 meters)
2. Wear protective clothes (e.g. gloves, mask, boot wearing) during disposing infected carcasses
3. Ensure that all body openings (e.g. anus, mouth, nose, etc.) are plugged and the head securely covered, cover the carcass with heavy plastic or other appropriate material
4. Burn all carcasses, contaminated materials and clothes during disposal
5. The carcass burning should be completely reduced to ash

PowerPoint presentation

**Session 4: Prevention and Control of anthrax**

- Routinely vaccinate animals once in a year before the occurrence of the disease
- Contact your local Vet office immediately and isolate the infected animal or carcass
- Use appropriate materials while in contact with infected animals (gloves, mask, protective cloth and shoes)
- Do not slaughter (skin or open) the carcass or use for consumption of any suspect animal
- Correctly disinfect, decontaminate and dispose of contaminated materials
- Appropriate carcass disposal (burning is preferable)
- Watch any animals that have been in contact with the suspect animal, and isolate them if they show signs of infection
- Person should get medical help if exposed to the disease while handling infected animal