Determination of Traditional Diagnosis and Treatment Methods Applied in Anthrax Disease: A Descriptive Qualitative Study

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Abstract

This study was conducted as a **descriptive qualitative study** to determine the traditional diagnostic and treatment methods used in anthrax disease. The research was carried out between July and October 2024 in a rural area located in the eastern region of Türkiye. Participants were reached using the snowball sampling method. It was found that individuals engaged in livestock farming in rural areas were able to identify anthrax symptoms observed in animals, such as sores in the mouth and nose, bleeding, discharge, ocular discharge, fever, loss of appetite, fatigue, bloating, and rapid breathing. Among the traditional treatment methods, it was determined that physical and ritual-based practices were used, such as applying butter, vegetable oil, salt, alum, used motor oil, vinegar, and mashed *anduz* herb to the wound; washing the animal with vinegar or cold water; and feeding the animal thorny plants to release contaminated blood. The findings also revealed the existence of risky behaviors, such as the use of products obtained from infected animals. The presence of both beneficial and harmful practices in response to the fatal anthrax disease in rural areas indicates the need for education on animal diseases in these regions. Therefore, it is recommended to implement sustainable educational programs focusing on animal diseases, modes of transmission, and preventive measures for individuals whose livelihood depends on livestock farming. The study data will guide future research in the field of veterinary public health by documenting traditional practices and associated risks in rural communities, and will contribute to the ethnoveterinary literature.

Keywords: Anthrax, Traditional diagnosis, Traditional treatment methods, Traditional prevention

Introduction

Animal husbandry, which is a component of agricultural activities, involves the raising of various domestic animals and the utilization of their products and labor power[1]. As one of the oldest economic activities of humankind, animal husbandry has evolved into a multifaceted economic sector in the modern world. Animal-based production, which meets the population's nutritional needs and provides employment, also serves as a raw material source for many industrial sectors[2]. Moreover, the trade of animals and animal products stands out as one of the primary sources of economic income in rural areas[3]. Although Turkey ranks among the world's leading countries in the livestock sector and possesses significant potential in this field, the proportion of producers engaged in livestock farming based on a traditional subsistence economy (extensive farming) has been gradually decreasing. Nevertheless, it is observed that extensive methods are still being practiced in certain regions[2]. In this context, the eastern region of Türkiye has historically stood out as an area notable for both the production of animal-derived food and the diversification of such products, owing to its rich cultural heritage and distinctive geographical characteristics[4]. The high-altitude terrain, continental climate conditions, and limited precipitation during the summer months constrain agricultural production, yet provide a highly suitable natural environment for pasture-based livestock farming. These characteristics have historically laid the groundwork for the adoption of cattle breeding as a primary economic activity in the region[3]. However, animal diseases pose significant challenges to the livelihoods of livestock producers and threaten the sustainability of these vital animal resources[5]. Zoonotic diseases carry a dual and substantial burden not only on animal health and welfare but also on human health and livelihoods. In developing countries, the majority of the population depends on livestock as their primary means of subsistence[6]. Therefore, controlling zoonotic diseases—which cause deterioration in both human and animal health and lead to loss of livelihoods—is critically important for achieving the Sustainable Development Goals[7]. Among these diseases, anthrax, which can lead to fatal outcomes, continues to be present in Turkey, particularly in regions where traditional livestock farming is practiced[8]. Although anthrax is among the infectious diseases that are gradually declining worldwide, it has not yet been eradicated in countries like Turkey where livestock farming is widespread[8–9].

Anthrax is a disease of herbivorous animals and is a zoonosis transmitted to humans either directly or indirectly from infected animals[10]. Anthrax is a bacterial disease caused by *Bacillus anthracis* and is characterized by sudden death in otherwise healthy animals[11–12]. The causative

agent, *Bacillus anthracis*, is a Gram-positive, aerobic or facultative anaerobic, endospore-forming bacillus measuring 0.5–2.5 µm in width and 1.2–10 µm in length. In the presence of free oxygen, it forms ellipsoid spores, usually centrally located but sometimes subterminal. Unlike its vegetative forms, the spore forms of the bacterium are highly resistant to heat, cold, dryness, chemical disinfectants, and metabolic products of other bacteria[13–14].

Animal anthrax—and consequently human anthrax—continues to be endemic in certain Middle Eastern countries, primarily Turkey, Iran, and Lebanon, as well as in some Central Asian countries such as Kyrgyzstan, Kazakhstan, and Turkmenistan, certain regions of India, West Africa, and Latin America[10]. According to data from the Turkish Ministry of Health, although the number of human anthrax cases in Turkey has declined over the years, the disease continues to be reported in provinces where livestock farming is widespread. Cases of human anthrax have been reported in several provinces, including Kars, Erzurum, Muş, and Kayseri[15].

To prevent the transmission of anthrax, it is essential that infected animals are not slaughtered or consumed, that carcasses are buried in accordance with proper protocols to prevent environmental recontamination, and that susceptible animals are vaccinated to control the disease in livestock. Additionally, it is critically important for individuals who come into contact with contaminated materials to take appropriate protective measures. Infection control programs should include the education of at-risk groups, decontamination of contaminated materials, routine cleaning of equipment potentially exposed to *B. anthracis*, the use of protective clothing, and adherence to basic hygiene practices such as handwashing[10].

The close coexistence of humans and animals in the same environment, along with the presence of neglected and uncontrolled diseases, poses significant risks and challenges, particularly in rural areas. It is crucial to investigate the reasons why anthrax—eradicated in many parts of the world—is still observed in Turkey, and to work toward eliminating these causes through research conducted in livestock production areas. This study was conducted to determine the awareness of anthrax disease among livestock producers, their traditional methods of diagnosis and treatment, and the practices implemented to prevent transmission in a rural area of a city located in the eastern region of Türkiye.

Method

Type of Research: This study, titled “Determination of Traditional Diagnosis and Treatment Methods Applied in Anthrax Disease,” was conducted as a qualitative research. A descriptive design, one of the qualitative research approaches, was employed in the study. Descriptive

qualitative research focuses on the direct identification and in-depth understanding of a phenomenon or event. In this approach, the researcher aims to understand the phenomenon as it is, from the perspective of the participants. The primary goal of the study is to reveal the existing situation in detail[16]. Maxwell (1992) emphasized that, for descriptive validity, the researcher must report everything seen and heard regarding the phenomenon during the research process. This approach seeks to uncover individuals' perceptions, descriptions, feelings, and opinions regarding a particular phenomenon[17].

Purpose of the Study: This study was conducted to determine the traditional diagnosis and treatment methods applied in anthrax disease.

Research Questions:

1. **Semi-Structured Core Questions**

- How can you tell when animals are infected with anthrax? (What are the symptoms?)
- How can you tell when humans are infected with anthrax? (What are the symptoms?)
- How do you treat animals when they are infected with anthrax?
- How do you treat humans when they are infected with anthrax?
- What do you do when animals die from anthrax?
- When humans die from anthrax, are there any specific practices you follow during burial?
- Are the products of an animal infected with anthrax (meat, milk, skin, feces) used?

2. **Probing Questions Generated During the Interview**

- How do you determine that an animal has a high fever during illness?
- In your opinion, is anthrax a contagious disease?
- Even though anthrax is contagious, do you touch the infected animals? (e.g., physical contact by hand)
- Are the anthrax lesions in humans and animals similar? (Can you explain in more detail?)
- What kind of motor oil do you use in the treatment of anthrax?
- Where on the animal do you apply the motor oil?
- When treating an animal infected with anthrax, do you take any protective measures such as wearing gloves or coveralls before touching it?
- How do you bury animals that have died from anthrax?
- In your opinion, can an animal that has died from anthrax continue to spread germs?

- Where do you bury animals that have died from anthrax?
- How do you transport the carcass of an animal that died from anthrax to the burial site?
- Do butchers purchase animals infected with anthrax?
- When you slaughter a sick animal, how do you consume it?
- Why don't you let a sick animal's milk be consumed by its offspring? Is it because the disease might be transmitted, or to help the mother regain strength?
- When you feed an anthrax-infected animal to your dogs, have your dogs ever become ill?
- When butchering an animal that died from anthrax to feed it to dogs, do you use any protective equipment?
- If an anthrax-infected animal is slaughtered before death, where and to whom do you sell its hide?
- When passing an anthrax-infected animal over fire, do its feet not get burned?
- If an animal that died from anthrax can still transmit the disease, why do you feed it to dogs?
- For what purpose and how do you use the hide of an anthrax-infected animal?
- Do you carry out any specific treatment or process before using the hide of an anthrax-infected animal?

Research Setting and Duration: The study was conducted between July and October 2024 in 11 villages affiliated with the central district of a province located in the eastern region of Türkiye.

Population and Sample of the Study: The study population consisted of individuals engaged in livestock farming in a rural area of a province located in the eastern region of Türkiye. The sample group was reached through intensive fieldwork using the snowball sampling method. Starting from one of the central villages of a province in the eastern region of Türkiye, individuals were included in the study who had been engaged in livestock farming for an extended period (40 years or more), had been directly involved in animal care, had used traditional methods for treating animal diseases, were considered experienced and often consulted by other villagers for their knowledge and expertise, and voluntarily agreed to participate in the study. During the research, interviews were conducted with 24 individuals residing in 11 different villages.

Inclusion Criteria:

- Being a resident of a rural village
- Having been engaged in livestock farming for at least 40 years
- Having no hearing, vision, or speech impairments
- Having no memory-related problems
- Having no psychiatric health disorders
- Voluntarily agreeing to participate in the study

Data Collection Process: The research data were obtained through in-depth interviews with individuals who met the characteristics of the sample group. During the interviews, audio recording and/or note-taking were conducted with the informed consent of the participants. Data collection involved the use of seven semi-structured main questions, along with additional probing questions developed during the interviews. Due to the participants being elderly, each interview lasted approximately 1.5 to 2 hours. Data collection was concluded after 24 participants, as the responses to the research questions began to reach saturation and became repetitive.

Ethical Approval: Ethical approval for the study was obtained from the Non-Interventional Research Ethics Committee of Kafkas University Faculty of Health Sciences. Decision No: 30.05.2024 (5).

Results

Table 1. Distribution of Participants by Sociodemographic Characteristics (n=24)

Variables	**X±SD**	**(Min–Max)**
Age	72.00±6.42	58-84
Years of Animal Husbandry	50.29±5.57	40-60
Variables	n	%
Gender		
Female	4	16.7
Male	20	83.3
Level of Education		
Primary School	14	58.3
Middle School	6	25.0
High School	4	16.7
Higher Education and Above	0	0.0
Household Income Level		
Less than expenses	17	70.8
Equal to expenses	5	20.8

Greater than expenses	2	8.3
Place of Residence		
Village	24	100.0
District	0	0.0
Province	0	0.0
Animal Husbandry		
Yes	24	100.0
No	0	0.0
History of Anthrax in Animals		
Yes	24	100.0
No	0	0.0
History of Anthrax in Humans		
Seen	7	29.2
Not seen	7	29.2
Heard but not seen	10	41.7

The participants had a mean age of 72.00 ± 6.42 years (min–max: 58–84), with 83.3% being male and 58.3% having completed primary school. It was found that 70.8% of the participants had an income lower than their expenses. All participants were residing in rural areas and engaged in animal husbandry. They had been involved in livestock farming for an average of 50.29 ± 5.57 years (min–max: 40–60). All participants reported having encountered anthrax disease in animals, and 29.2% reported having encountered anthrax in humans (Table 1).

The second part of the research findings presents the data obtained through in-depth interviews conducted with the participants. The data were analyzed by the researchers and an independent researcher, and the responses to the research questions were compiled and conveyed as they were expressed. As a result of the data analysis, five main themes related to traditional practices concerning anthrax were identified: 1. Traditional Diagnosis of Anthrax, 2. Traditional Treatment of Anthrax, 3. Death-related Practices in Anthrax, 4. Use of Products from Anthrax-Infected Animals, 5.Traditional Prevention of Anthrax

1.Traditional Diagnosis of Anthrax: This theme aimed to determine how well participants living in rural areas and engaged in livestock farming were able to recognize anthrax disease, as well as their knowledge regarding the symptoms of anthrax observed in animals. It was found that the majority of participants correctly identified the symptoms of anthrax in animals; however, they lacked sufficient knowledge about the symptoms of anthrax in humans. The data obtained from the interviews are presented as originally expressed.

(P1, Age 71, Female): *When animals are infected with anthrax, sores appear in their mouths; their mouths and noses swell and foam. The animal burns with fever. Its eyes become bloodshot. Even when you approach the animal, you can feel the heat. When you touch the animal, you can tell it is burning. The abdominal area swells and deflates rapidly. It breathes very fast. The animal refuses to eat—no matter what you give, it won't eat. Of course, the disease is contagious; it spreads to other animals and to humans. If anthrax spreads to humans, sores also appear. Painful, swollen sores form on the hands, fingers, and arms. In humans, the sores first appear red, then darken. They are swollen and painful. Later, the sores turn purple.*

(P4, Age 77, Male): *The animal loses its appetite and stops eating. Then tears start flowing from its eyes, and its eyes become crusted. That's why we call anthrax çor. Çor means eye discharge. The animal develops a fever. It is contagious. If it spreads to humans, oozing sores appear on their hands. The skin turns black, the hands develop black sores, as if they are burned. The sores in animals and humans are different. In animals, they appear in the mouth, nose, and eyes. In the animal's mouth, the sores are red; on the human hand, they look like burn wounds. That's what I have seen.*

(P6, Age 80, Male): *It is a fatal disease. We lost three of our cows to it. When an animal contracts this disease, it doesn't recover. The poor creature stops eating and drinking. Its mouth and nose become covered with sores. Its head swells and becomes enormous. Its eyes look like pools of blood. When the eyes turn bloody, we know the animal is going to die. It gets a fever. It becomes weak. The animal doesn't want to walk. Anthrax is contagious; that's why we call it hayvan kıran (animal killer). If one catches it and is not separated from the others, it spreads to them too. I've never seen this animal disease pass to humans. I don't think it spreads to people. It never infected us. The name of the disease itself is hayvan kıran—if it were transmitted to humans, our ancestors would have called it human killer.*

(P7, Age 75, Male): *We call anthrax malkıran (livestock killer). Some people also call it çor. Our animals had anthrax, and so did our neighbors' animals. In the past, veterinarians wouldn't come to the villages. We didn't have enough money to bring one anyway. We used to care for the animals ourselves. My grandmother was a healer—she would boil medicinal herbs and make remedies for both animals and people when they were ill. I know anthrax (malkıran) very well. There are two types of anthrax: one with coughing and one without. If the animal has the coughing type (it coughs as if something is stuck in its throat), that animal will not survive. If there is no cough and the animal is well cared for, it can recover. A sick animal with anthrax will have a fever, and drool will flow from its mouth, nose, and eyes. The animal loses its fur. It*

cannot walk and becomes extremely weak. Its eyes turn red. Sores appear on its mouth, nose, and hooves. It stops eating and drinking. If it is a dairy animal, its milk production decreases. If it has a calf, it refuses to nurse. Its udder becomes swollen and develops sores. The animal's head and tongue swell. Its hair becomes coarse. Anthrax is contagious; it spreads to both animals and humans. I saw it transmitted to a human once—in 1958. The person wasn't elderly, maybe in their 50s. I saw anthrax in that woman. She had sores on her hands and arms. They looked decayed, like burn wounds—gray and black sores. She was in a lot of pain. The sores were painful. In humans, the fever rises. There is loss of appetite and fatigue. The eyes water, tears flow. The sores in animals and humans are both similar and different. In animals, the sores are red and gray—red in the mouth, gray on the back and legs. In humans, the sores are black.

(P9, Age 73, Male): *An animal infected with anthrax swells up; its hair stiffens and stands up. Blood comes out of its mouth and nose. Sores appear. It is a very severe disease. The animal becomes completely çorlanır (covered in discharge and sores). It is contagious—if one animal becomes infected and continues to stay in the same barn with the others, it will spread the disease to all of them. I've heard that similar sores also appear in humans, but I haven't seen it myself.*

(P12, Age 78, Male): *To be sure that an animal is infected with anthrax, we examine its blood. We take a sample of the blood that has dripped onto something—a stone or a leaf—something that won't absorb it. Then we turn it upside down. If the blood falls to the ground, it means the animal has anthrax. If the blood clots and doesn't fall, then the animal does not have anthrax. The animal's fever is high. The sores in humans and animals are similar. We call anthrax sores "night burns"—they are black or gray, and over time, they turn darker.*

2.Traditional Treatment of Anthrax: This theme aimed to identify whether individuals engaged in livestock farming in rural areas resort to traditional methods to treat animals and humans infected with anthrax. According to the findings of the study, it was determined that individuals practicing animal husbandry in rural areas do apply traditional treatment methods in cases of anthrax. Some participants believed that anthrax could be cured and attempted to treat it accordingly, while others believed that recovery from anthrax was not possible and thus did not engage in any treatment practices. The data regarding the traditional treatment methods applied by participants to animals infected with anthrax are presented verbatim.

(P2, Age 76, Male): *We apply motor oil to the animal's sores to help them heal. We make it drink salty water. If the fever is very high, we wash the animal with cold water. We don't take it*

out to graze—we let it rest at home. Even if it goes out, it won't eat anyway. The motor oil is the kind used in tractors; when the oil in the tractor gets old, we replace it, and that old oil is what we use. We apply the motor oil to the sores in the animal's mouth. We don't treat people ourselves—we take them to the doctor. In the past, people used to apply things to human sores too, but I don't remember what.

(P11, Age 70, Male): *We give the animal salty water. Since it has mouth sores, we feed it soft foods. We give it wet bread and boiled potatoes. Because of the sores, it cannot eat hard grass. If the cow has milk, we milk it and feed its own milk back to it. Milk is nutritious and good for the animal. We apply alum salt to its mouth to help the sores heal. To reduce its fever, we don't let the animal lie down in the barn—we let it rest outside. Alum salt is also applied to human sores. In the past, people used to crush a certain herb and apply it to the wounds, but no one knows that herb anymore.*

(P17, Age 80, Male): *In the past, there were no medicines in the villages. We used to apply salt directly to the animal's wounds. Salt burns the wound and kills the germs. If you take good care of the animal, it can survive. We take good care of them. We constantly give it water, whey (cheese water), and milk. We mix flour with water to make a soup-like mixture and make the animal drink it. We don't give hard feed or grass. Since its mouth and nose have sores, hard things worsen the wounds. We feed soft things. We crush barley and wheat thoroughly before feeding. To prevent the disease from spreading in the barn and to kill the germs, we sprinkle lime on the animal's hooves. If the fever is very high, we mix vinegar with water and wipe the animal down with a cloth. Once the fever drops, the animal starts to recover and eat. We boil anduz herb, make an ointment, and apply it to the wounds. We apply vinegar to the eyes to prevent discharge. If the head swells too much, we crush raw garlic and raw potato, wrap them in a cloth, and tie it around the animal's head to reduce the swelling. We monitor the animal constantly. We separate it from the others and give it special care. I have never seen it spread to humans, but I've heard of cases in other villages. I don't know what is done in those situations.*

(P20, Age 84, Male): *We apply oil (butter or vegetable oil) to the animal's sores to soften them so the animal can eat. If the sores on its back or legs have dried, we groom it and then wash it with vinegar and salty water. We boil anduz herb, crush it, and feed it to the animal. We also give it the boiled water to drink. We feed it thorny plants—the thorns cause the wounds to bleed, releasing the dirty blood, which helps the animal feel better. We tie a blue bead or a healing amulet around its neck or horn. We dip its hooves in lime and sprinkle lime all around the barn.*

We wash the water bucket and the feed container with lime water every day. My grandmother had ancient knowledge. When I was a child, she used to heal both people and animals. She would boil various herbs. I don't remember most of them anymore—we've forgotten. We apply cold wood ash to the animal's sores (mouth, nose, back). Ash kills the germs. We boil garlic and onion, crush them, and make the animal drink the mixture with its juice. If it doesn't drink it willingly, we pour it into its mouth like medicine. We don't let the calf drink its mother's milk. For people infected with anthrax and treated at home, we wash them with vinegar water. For the sores, we crush cooked onion and garlic, mix it with vegetable oil to make an ointment, and apply it to the wounds. Their eating utensils and dishes are kept separate from those of the household. After every meal, their dishes are boiled. Their clothing and bed linens are also boiled. They sleep in a separate room with the window kept open for ventilation. People are treated both at home and by taking them to a doctor. I only saw one person infected with anthrax. That person died from it. It was said to be the coughing type of anthrax.

(P22, Age 66, Female): *Anthrax cannot be treated. When an animal contracts anthrax, it always dies. Still, we apply oil and salt to soften the sores—but it doesn't recover. When people get sick, they go to the doctor. I have never seen anthrax in a human.*

3.Death-Related Practices in Anthrax: This theme aimed to determine the practices followed by livestock farmers living in rural areas when humans or animals infected with anthrax die. Therefore, participants were asked about burial procedures for humans and disposal methods for animals that died due to anthrax. According to the data obtained, no special procedures were performed for the burial of people who died from anthrax; standard burial practices—such as washing the body, performing the funeral prayer, and placing the body in the grave—were followed as with any other death. However, it was found that different practices were applied in the case of animals that died from anthrax.

(P10, Age 58, Male): *If an animal dies, it means it died from the coughing type of anthrax. We transport such animals to a place far from the village. There, we either bury them with lime or burn them. After burning, we bury the remains. In the past, when an animal was infected with the coughing type of anthrax, it would be isolated in a separate area and left to die. Sometimes, feed and water were withheld so that it would die more quickly. Then it would be taken far away and buried.*

(P13, Age 65, Male): *When an animal dies, we dig a pit, sprinkle lime over it, and bury it. Lime kills the germs and prevents the disease from spreading. We bury it in an empty field, far from*

the house. We tie the animal to the back of a tractor and drag it to the burial site. In the case of human death, we don't do anything special. We wash, shroud, and bury them just like any other deceased person.

(P21, Age 75, Female): *When an animal dies from anthrax, we butcher it and feed it to the dogs. Some parts of the meat turn dark when the animal is slaughtered, and the dogs won't eat those parts. We used to throw those pieces away in a place far from the house. Birds or wild animals like wolves would eat them. None of our dogs ever died from eating animals that had died of anthrax. The dogs that died were simply very old.*

4.Use of Products from Anthrax-Infected Animals: This part of the study aimed to determine whether the products (milk, meat, hide, feces) of animals infected with anthrax are used in rural areas. Based on the data obtained, it was found that some members of the rural population use the products of anthrax-infected animals, while others do not.

(P3, Age 70, Male): *When an animal contracts anthrax, we do not consume its milk because the animal becomes weak and exhausted, and since it does not eat, the milk yield decreases. However, if the animal is slaughtered before it dies, its meat is consumed. In order to eat the meat, we boil it extensively. When it is boiled thoroughly, the disease-causing microbes die and transmission does not occur. If, upon slaughtering, the meat appears darkened, we give it to the dogs. However, if the animal dies before we slaughter it, we do not give its meat to the dogs; instead, we bury it directly.*

(P5, Age 66, Male): *In the past, we used to slaughter sick animals before they died. We consumed the better parts of the meat that were not affected by the disease, while the deteriorated portions were given to the dogs. In the case of 'Çor' disease, the animal's insides, such as the lungs, would decay, but not the entire body. We would cook the unaffected parts and give the decayed ones to the dogs. Nothing ever happened to us. We did not consume the milk of the sick animal; instead, we gave it back to the animal itself. Even its calf was fed with the milk of other cows. The milk yield of the sick animal was already low. The disease does not pass from the sick animal to its calf through milk*

(P14, Age 73, Male): *When we slaughter an animal infected with anthrax before it dies, we sell its hide to leather dealers in the city. I don't know what they do with the hide. Probably, they make shoes or something like that.*

(P19, Age 68, Male): *The milk and meat of an animal infected with anthrax should not be consumed. People say it can be contagious. We dry its feces and burn them in the stove or the tandır oven.*

(P23, Age 66, Male): *If an anthrax-infected animal is slaughtered before it becomes severely ill, of course we cook its meat, but we boil it extensively. Once boiled, no microbes remain. In the past, when we realized that an animal had contracted anthrax (locally referred to as 'çor'), we would immediately slaughter it, since it was very difficult to save the animal from the disease. We would thoroughly boil the meat and consume it. However, the internal organs of an anthrax-infected animal (liver, spleen, kidneys, etc.) are not eaten, as the disease primarily affects the internal organs. In fact, an anthrax-infected animal is said to have 'internal pain.' We do not even give the internal organs to dogs. If the animal produces milk, we do not consume its milk, as milking worsens its condition. We do, however, make use of the hide. Even if the animal dies from anthrax, the hide does not transmit the disease. We do not consume the hide; rather, we use it as a covering for benches (wooden or concrete), floors, tractor or car seats, etc. We also use it to make pouches for storing cheese, butter, and cooked meat, and churns for making butter. Nowadays, the younger generation no longer uses these practices extensively, but they are important traditions inherited from our ancestors. Before using the hide, we carry out several processing steps. First, we scrape the hair thoroughly. Then, we carefully thin the inner surface and peel off its membrane. We trim the bloodstained edges. The hide is stretched and hung on tall poles, with a fire lit underneath. The hide absorbs the soot and smoke from the fire. Afterwards, we wipe the inner side of the hide with a cloth, which both spreads the soot evenly and removes the excess blackness. This smoke and soot both clean the hide and preserve the foods stored in it. We also dry the animal's dung and use it as fuel.*

5.Traditional Self-Protection Practices Against Anthrax: This study aimed to determine what self-protection practices livestock farmers in rural areas use to protect themselves and other animals when anthrax occurs—during treatment, slaughter, and post-mortem disposal of infected animals. Based on the data obtained, it was found that while some rural livestock farmers take certain self-protective measures, others take no precautions at all and even engage in behaviors that pose a risk for disease transmission.

(P8, Age 75, Male): *We can't care for animals without touching them—we definitely touch them. Gloves aren't commonly used in village settings. But we don't touch the animal's wounds directly. When we want to apply something to the wound, we wrap a piece of cloth around a stick and use that to apply oil or salt to the wound.*

(P15, Age 76, Male): *Are there gloves in the village? We touch the animal with our bare hands. Then we wash our hands afterward.*

(P16, Age 75, Male): *It is not possible to care for an animal without touching it, so of course we touch them. In the past, we used to treat the animals ourselves. Nowadays, veterinarians come to the villages. They wear gloves and tell us not to touch with bare hands because it is contagious. I have cured many cattle with anthrax. Some died, but some recovered as well. We never touch the wound or the blood flowing from the wound of an animal with anthrax, but we touch other parts of the body without taking any precautions, and none of us ever became infected. When applying something to the wound, we use a cloth. When we give the carcass to the dogs, we do not slaughter and skin the animal as in a ritual sacrifice; rather, we simply cut it into pieces and feed it to the dogs. Afterwards, we wash our hands with vinegar water and soap.*

(P18, Age 59, Female): *When an animal has anthrax, we separate it from the other animals to prevent the disease from spreading. We have separate barn clothes. After taking care of the sick animal, we change our clothes. We wash our hands with soap and pour vinegar water over them. We do not touch the animal's wounds directly. We sprinkle lime in the barn where the sick animal is kept.*

(P22, Age 66, Male): *To protect ourselves from the disease, when an animal dies and we intend to feed it to the dogs, we try to butcher it with large knives without getting blood on our hands. If blood does get on our hands, we wash them with soapy water. We soak our knives in bleach and boil them to kill the germs.*

(P24, Age 72, Male): *To prevent the spread of anthrax, we take the sick animal to the highlands and keep it away from our other animals. We sprinkle lime on its hooves. If the animal dies, we cover it with lime and bury it. When a person gets sick, we separate their room. We boil their eating utensils or soak them in bleach. We also boil their clothes and bedding.*

Conclusion

- According to the study data, it was determined that most individuals living in rural areas and engaged in livestock farming for many years were able to recognize anthrax disease in animals. Participants were found to identify anthrax symptoms in animals, such as sores in the mouth and nose, bleeding, discharge, ocular discharge, high fever, loss of appetite, fatigue, bloating, and rapid breathing. In addition, in order to confirm the

diagnosis of anthrax, it was observed that they performed a test of the animal's blood coagulation status (placing the blood on a non-absorbent material, turning it upside down, and if the blood flowed—indicating a lack of coagulation—they considered this as proof of anthrax). This finding demonstrates that livestock breeders possess knowledge and experience related to anthrax disease.

- It was found that there are differing opinions in rural areas regarding whether animals infected with anthrax can be treated. While some livestock farmers argued that anthrax is treatable and claimed to have successfully treated it in the past, others believed that animals infected with anthrax cannot recover and that the disease inevitably results in death. Traditional treatment practices applied to animals infected with anthrax included: administering liquids such as salty water, cheese whey, or the animal's own milk; feeding soft foods like flour-based soup, soaked bread, and crushed grains; applying substances such as butter, vegetable oil, salt, alum, used motor oil, vinegar, and crushed *anduz* herb to the wounds; washing and grooming the animal with vinegar or cold water; feeding thorny plants to induce bleeding from the wounds to release contaminated blood; sprinkling lime in barns and on the animal's hooves; isolating the animal by keeping it outside the barn or in a separate shelter; and taking it to highland pastures. In addition, some ritualistic practices were identified, such as attaching blue beads or protective amulets to the animal's neck or horns and passing the animal over a dying fire.

- Although all participants with experience in livestock farming in rural areas agreed that anthrax is a contagious disease, it was found that they held differing views regarding the use of products from animals infected with anthrax. A small number of participants stated that they did not use products such as meat, milk, hide, or feces from infected animals; however, the majority reported using them in various ways. **Milk:** The milk of a sick animal was not consumed by the participants themselves but was instead given back to the sick animal to drink. **Meat:** In cases where the infected animal was slaughtered before death, participants reported several approaches: 1.Consuming the parts of the meat described as "non-blackened" after thorough cooking, and giving the "blackened" parts to the dogs, 2.Feeding the non-blackened parts of the meat to dogs, and burying the blackened parts along with the internal organs, 3. Giving the entire meat to the dogs, 4. Feeding the meat to dogs after the animal had died, 5. Burying the entire animal after death. **Hide:** Participants expressed differing approaches regarding the use

of hides from animals infected with anthrax: 1.Not using the hide under any circumstances, 2.If the animal was slaughtered before death, cleaning and smoking the hide and using it either for food storage or as coverings for various surfaces, 3. Selling the hide in urban markets or to traders. **Feces:** It was reported that feces from anthrax-infected animals were dried and used as fuel for heating. These findings indicate that, despite awareness of anthrax's contagious nature, risky behaviors related to the use of animal products continue to be practiced in rural areas.

- It was determined that individuals engaged in livestock farming in rural areas apply various practices for the disposal of animals that have died from anthrax: 1. urying the dead animals in locations far from residential areas with the application of lime to the burial site. 2. Dismembering the carcasses and feeding the entire body to dogs. 3. Dismembering the animals and feeding only the meat to dogs, while disposing of the internal organs in remote, uninhabited areas. 4. Burning the carcasses in isolated areas and then burying the remains. This situation indicates that both appropriate and inappropriate methods are employed in rural areas for the disposal of animals that die due to anthrax disease.
- It was found that individuals engaged in livestock farming in rural areas and possessing long-term experience in this field often lacked knowledge of, or did not implement, personal protective measures during the care of animals or the disposal of animal carcasses in cases of anthrax infection. However, it was also identified that some livestock owners, upon detecting signs of anthrax, took preventive steps to limit the spread of the disease—such as isolating infected animals, applying lime in barns, and burying dead animals with lime.
- It was determined that individuals engaged in livestock farming in rural areas agreed on the contagious nature of anthrax to humans, and some were able to describe anthrax-related lesions in people. It was determined that some livestock breeders possessed knowledge regarding the isolation of individuals infected with anthrax and hygiene rules, and that they did not treat people with anthrax using traditional methods.

Recommendations

- When evaluating the knowledge and practices of individuals engaged in livestock farming in rural areas regarding the fatal anthrax disease, it is evident that alongside beneficial practices such as isolating infected animals and humans, and burying deceased animals with lime in areas distant from human settlements, there are also risky

and harmful practices such as using products from infected animals, passing animals through fire, and administering salty water. The identification of these practices highlights the need for education on animal diseases in rural regions. Therefore, it is recommended that sustainable educational programs be conducted for individuals whose primary source of livelihood is livestock farming, focusing on animal diseases, transmission routes, and preventive measures.

- In order to ensure the continuity of the livestock sector—which plays a crucial role in meeting the population's food needs, providing employment, and supplying raw materials for industry—to prevent migration from rural to urban areas due to livelihood challenges, and to support the growth and promotion of key rural sectors such as agriculture and animal husbandry, and to increase sustainable livestock potential, it is recommended that scientific studies be conducted in the field of animal diseases and that the results of research studies be made visible.
- It is recommended to develop rural awareness projects on infectious diseases.

References

1. Şahin, C. and Doğanay, H., 2000. *Geography of Turkey*. Ankara: Gündüz Education and Publishing.
2. Gökburun, İ., 2018. Recommendations for the development of livestock activities in Yüksekova. *Marmara Geographical Review*, (37), pp.204–218.
3. Atış, E. and Çelikoğlu, Ş., 2017. The contribution of traditional Kars Gravyer and Kaşar cheese production in Boğatepe village to the local economy and promotion. In: *75th Anniversary of TCK International Congress*. [online] pp.310–324.
4. Baburşah, E. and İnce, Z., 2025. Cheese production in Kars province and its effects on the local economy. *Premium e-Journal of Social Sciences*, 9(53), pp.322–340.
5. Surve, A.A., Hwang, J.Y., Manian, S., Onono, J.O. and Yoder, J., 2023. Economics of East Coast fever: A literature review. *Frontiers in Veterinary Science*, 10, p.1239110. Available at: https://doi.org/10.3389/fvets.2023.1239110 [Accessed 19 Jul. 2025].
6. Krätli, S., Huelsebusch, C., Brooks, S. and Kaufmann, B., 2013. Pastoralism: A critical asset for food security under global climate change. *Animal Frontiers*, 3(1), pp.42–50.
7. Swaminathan, M.S. and Kesavan, P.C., 2016. Achieving the Sustainable Development Goals. *Current Science*, 110(2), pp.127–128.
8. Balkan, Ç.E. and Çelebi, S., 2018. Investigation of the anthrax agent and its seroprevalence in the Eastern Anatolia Region. *Turkish Journal of Microbiology*, 48(1), pp.52–59.
9. Özkurt, Z., Parlak, M., Taştan, R., Dinler, U., Sağlam, Y.S. and Özyürek, S.F., 2005. Anthrax in Eastern Turkey, 1992–2004. *Emerging Infectious Diseases*, 11(12), pp.1939–1941. Available at: https://doi.org/10.3201/eid1112.050151 [Accessed 19 Jul. 2025].
10. Kadanalı, A. and Özel, A.S., 2019. Anthrax: Unforgettable disease in the modern era [Şarbon: Modern çağda unutulmayan hastalık]. *Klimik Journal*, 32(3), pp.222–228.
11. Molyneux, D., Hallaj, Z. and Keusch, G., 2011. Zoonoses and marginalised infectious diseases of poverty: Where do we stand? *Parasites & Vectors*, 4(1), p.106. Available at: https://doi.org/10.1186/1756-3305-4-106 [Accessed 19 Jul. 2025].
12. Maudlin, I., Eisler, M.C. and Welburn, S.C., 2009. Neglected and endemic zoonoses. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1530), pp.2777–2787. Available at: https://doi.org/10.1098/rstb.2009.0067 [Accessed 19 Jul. 2025].

13. Turnbull, P.C.B. (ed.), 2008. *Anthrax in humans and animals*. 4th ed. Geneva: World Health Organization.
14. Öğütlü, A., 2012. Anthrax. *Journal of Experimental and Clinical Medicine*, 29, pp.S155–S162. Available at: https://doi.org/10.5835/jecm.omu.29.s3.011 [Accessed 19 Jul. 2025].
15. Republic of Türkiye Ministry of Health, Directorate General of Public Health, Department of Zoonotic and Vector-Borne Diseases, 2025. *Anthrax statistical data*. [online] Available at: https://hsgm.saglik.gov.tr/tr/dokumanlar-zoonotik.html [Accessed 19 Jul. 2025].
16. Creswell, J.W., 2013. *Qualitative inquiry and research design: Choosing among five approaches*. 3rd ed. Thousand Oaks, CA: Sage Publications.
17. Patton, M.Q., 2014. *Qualitative research and evaluation methods*. Translated by M. Bütün and S.B. Demir. Ankara: Pegem Academy.
18. Aminu, O.R., Tetteh, J., Akpadza, K. et al., 2020. Practical and effective diagnosis of livestock anthrax in endemic low-resource settings. *PLoS Neglected Tropical Diseases*, 14(9), p.e0008655. Available at: https://doi.org/10.1371/journal.pntd.0008655 [Accessed 19 Jul. 2025].