

*Review*

# **An outbreak of black quarter in cattle at the National Livestock Resources Research Centre, in Maruzi, Apac, Uganda**

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**Black quarter (BQ) is an acute, endogenous, infectious bacterial disease that primarily affects the hind limb of ruminants. It is caused by *Clostridium chauvoei*, a small spindle, Gram-positive, anaerobic rod-shaped spore-forming organism that is motile through peritrichous flagella. It bears the name in honour of Auguste J. B. Chauveau the French veterinarian and bacteriologist (1827–1917). Severe toxæmia and gaseous oedema of the skeletal muscle are the hallmarks of this condition. The death rate is 100%; animals that are found alive can receive large doses of penicillin, but the results are not good. Because it is a peracute infection, it is quite severe and short-lived. This study reports a spontaneous outbreak of clostridial illness at the National Livestock Resources Research Centre, headquartered in Maruzi, Apac District, Uganda. Black quarter diagnosis included clinical history, antemortem and post-mortem clinical findings, histopathology and laboratory diagnosis. In order to control an outbreak of sporadic *C. chauvoei* at the livestock research centre in Maruzi, northern Uganda; laboratory testing, observation of the disease's distinctive clinical indications, and the use of penicillin as an empirical treatment were used. Death was observed in 7 cases.**

**Key words:** Black quarter, *Clostridium chauvoei*, septicaemia, cattle, Maruzi, Apac District, Uganda, outbreak, antibiotic therapy, sudden death, myonecrosis.

## **INTRODUCTION**

Sheep and cattle can contract the deadly disease known as "blackleg" or "black quarter." It causes a severe local infection, and blood poisoning that follows quickly results in death. The term "blackleg" refers to haemolysis caused by an infection that typically affects a leg muscle and is dark in colour (Robson and Wilson, 2007). It is a severe, acute, febrile, and often fatal illness that affects sheep

and cattle due to *Clostridium chauvoei*. It is characterized by a range of symptoms, including emphysematous enlargement, which typically affects heavier muscles. In the genus *Clostridium*, there are roughly 180 species. *Clostridium septicum* and *C. chauvoei* are closely related. The illness is 100% fatal and has a global distribution (Mohamed, 2021). The black quarter is an endogenous

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infection in cattle. Lesions discovered in the absence of any prior wounds, albeit in certain situations, bruising or strenuous exercise may hasten the disease. Most animals with black quarters are beef breeds that are in good health and are gaining weight (Mohamed, 2021). It is an acute illness that typically affects heavy muscles in cattle and is characterized by emphysematous oedema. Buffaloes typically experience a milder infection. It seems that contaminated pasture is the main cause of the illness. Generally, healthy animals between the ages of six months and two years are the impacted ages. Individual therapy is frequently useless due to how quickly black quarter kills. However, animals given antibiotics at an early stage may sometimes survive, albeit they frequently develop chronic deformities as a result of the partial or total loss of muscle (Robson and Wilson, 2007). The majority of black quarter occurrences happen in the summer months, following soil excavation, or during exceptionally heavy annual rainfall, which can expose and activate dormant spores. Furthermore, the illness is enzootic in regions that have already experienced floods (Useh et al., 2006; Huang et al., 2013). It is non-contagious and can infect sheep of any age, although it primarily affects animals between the ages of six months and two years. Rarely, though; it might impact cows of 12 years old and calves as young as six weeks. Regrettably, animals that grow quickly and perform well are typically the ones affected by this disease (Barret and Richmond, 2022). The virulence factors of *C. chauvoei* include the toxin CctA (*C. chauvoei* toxin A) and a  $\beta$ -barrel pore-forming toxin of the leucocidin family that is the major virulence factor of *C. chauvoei*. These proteins induce unregulated pores in the target cells' membranes, which makes them cytotoxic. It should be noted that the high haemolytic activity observed on blood-agar plates is caused by CctA, Deoxyribonuclease (DNase) and hyaluronidase, also known as  $\beta$ - and  $\gamma$ -toxin, respectively, are additional virulence factors (Veterinary Bacteriology, 2023).

## STUDY AREA

In Maruzi, Apac, the National Livestock Resources Research Centre serves the Apac District's two sub-counties, Ibuje and Akokoro. Approximately 64 km<sup>2</sup> of Maruzi properties have been occupied by almost 1,500 squatters since 1995. Some of the nearby natural highlights are the Budongo Forest, Lake Kwanja, Lake Kyoga, Lake Kojweri, Masindi Port, and Paraa Lodge. Interest areas include Bunyoro, Acholi, and Lango sub-regions. The 10 agroecological zones of Uganda are as follows: West Nile, Western highlands, Southeast, Karamoja drylands, Eastern, Mid-Northern, Lake Albert crescent, Southern highlands, and Southern drylands. Mid-Northern includes savannah grassland which covers flat terrain and comprises of the following districts which are Lira, Apac, Kitgum, Gulu, and Pader. Uganda is an

African nation through which the Equator passes, and its altitude moderates its climate. Actually, a plateau that ranges in elevation from 1,000 to 1,400 m (3,300 to 4,600 ft) occupies a large portion of the nation. The average annual rainfall is between 900 and 1500 mm (35 and 60 IN), and the average temperature ranges between 20 and 25°C (68 and 77°F). The climate is pleasant and mild. The year-round temperature fluctuations are minimal; that being said, there are two distinct seasons, December to March, which is warmer and more pronounced in the north, and June to September, which is cooler. The variety, quantity, and distribution of cattle raised in Bunyoro, Lango, and Acholi are the result of cultural and ecological influences. The low rainfall zone, which has an abundance of pastures and ideal weather for raising livestock, is noted for having higher populations of native cattle, goats, sheep, and poultry. But far smaller herds of native cattle, mostly a mix of short-horn Zebu and Ankole, are kept in the high and medium rainfall zones.

## OUTBREAK AND FINDINGS

In August 2024 there was a black quarter outbreak among cattle at the National Livestock Resources Research Centre, located in Maruzi, Apac. The National Livestock Resources Research Institute (NaLIRRI) under the National Agricultural Research Organization (NARO) is responsible for producing cattle, pigs, poultry, goats, and sheep for both the local and export markets. The centre is situated in Maruzi, in the Apac catchment area. The livestock research institute keeps cross-bred beef cattle from the Ankole, Brahman, Short-horned Zebu, and some Friesian crosses (Nakayima and Sente, 2023a and b). The livestock graze freely on paddocked, upgraded pastures that have been established. Microscopic analysis and gross lesions are used to diagnose black quarter septicaemia in cattle. The acute infectious sickness known as black quarter (BQ) is caused by the Gram-positive, anaerobic bacteria called *C. chauvoei*. According to Sultana et al. (2008), this illness is characterized by inflammation, severe toxemia, and gaseous oedema of the skeletal muscle. In August 2024, seven cases of black quarter in cattle were discovered at the National Livestock Resources Research Centre, which is located in Maruzi, Apac. When antibiotics were given within 12 h of the onset of clinical symptoms, they were proven to be efficacious; but, when the septicaemia progresses, they become useless. Death was observed in 7 cases, mainly involving young cattle and calves below 4 months. Of these cases, 2 were treated but later died. They had fever with temperatures above 39.5°C, gluteal and sacral regions swellings, crepitus feel on the swellings, lameness, and anorexia. Afflicted body components include the muscles of the back. 12 h following the commencement of clinical signs and symptoms, septicaemia was developed. Within 24 to 48 h of the symptoms appearing, the animal dies; and the

swellings turn cold and painless. Black quarter diagnosis includes clinical history, antemortem clinical symptoms, post-mortem lesions, microscopic analysis, and laboratory diagnosis. Whole blood, serum, lesion aspirates, faecal and soil samples were collected. The diagnosis includes culture for *C. chauvoei*, serology and soil culture of the collected samples.

### Clinical signs

The clinical signs include acute death without symptoms, or in less severe cases, a hind leg that is lame, swelling, gas bubble-induced crepitus, and muscle group dysfunction (Veterinary Bacteriology, 2023).

### Postmortem findings

Muscles that turned black, discoloured, bloated, and putrid were the affected portions that were cut off and because of the bacterial synthesis of butyric acid, the afflicted muscle smelled like rancid butter and contained extra fluid and gas bubbles. Excess fluid will also be present in body cavities because of lying on one side with the affected leg (Rosangela et al., 2018).

### Microscopic examination

Fluid was obtained through needle puncture of the afflicted muscle, blood smear on a glass slide, air drying, methyl alcohol fixation, and Gram staining. Light microscopy was used to identify distinctive rod-shaped, motile, Gram-positive single organisms or tiny, irregular aggregates organisms. Smear microscopy along with Gram staining of the jugular vein blood was collected 6 h after the onset of clinical signs in order to identify signs of septicaemia (Sultana et al., 2008). Large, round-ended straight rods measuring  $0.6 \times 3.8 \mu\text{m}$  can be found alone or in short chains of three to five bacteria (Veterinary Bacteriology, 2023).

### Blood culture

Blood culture was plated on blood agar plates after 12 h and incubated in a McIntosh anaerobic jar for 72 h to study the organism's growth characteristics. Under a microscope, a section of colonial growth is also thoroughly investigated (Sultana et al., 2008). They grow in massive colonies (5 mm in diameter), or alternatively; the bacteria may form a continuous "carpet" of bacteria. On sheep blood agar it has haemolysis characteristics (Veterinary Bacteriology, 2023).

### Vaccination

The black quarter can be vaccinated once annually. The

most effective way to fight this illness may be to vaccinate animals in the field. Avoid vaccinating ill or stressed animals.

### CONCLUSION

The black quarter is characterized by inflammation and gaseous oedema of skeletal muscles and severe toxæmia. Despite extensive immunization campaigns, it is an acute and frequently fatal sickness that affects cattle, and it is still widespread throughout the world. It is necessary to conduct more research on the creation of vaccines that have a defence against *C. chauvoei*. Following the outbreak, the herd was vaccinated in mass. The cases were treated with Penicillin, Vitamin K and Anti-inflammatory drugs. Following an outbreak, control measures should include vaccinating all susceptible cattle and prophylactic treatment with penicillin (10,000 IU/kg, IM) to prevent new cases for as long as 14 days. Additionally, cattle should be moved from affected pastures. In the early stages of the black quarter, treat with penicillin or other antibiotics (procaine penicillin, oxytetracycline, or ceftiofur) in large doses is helpful and non-steroidal anti-inflammatory drugs (flunixin meglumine, ketoprofen, meloxicam, or tolfenamic acid) and once finished, recheck the animal for relapse cases. Avoid long-acting penicillins and glucocorticosteroids. The cattle which recover from this disease may have weak muscles in the legs, shoulder, etc. The black quarter disease is enzootic to Maruzi with a mortality rate of 100%. All non-symptomatic animals were vaccinated with the combined black quarter-anthrax vaccine. Annual vaccinations against the black quarter and strict vaccination schedules for other clostridial infections are recommended.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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