

Case Reports

Clinical features and postmortem findings of sheep-associated malignant catarrhal fever in a 2-years old bull

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Abstract

Malignant Catarrhal Fever (MCF) is a fatal lymphoproliferative disease of cattle and other ungulates caused by alcelaphine herpesvirus 1 (AIHV-1) and ovine herpesvirus 2 (OvHV-2), the main causative agents of wildebeest-associated MCF (WA-MCF) and sheep-associated MCF (SA-MCF), respectively. The virus is mainly spread by aerosols from pregnant or newborn sheep, goats, and wildebeest to susceptible animals. This case report presents the clinical features and post-mortem findings of an unusual case of malignant catarrhal fever (MCF) in a two-year-old bull brought to the Professor Feseha Gebreab Memorial Veterinary Teaching Hospital in Bishoftu, Ethiopia. The bull was semi-intensively managed, co-housed, and fed with sheep and other domestic animals. The animal was shivering upon arrival, with naso-ocular discharge and clouding of the eyes. The bull was febrile, with a rectal body temperature of 41.4 °C and a respiratory and heart rate of 40 and 48 beats per minute, respectively. On physical examination, the bull was emaciated, with bilateral yellowish mucopurulent naso-ocular discharge, frequent blinking, bilateral corneal opacity, salivation, a foamy mouth, head pressing, and enlargement of superficial lymph nodes. Malignant catarrhal fever was suspected based on the history and clinical signs, and empiric therapy with 10% oxytetracycline, diclofenac, and IV fluid was initiated. The bull died after receiving the third day of treatment. At necropsy, hemorrhages were found in the esophagus, trachea, and small and large intestines. In the kidney, white foci, enlargement, and fatty degeneration were observed. An ulcerated lesion was seen on the abomasum. In the gall bladder, enlargement and vascularization were also noted. The current case report confirms the rare case of clinical SA-MCF based

on the history, exhibited clinical pictures, post-mortem findings, and PCR results. Separation of cattle and sheep is strongly advised to prevent SA-MCF, as no vaccine has yet been developed.

Keywords: Bull; Clinical signs; Malignant catarrhal fever; PCR; Postmortem findings.

Introduction

Malignant catarrhal fever (MCF) is a fatal lymphoproliferative disease of cattle and other ungulates caused by the ruminant gamma-herpesviruses alcelaphine herpesvirus 1 (AIHV-1) and ovine herpesvirus 2 (OvHV-2). The other recently identified viruses known to cause MCF include caprine herpesvirus 2 (CpHV-2), which is enzootic in domestic goats. These viruses infect their reservoir hosts efficiently and without apparent disease (Dettwiler *et al.*, 2011). Alcelaphine herpesvirus 1 (AIHV-1) and ovine herpesvirus 2 (OvHV-2) are the major causative agents responsible for wildebeest-associated MCF (WA-MCF) and sheep-associated MCF (SA-MCF), respectively, in cattle and other ruminant species. Wildebeest-associated MCF (WA-MCF) is an economically important disease of cattle in Africa, where wildebeest are present, and SA-MCF is prevalent worldwide where sheep husbandry is practiced (Gelaye *et al.*, 2013).

MCF is a fatal lymphoproliferative disease upon infecting susceptible hosts, including cattle, deer, bison, water buffalo, and pigs. However, there are outbreaks in which several animals are affected, with evidence of recovery and mild or inapparent infections in some cases (Baxter *et al.*, 1993; O'Toole *et al.*, 1997; OIE, 2020). The disease is transmitted to the reservoir host both vertically *in utero* and by close contact. While, from the reservoir to the susceptible host (such as cattle), the transmission is by close contact through aerosols and contamination of pasture by the discharge of the reservoir animal. However, cattle are a dead-end host for MCF because once they are infected; they do not transmit the disease to other animals (Horner, 2003).

In diseased animals, the clinical signs of MCF are highly variable and range from peracute to chronic forms involving multiple organs, including the head and eye, alimentary tract, nervous system, and skin (Sood *et al.*, 2013; OIE, 2020). In a peracute case, either clinical signs are not evident, or depression followed by diarrhea and dysentery may develop 12–24 hours before death. In general, the disease is characterized by high fever, inappetence, ocular and

nasal discharge, keratoconjunctivitis with bilateral corneal opacity, and a decrease in milk yield (Li *et al.*, 2011).

The diagnosis of MCF has multiple challenges, including clinical resemblance to many viral diseases and highly complex pathogenesis and epidemiology. The diagnostic method is different in different clinically affected animals and reservoir hosts due to the biology of the MCF viruses and the hosts' responses to the viruses. Clinical signs and different assays such as serological tests, PCR, histopathology, isolation, and identification of viruses are used for the detection of MCFVs or the diagnosis of the disease caused by the viruses (Wallman and Thompson, 1982). The severity of clinical symptoms is reflected in gross pathological alterations, which are often broad and may encompass multiple organs (OIE, 2020). Salivation and oral hyperaemia may be early signs and may progress to erosions of the tongue, hard palate, gums, and particularly the tips of the buccal papillae. Sometimes skin ulceration and necrosis may develop which may extend or be restricted to the udder and teats. Erosions and hemorrhages in the gastrointestinal tract may be evident (Moore *et al.*, 2010). The urinary bladder often has characteristic ecchymoses and hemorrhages of the epithelial lining, especially in bison. In the kidney, extensive multiple raised white foci, each 1–5 mm in diameter, may appear (Sood *et al.*, 2013; OIE, 2020). The brain may also show signs and symptoms of non-suppurative meningoencephalitis (OIE, 2020).

The use of PCR allows sensitive confirmation of the presence of MCF viruses in infected animals and is also useful for phylogenetic and epidemiological studies in both natural and MCF-susceptible hosts. Both conventional and quantitative real-time PCR assays have been developed for the detection of OvHV-2 and AIHV-1 viral DNA (Toole and Crawford, 2000). The OIE-approved nested PCR was found to be 10-fold more sensitive than quantitative PCR. However, real-time PCR assays have the potential to define viral loads in a range of tissues from both natural and MCF-susceptible hosts (Swai *et al.*, 2013). This case report presents a PCR-confirmed case of sheep-associated malignant catarrhal (SA-MCF) fever in a two-year-old bull in Bishoftu, Ethiopia.

Case description and management

A two-year-old bull was brought to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha Gebreab Memorial Veterinary Teaching Hospital with a history of reduced feed intake, shivering, nasal discharge, and lacrimation. The bull was semi-intensively managed, cohoused,

and fed with sheep, horses, and donkeys. Body vital parameters revealed that the bull was febrile with 41.4 °C, 40 breaths per minute, and 48 beats per minute of temperature, respiratory rate, and heart rate, respectively. The bull was highly emaciated, with bilateral yellowish mucopurulent naso-ocular discharge, frequent blinking of the eyes, bilateral corneal opacity, salivation, foamy mouth, and prescapular and prefemoral lymph node enlargement (Figure 1). The team of veterinarians went to the village where the animals lived and discovered that the bull and other animals (a donkey, a horse, and sheep) shared the same house and communal grazing land. Based on the clinical presentations, viral diseases like infectious bovine rhinotracheitis (IBR), malignant catarrhal fever (MCF), rickettsial infections like ehrlichiosis, and other diseases with related signs were suspected.



Figure 1. Clinical evidence of the case: (A); Yellowish mucoid nasal discharge (B); Foamy salivation (C); Corneal opacity (D); Emaciation with prominent ribs and pelvic bone

To prevent secondary bacterial complications and relieve pain, 10% oxytetracycline (Shanghai Thongren Pharmaceutical Co., Ltd., China) at a dose of 10 mg/kg body weight daily was prescribed for five days in conjunction with 2.5 mg/kg diclofenac sodium (Jiangsu Pengyao Pharmaceutical Co., Ltd., China).

The bull was in good condition on the first and second days of follow-up. However, it became lethargic and unable to move. The following day, after the third shot, the bull died.

Postmortem findings and PCR result

Immediately after the bull died, the cadaver was opened for post-mortem investigation. The trachea, esophagus, lymph nodes, lung, liver, kidneys, gall bladder, and gastrointestinal tract were thoroughly investigated and sampled. The gross postmortem findings were hemorrhages in various organs, including the esophagus, trachea, and small and large intestines. In the kidney, white foci, enlargement, and fatty degeneration were noted. In addition, ulcerated lesions on the abomasum, enlargement, and vascularization of the gall bladder were seen, as indicated in Figure 2 below.



Figure 2. Post-mortem findings of the case: (A); Hyperemic esophagus (B); Eroded lesion on gall bladder (C); Hemorrhage on the trachea and diphtheritic mucus membrane (D); Engorged heart (E); Infarct and white foci on the kidney (F); Fatty degeneration (G); Hemorrhage on intestine and (H); ulcerated lesions on abomasum.

For molecular detection, MCF1TK-Fow-5 pm/ μ 5-CCCGGGAAAACCTTCTAC-CAC-3 and MCF1TK-Rev-5pm/ μ 5-CGCTTAGGTCAATGACAACG-3 primers (NVI, Ethiopia) were used, DNA extraction was made from pathological tissue samples (kidney, liver, and lymph node) and Ovine herpesvirus type two (OHV-2) DNA was detected in the samples using the conventional PCR diag-

nostic method (Figure 3). This result has confirmed that the bull's death was caused by SA-MCF, a rare and underreported condition in Ethiopia.

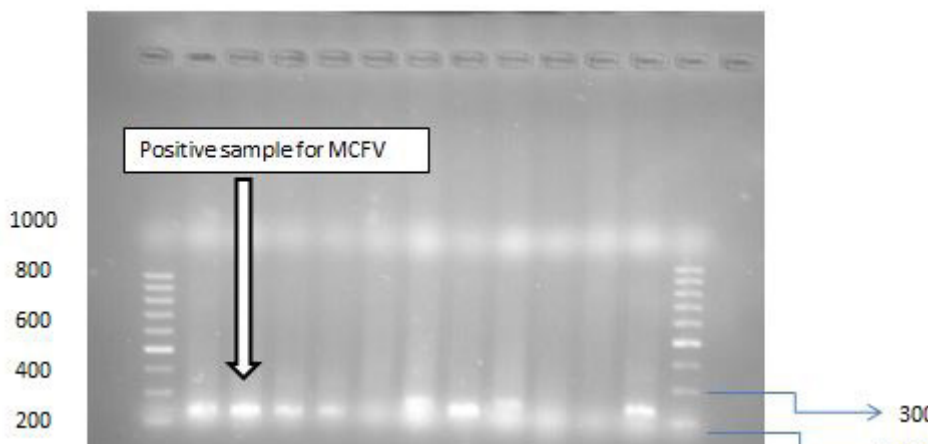


Figure 3. PCR test result

KEYS: M- Molecular ladder, S1- Sample one, D1-D4- Doubilacated samples of the original sample, NC- Negative control, PC- Positive control, and Left side and right side molecular base pairs put by numbers

Discussion

The present case of MCF was diagnosed based on clinical findings, post-mortem, and a PCR result, as described by Horner (2003). Similar to the current case, MCF is characterized by clinical signs of appetite loss, self-isolation from the stock, lethargy, emaciation, fever, lymph node enlargement, bilateral corneal opacity, nasal and ocular discharge, and hyperesthesia (Zamila *et al.*, 2011; Gelaye *et al.*, 2013; OIE, 2020). The gross pathological findings obtained in the present case report are similar to those described in previous reports by Horner (2003) and Pesca *et al.* (2019), which revealed erotic lesions in the mouth and nasal cavities, diphtheritic mucus membranes, hemorrhage on the serosal surface, an infarct, white foci in the renal cortex, and enlarged superficial lymph nodes. The conventional PCR test has confirmed the presence of Ovine herpesvirus type two (OHV-2) DNA in the pathological tissue samples (kidney, liver, and lymph node) collected during the post-mortem examination of the present case. However, PCR detection was not performed on sheep, which are potential reservoir hosts. The lack of clarity of the gel photo used in this report and the failure to include histological investigation due to a lack of facilities are limitations of this work.

Conclusion

The current report confirms a rare clinical case of SA-MCF based on history, clinical signs, post-mortem findings, and PCR results. Therefore, separating sheep from cattle could be a possible control measure because there is no effective vaccine against SA-MCF.

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Institutional Review Board Statement

All the procedures performed on the bull included in this study were done in the framework of routine clinic veterinary care and post-mortem procedure. Thus, ethical review and approval were not needed for this case report.

Informed Consent Statement

Informed consent was obtained from the owner.

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Conflicts of Interest

The authors declare no conflict of interest.

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