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## Trauma induced septicemia in cattle: A necropsy case report

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### Abstract

A necropsy case of Vrindavani cattle was presented at the ICAR-Indian Veterinary Research Institute, Izzatnagar, Bareilly (Uttar Pradesh). The postmortem examination of a six-year-old female Vrindavani cattle revealed slipped and dislocated femur bone, resulting in immobility for four days prior to death despite treatment efforts. External examination showed good carcass condition, pale mucous membranes, hind limb rigor mortis, hemorrhages, pus formation, and black discoloration in affected muscles. Gross examination displayed frothy exudates, tracheal and pulmonary hemorrhages, emphysema in cranial lung lobes, consolidation in caudal lobes, and fibrinous pleural appearance. Petechial hemorrhages were present on the epicardium and endocardial wall, along with clotted blood in the heart's ventricles. Liver exhibited rounded borders, black patchy discoloration, and mottled necrotic areas on cut sections. Spleen and kidneys displayed petechial hemorrhages, cortico-medullary junction congestion, and severe serosal congestion and mucosal congestion in the intestines. Microscopic examination revealed mild subacute bronchiointerstitial pneumonia in the lungs, vacuolar degeneration and mononuclear cell infiltration around the central vein in the liver, and severe interstitial infiltration of mononuclear cells in the kidneys. The findings suggest death by trauma-induced septicemia resulting from femur bone displacement and associated complications.

**Keywords:** Dislocated femur bone, petechial hemorrhages, mononuclear cell infiltration

### 1. Introduction

Septicemia is a morbid condition caused by the presence of pathogenic bacteria and their associated toxins in the blood. The diagnosis of septicemia can be done by isolation of the causative organism from the blood stream. This is not usually practised on routine antemortem examination of animals in abattoirs; however, the evidence of septicemia is determined by the antemortem and postmortem findings. There are many aetiological factors of septicemia, on necropsy examination, grossly one or more lesions may be absent. All gross lesions in the carcass and organs must be considered before the animal is judged septicemic. Septicemia is found in many infectious diseases including acute forms of salmonellosis, leptospirosis, swine erysipelas, hog cholera and in anthrax in cattle. according to Miller *et al.* (2013) [2] the presence of adhesions and fibrin adhered to the epicardium indicate the chronicity of the inflammatory process resulting from foreign body penetration, whereas the hemorrhagic injury observed in can be attributed to severe septicemia, endotoxic and anoxia. These lesions are frequently seen in cases of traumatic pericarditis as exposed by Hussein & amp; Staufenbiel (2014) [1], with hepatomegaly (hepatic congestion) as a consequence of right congestive heart failure (Mosier, 2013) [4]. Congestion and petechial or ecchymotic hemorrhage in kidney, heart surface, mucous and serous membranes, connective tissue and panniculus adiposus are most prominent gross pathological findings of septicemia in bovines.

### 1.1 Case report

A necropsy case of Vrindavani cattle was presented at the ICAR-Indian Veterinary Research Institute, Izzatnagar, Bareilly (Uttar Pradesh). The postmortem examination of a six-year-old female Vrindavani cattle revealed slipped and dislocated femur bone, resulting in immobility for four days prior to death despite treatment efforts.

External examination showed good carcass condition, pale mucous membranes, hind limb rigor mortis, hemorrhages, pus formation, and black discoloration in affected muscles.

**2. Materials and Methods**

**2.1 Histopathology**

Tissue samples, including the lungs, heart, liver and kidneys were collected and stored in 10% NBF for 48 hours at room temperature to ensure proper fixation. Subsequently, 0.5 cm thick tissue sections were cut from the fixed tissues and processed for routine histopathological examination. The cut sections underwent dehydration using ascending grades of alcohol and were cleared through two changes of xylene. Further, paraffin-embedded tissue sections were processed, and 4 to 5-micron thick sections were cut using a semiautomatic microtome, placed on glass slides. For routine histopathological examination, the sections were stained with Haematoxylin and Eosin (H&E) following a standard protocol (Luna, 1968) [6].

**3. Results**

**3.1 External examination**

External examination further highlighted several notable observations: the carcass exhibited a satisfactory overall condition, although the mucous membranes appeared pale, indicative of potential underlying issues. Rigor mortis was evident in the hind limbs, indicating the postmortem interval. Additionally, various signs of trauma were observed, including hemorrhages, pus formation, and black discoloration within affected muscle tissues. These findings collectively suggest a complex and potentially severe pathological process affecting the animal.

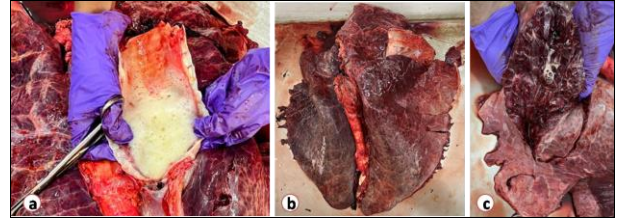


**Fig 1:** Carcass Condition: Good (a), Hemorrhage on thigh musculature with multiple areas of pus formation (b) and black discoloration of affected muscles (c)

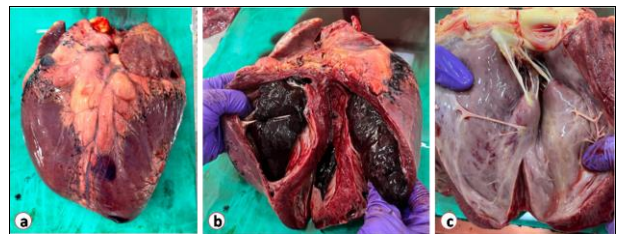
**4. Gross Pathology**

The trachea contains frothy exudates and mucosal hemorrhage (as seen in Fig. 2a), while the lungs exhibit emphysematous changes in the cranial left and right lobes, consolidation of caudal lobes, and a fibrinous appearance of the visceral pleura (Fig. 2b). Cut-sections of the lungs reveal froth and consolidation (Fig. 2c). In the heart, petechial hemorrhages are observed on the epicardium (Fig. 3a), along with clotted blood present in the ventricles (Fig. 3b), and petechial hemorrhages on the endocardial wall (Fig. 3c). Grossly, the liver shows rounding of borders, black and small patchy discoloration (a); Cut-section showing mottled appearance of necrotic areas (b).

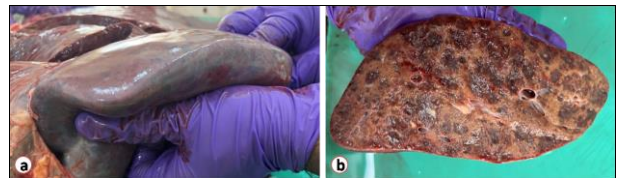
patchy discoloration (Fig. 4a), with cut-sections displaying a mottled appearance of necrotic areas (Fig. 4b). The spleen also presents petechial hemorrhages (Fig. 5a), with cut-sections showing dark reddish parenchyma (Fig. 5b). The kidneys exhibit petechial hemorrhages in the cortical region (Fig. 6a) and congestion of the cortico-medullary junction (Fig. 6b). Severe serosal congestion is evident in the intestines (Fig. 7a, b), with the mucosa showing petechial to ecchymotic congestion (Fig. 7c).



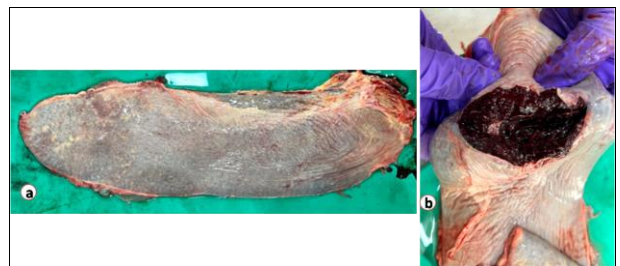
**Fig 2:** Trachea- contains frothy exudates & mucosal haemorrhage (a); Lungs- Cranial left & right lobes emphysematous, consolidation of caudal lobes, fibrinous appearance of visceral pleura (b) ; Cut-section showing froth & consolidation (c)



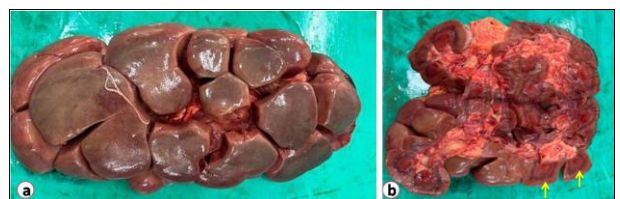
**Fig 3:** Heart- Petechial Hemorrhage on epicardium (a); Clotted blood present in ventricles (b); Petechial Hemorrhage present on endocardial wall (c)



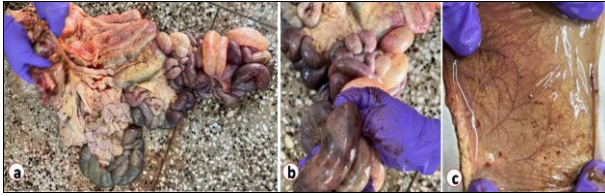
**Fig 4:** Liver- Rounding of borders, black and small patchy discoloration (a); Cut-section showing mottled appearance of necrotic areas (b)



**Fig 5:** Spleen- Petechial Hemorrhage (a); Cut section showing dark reddish parenchyma (b)



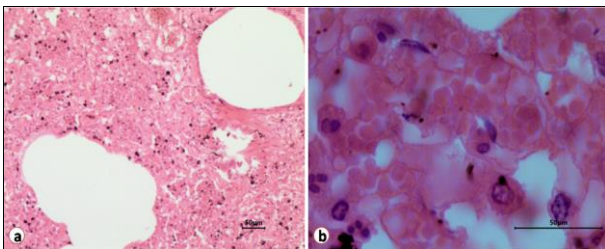
**Fig 6:** Kidneys- Petechial Hemorrhage in the cortical region (a); congestion of cortico-medullary junction (b- yellow arrow)



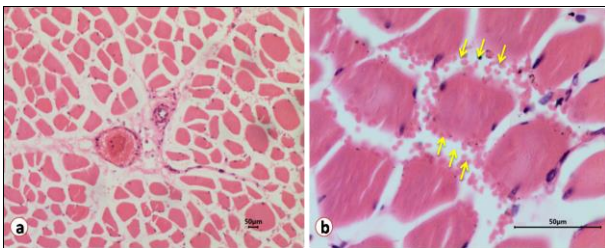
**Fig 7:** Intestine- Severe serosal congestion (a, b); In mucosa petechial to ecchymotic congestion (c)

## 5. Histopathology

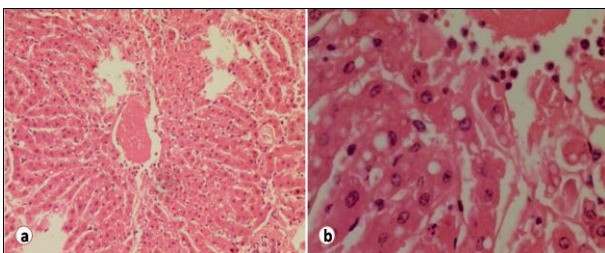
In the lungs, microscopic examination reveals bronchiolar desquamation and eosinophilic serous exudate within the bronchiolar lumen (Fig. 8a). Additionally, there is thickening of the interstitium, engorged capillaries, and a mild infiltration of mononuclear cells (Fig. 8b). In the heart, erythrocytes are observed between cardiac muscle cells, indicating hemorrhages (Fig. 9a, b). The liver exhibits hepatocytes around the central vein showing vacuolar degeneration with infiltration of mononuclear cells (Fig. 10a, b). Furthermore, the kidneys show severe infiltration of mononuclear cells within the interstitium (Fig. 11a, b). These microscopic findings provide valuable insights into the pathological processes underlying the observed gross lesions, indicating potential systemic involvement and contributing to the overall understanding of the necropsy case.



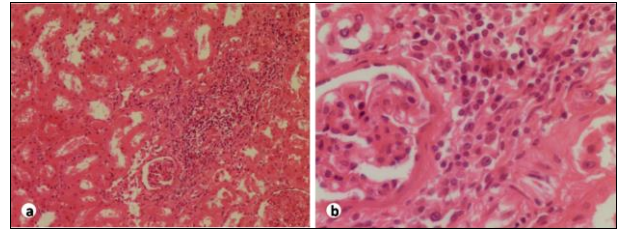
**Fig 8:** Lungs - Interstitium thickening engorge capillaries (a-10X; H&E stain) and mild infiltration of mononuclear cells (b-40X; H&E stain)



**Fig 9:** Heart – Erythrocytes seen between cardiac muscles cells indicating hemorrhage and vessels showing congestion (10X; 40X H&E stain).



**Fig 10:** Liver- Hepatocytes around central vein showing vacuolar degeneration (a-10x; H&E stain) with infiltration of mononuclear cells (b-40X; H&E stain)



**Fig 11:** Kidneys- Interstitium showing severe infiltration of mononuclear cells (a10x, b40x-H&E stain).

## 6. Discussion

The necropsy findings suggest that trauma to the hind limbs initiated a cascade of events. Proliferation of bacteria at the site of injury ensued, facilitating their entry into the bloodstream and subsequent release of endotoxins, leading to septicemia. These endotoxins induced damage to the endothelium of blood vessels, triggering the activation of the coagulation cascade and resulting in the formation of disseminated intravascular coagulation (DIC). Consequently, hemorrhages occurred throughout various organs due to compromised vascular integrity. The extensive hemorrhaging led to a loss of circulatory blood volume, causing hypovolemia. Ultimately, the combination of hypovolemic and/or septicemic shock culminated in the death of the animal. This sequence of events underscores the systemic impact of the initial trauma and subsequent bacterial invasion, highlighting the severity of the pathological process leading to death.

## 7. Conclusion

In summary, the necropsy of the six-year-old female Vrindavani cattle revealed trauma-induced septicemia resulting from slipped femur bone, despite treatment. Extensive external and gross examination findings, including hemorrhages and organ discoloration, highlighted the severity of the condition. Microscopic examination further elucidated pulmonary, hepatic, and renal involvement. These findings underscore the importance of comprehensive postmortem evaluation in understanding fatal conditions in cattle.

## 8. Acknowledgements

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