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MECONIUM ASPIRATION PNEUMONIA IN MURRAH BUFFALO CALVES

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ABSTRACT

Meconium aspiration syndrome (MAS) is caused due to respiratory distress to the fetus during or before parturition. As a result of asphyxia, the fetal gasping causes meconic amniotic fluid entry into the respiratory air passages and pulmonary complications, and sometimes death of the newborn. In the present study, two cases of MAS in Murrah buffalo calves born full term by assisted delivery and died after few hours of delivery were received for routine postmortem examination. Necropsy examination revealed diffuse mosaic-pattern - like lesions in the lungs characterized by dark brown-to-red deflated (atelectatic) lobes and small irregular pale raised multi focal partially inflated tiny areas amidst the atelectatic lobes. The respiratory passages were filled with aspirated substances. Microscopically, bronchoalveloar lumen contained with keratin, squames and subtle meconium along with mild infiltration of neutrophils in the alveolar parenchyma. The MAS in Murrah buffalo calves in the present study was similar in presentation with that reported in human babies due to the MAS. These cases add further information on MAS in the buffaloes to the scanty literature on this condition.

Keywords: *Bubalus bubalis*, buffaloes, meconium, calf, pneumonia, atelectasis

INTRODUCTION

Neonatal mortality in livestock due to hypothermia, starvation, maternal under nutrition, mismothering, infections and injuries is an important concern worldwide (Mellor and Stafford, 2004). The neonatal mortality due to meconium aspiration syndrome (MAS) which occurs due to respiratory distress (asphyxia) during or before parturition is an important clinicopathological condition that contributes to respiratory complications and sometimes death of newborns if not obstetrically handled as done in case of human medicine in which fatality rate due to MAS is prevented up to 28% (Carsan *et al*., 1976). MAS both in humans and animals are characterized by aspiration of released meconium and amniotic fluid by the neonates leading to serious disease consequences (Newman and Fasina, 2019). Meconic amniotic fluid contains fetal derived substances from the digestive system, including salivary, gastric, pancreatic, and intestinal juices, mucus, bile, bile acids, cellular debris, downy

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fetal hairs, fetal wax, and blood (Lindenskov *et al*., 2015). When meconic amniotic fluid is inhaled or ingested by neonates due to asphyxia during or before delivery, it impacts on visceral organs such as the lungs by several interconnected mechanisms including obstruction, irritation, toxic insult, chemotaxis, and surfactant inhibition (Dargaville, 2012). Hypoxic events *in utero* lead to release of meconium in the amniotic fluid and aspiration into lungs (Lindenskov *et al*., 2015). The aspirated substances lead to various types of lung lesions due its toxic nature or local irritation to the pulmonary epithelium. Moreover, it contains pro-inflammatory and chemotactic substances, also can activate complement (Dargaville, 2012). Till date, MAS has been documented from various species of animals including neonatal foals (Dubielzig, 1977), calves (Lopez and Bildfel, 1992), piglets (Castro-Nájera *et al*., 2006), small ruminants (Newman and Fasina, 2019) and a dolphin (Tanaka *et al*., 2013). To the best of our knowledge, MAS has not been reported from the buffaloes so far. Therefore, present research paper documents the patho-morphology of MAS in two Murrah buffalo calves.

MATERIALS AND METHODS

Two one- day- old carcasses, one each of male and female buffalo calves, were received for routine necropsy examination at the postmortem facility of the Division of Pathology, ICAR- Indian Veterinary Research Institute, Bareilly, India. The cases had the history of dystocia at the Livestock Production and Management Farm of the Institute and were delivered live after obstetrical assistance. However, after few hours of assisted live parturition of the calves, both were succumbed. Detailed necropsy was conducted and any alteration in various visceral organs was noted. Representative tissue pieces (5 mm thickness) from various organs were fixed in 10% neutral buffered formalin (NBF) for the histopathological examination. After proper fixation of tissues, thin slices of trimmed tissues were processed for paraffin embedding method. The paraffin blocks were cut into 4 to 5 micron thick paraffin tissue sections with the help of semi-automatic microtome. The tissue sections were then taken on glass slides and further stained with Haematoxylin and Eosin (H&E) stains following standard procedure (Luna, 1968).

RESULT AND DISCUSSIONS

The full term murrah buffalo carcasses grossly showed yellowish staining of hair coat and skin of the perineum. Lungs had diffuse mosaic pattern due to dark brown-to-red atelectatic (collapsed) lobes and multiple foci of pale soft partially inflated lung parenchyma within the confines of the atelectatic lobes. Additionally, female calf carcass also revealed severe and diffuse congestion of other visceral organs, including marked meningeal congestion, and petechial hemorrhages on serosal surfaces in the abdominal cavity. Histopathological examination revealed, alveolar and bronchiolar lumen contained with keratin and squames (Figure 1). Keratin associated areas showed mild alveolitis, characterized by the exudation of a few neutrophils, few alveolar macrophages and small amount of fibrin. Meconium substance was very scanty visible. Female calf had severe congestion and focal to multifocal hemorrhages in the vital organs. Brain showed mild gliosis and capillary congestion.

MAS is an important clinico-pathological

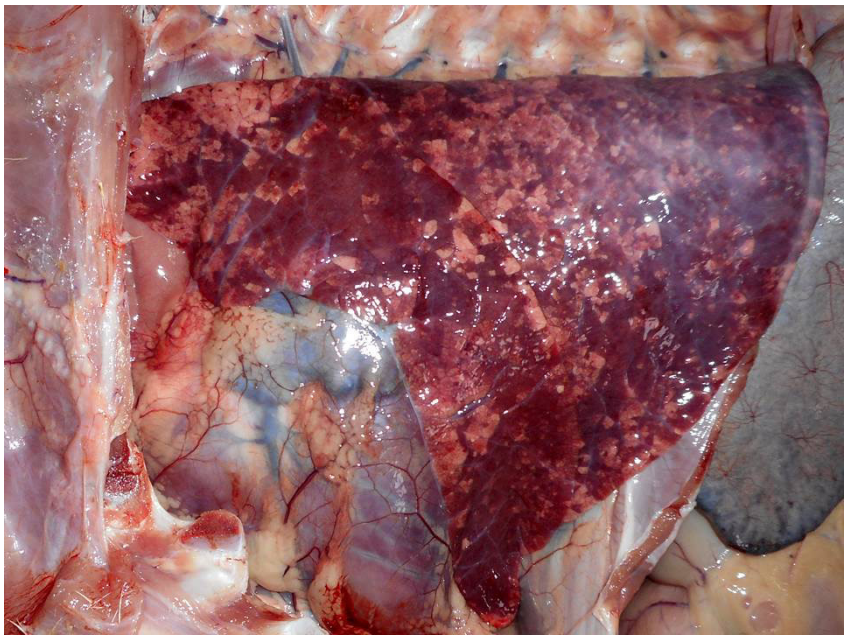

Figure 1. Lung showing mosaic pattern of normally inflated and atelectatic lobules.

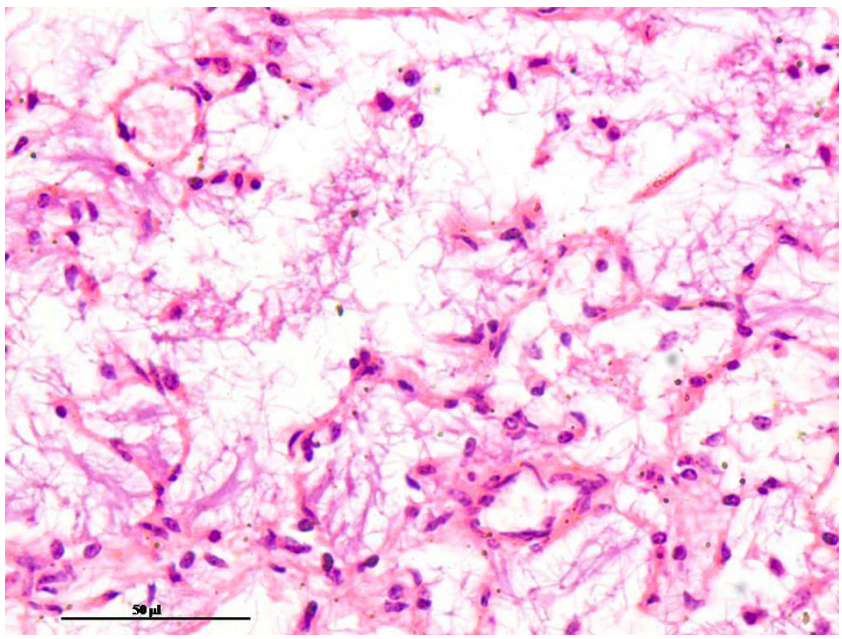

Figure 2. Microphotograph of the lung after haematoxylin and eosin staining showing keratin and squames in the alveoli (400 x).

condition of neonates, characterized by hypoxemia, acidosis, and patchy atelectasis (Newman and Fasina, 2019). It generally occurs by aspiration of meconic amniotic fluid in the lung of neonates, but it can also occur when amniotic fluid containing only skin keratin or squames cells and no meconium, aspirated in the lower respiratory airways (Davis *et al*., 1985). During or before parturition when hypoxia or acidosis occurs, the amniotic fluid, with or without meconium is aspirated by the neonates. It serves as a vehicle to carry fetal epidermal cells, keratin, and meconium into the lungs (Goel and Nangia, 2017). When meconium released into amniotic cavity by the stressed fetus it stains yellowish fetus hair coat (Dargaville, 2012) as was observed in our study in male calf. Aspiration of amniotic fluid admixed with meconium and skin keratin immediately after birth associated with dystocia or prolonged parturition efforts leads to fatal hypoxia (McKenzie, 2018) as observed in the present study that, both the calves had history of difficult parturition.

Aspirated amniotic fluid mixed with meconium can induce inflammatory response in the tissues. It has a direct toxic or local irritant activity to the pulmonary epithelium. Also, it contains substances that are pro-inflammatory, chemotactic to neutrophils, and activate complement (Dargaville, 2012). Additionally, meconium partially occludes airways, and traps air during expiration (Piza *et al*., 1989). Gross lesions included inflated and atelectatic lobules in the present study was in agreement with the reports of Lopez and Bildfel (1992). Such lesions are seen because of dose-dependent surfactant inhibition activity of amniotic fluid mixed with meconium, that leads to reduction in surface tension, and results in grossly recognizable atelectasis and variable degrees of ventilation-perfusion mismatch (Dargaville, 2012). Microscopically, keratin and squames were observed in the alveoli along with alveolitis and infiltration of neutrophils. These changes are in agreement with the reports of Newman and Fasina (2019), who described the presence keratin exfoliated from the skin into the amniotic fluid in the bronchi, bronchioles, and alveoli, accompanied by mild alveolitis characterized by infiltration of leukocytes. In cases considered to be of longer duration, macrophages and multinucleate giant cells predominated around meconium particles (Castro-Nájera *et al*., 2006). Septicemic lesions observed in the female calf in the present study may be due bacterial growth and sepsis, because aspirated meconium and amniotic fluid can act as an enriched medium for bacterial growth (Lopez and Bildfel, 1992).

Owing to the established importance of MAS in human neonatology and findings of the present study it is suggested that the cause and incidence of MAS in livestock neonates is necessary to establish to reduce the neonatal mortality in animals.

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