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RESEARCH ARTICLE

Pathological study on an outbreak of sheep pox in a Mecheri sheep flock

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ABSTRACT

In the present article, the pathology of sheep pox in a Mecheri sheep flock has been described. Six adult sheep carcasses from an organized sheep farm were presented for necropsy. Affected sheep had clinical signs of pyrexia, conjunctivitis, laboured breathing, loss of appetite and raised firm nodules in the hairless areas all over the body. On necropsy, skin over the groin, ventral abdomen and inner thigh revealed multiple, round, firm, elevated grey-coloured nodules. Lung lobes revealed many reddish-brown circular areas. Microscopically, hyperplasia with hydropic degeneration of the lining epithelium was observed in tissues of skin, lip, rumen and reticulum. Eosinophilic intracytoplasmic inclusions also seen in hyperplastic epithelial cells of the above tissues. Trachea showed mucosal congestion with subacute tracheitis, epithelial hyperplasia with intracytoplasmic inclusions and lungs showed interstitial pneumonia. Tissues with lesions were subjected to polymerase chain reaction and were found to be positive for ITRs of the sheep pox virus with an amplicon size of 289 bp. The disease was diagnosed as sheep pox on the basis of gross pathology, histopathology and confirmation by molecular methods.

Keywords: Mecheri sheep, pathology, sheep pox, Tamil Nadu

INTRODUCTION

In India, sheep pox is a contagious disease of sheep affecting all age groups and is endemic in Indian subcontinent. It is economically important viral disease of sheep which causes heavy economic losses in outbreaks due to heavy mortality, abortions and loss of market value of the affected animals[1]. Mortality rate of up to 50% in a fully susceptible flock and as high as 100% in young lambs has been reported[2,3]. Mild infections are common in indigenous breeds. However, symptoms may be more severe in lambs, animals under stress and those with concurrent infections and or animals from areas where sheep pox is not endemic[4,5].

Sheep pox is caused by sheep pox virus, a member of the genus *Capripox virus* of the family *Poxviridae*[6]. The other members of the genus are goat pox virus and lumpy skin disease virus (LSDV) of cattle. Although the geographic distribution of sheep pox, goat pox and lumpy skin disease is different, the viruses are indistinguishable by conventional serology and barely distinguishable by restriction endonuclease analysis[7]. Strains of sheep pox and goat pox virus are not considered to be host-specific and although the majority of strains show a host preference, but preferably a single strain may cause disease in both sheep and goats. Goats may get mild infection with sheep strains, which can then cause severe disease when transmitted back to sheep. Similarly, sheep may become infected with virulent goat strains[2]. It has been proposed that both sheep pox and goat pox be described as a single disease called capripox[8]. The present study describes the pathology of an outbreak of sheep pox in an organized sheep breeding farm in Thanjavur district of Tamil Nadu.

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MATERIALS AND METHODS

Six carcasses of sheep of different ages (4 months - 3 years) were brought for post-mortem examination from an organized sheep farm during the month of January 2016 (mid-winter season) to the Department of Veterinary Pathology, Veterinary College and Research Institute, Orathanadu, Thanjavur, Tamil Nadu with the clinical history of pyrexia, conjunctivitis, loss of appetite, depression, abortion, raised firm nodules in the hairless areas, prostration and laboured breathing followed by death. The farm had a flock strength of 58 animals and were maintained in closed pen system with open grazing time of 6 to 8 hours.

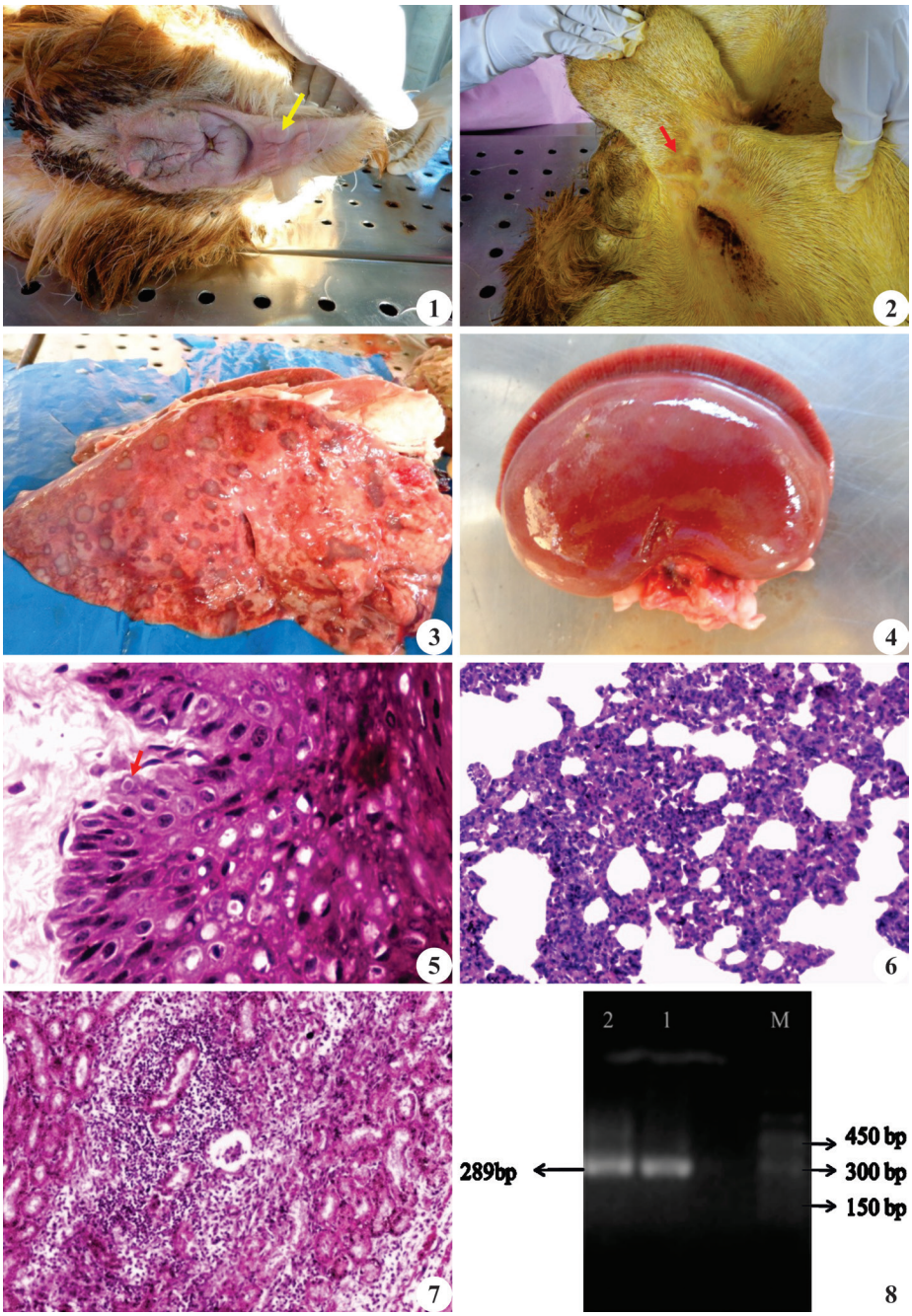

Fig. 1. Raised, firm, circular nodules on underside of the tail; **Fig. 2.** Multiple, raised, firm, circular nodules on skin at the base of the scrotum; **Fig. 3.** Lungs: Multiple and confluent greyish, round, firm nodules with hyperaemic borders; **Fig. 4.** Kidney: Cortical surface showing multifocal, greyish spots; **Fig. 5.** Skin: Intracytoplasmic eosinophilic inclusions in the hyperplastic epithelial cells (H&E x400); **Fig. 6.** Lungs: Subacute interstitial pneumonia (H&E x100); **Fig. 7.** Kidney: Subacute interstitial nephritis (H&E x100); **Fig. 8.** Agarose gel electrophoresis showing amplicons specific to sheep pox virus for 289 bp of the inverted terminal repeats gene. Lane M: DNA marker; Lane 1 & 2: Representative positive field samples.

Sick animals were segregated from apparently healthy animals and housed in a separate enclosure away from the main stock. Clinical signs, mortality and morbidity were recorded.

Necropsy was performed as per the standard procedure and gross lesions were recorded. The representative tissue pieces from the skin, lungs, kidney, spleen, liver, heart, trachea, rumen and reticulum were collected in 10% neutral buffered formalin. The tissues were processed as per standard histological technique[9]. The tissue sections were cut at 3-5µ thickness and stained by the Haematoxylin and Eosin staining technique. Samples of infected lung tissue and other organs showing lesions collected in sterile container and heart blood swab

were sent to Department of Veterinary Microbiology, Veterinary College and Research Institute, Orathanadu for identification of etiological agent. The DNA was extracted and the PCR was carried out to amplify inverted terminal repeats of sheep pox virus with a forward primer, InS-1.1 (5′-AGAAACGAGGTCTCGAAGCA-3′) and a reverse primer, InS-1.1′ (5′-GGAGGTTGCTGGAAATGTGT-3′) to get an amplicon size of 289 bp length of the inverted terminal repeats (ITRs) of sheep pox virus[10].

RESULTS

The outbreak of sheep pox was recorded during mid-winter season. The overall morbidity and mortality were 56% and 11%, respectively and the severity was more in adults. On external examination, the skin of lips, ventral neck, sternum, abdomen, inner thigh, inguinal region and underside of the tail also revealed multiple, elevated, greyish, round, firm areas of about 5-8 mm diameter (Figs. 1 & 2). Scab formation was noticed in the udder, sternum and ventral abdomen of a few animals. Subcutaneous tissue of the above cutaneous lesions revealed congestion and areas of ecchymosis. The nodular lesions extended into the mucosa of mouth, dental pad, pharynx, larynx, rumen, reticulum, abomasum and vagina with generalized lymphadenopathy. The spleen was congested. Dorsal aspect of the tip of tongue revealed severe erosions and it was covered with yellow strands of necrotic debris. Trachea showed ulcerations with hyperaemic borders. Lungs revealed multiple, confluent, greyish, round, firm nodules of 3-8 mm diameter with hyperaemic borders (Fig. 3). Moderate to severe pulmonary oedema and endocardial haemorrhages were also observed. Liver and kidneys revealed multifocal, greyish spots of 1-2 mm diameter (Fig. 4).

On microscopic examination, skin revealed thickening of dermis with lympho-macrophage infiltration. Epidermis revealed hyperplasia, acanthosis, areas of parakeratosis and hyperkeratosis, necrosis and reepithelialisation. Epithelial cells of skin and labia showed hydropic changes with intracytoplasmic eosinophilic inclusion bodies (Fig. 5). Hair follicular epithelium also revealed epithelial proliferation with intracytoplasmic inclusions. Sebaceous gland revealed sebaceous adenitis. Lungs showed sub-acute interstitial pneumonia (Fig. 6) with areas of emphysema and pleuritis. Trachea showed mucosal congestion with sub-acute tracheitis and epithelial hyperplasia with intracytoplasmic eosinophilic inclusions. Rumen and reticulum revealed epithelial hyperplasia with intracytoplasmic eosinophilic inclusions. Liver showed cell swelling of hepatocytes with periportal fibrosis. Kidneys revealed sub-acute interstitial nephritis (Fig. 7). Lymph node revealed lymphoid depletion with multifocal areas of haemorrhage. The lung and skin tissues were found to be positive by PCR for inverted terminal repeats (ITRs) of the sheep pox viral proteins with the amplicon size of 289 bp (Fig. 8).

DISCUSSION

An outbreak of sheep pox was recorded in Mecheri sheep flock in Thanjavur district of Tamil Nadu. The overall morbidity and mortality were 56% and 11%, respectively. Similar morbidity and mortality patterns owing to sheep pox have been reported earlier in different breeds of sheep[11,12]. It has also been described that the indigenous sheep are more resistant to sheep pox while exotic breeds are considered highly susceptible[8]. Although, Mecheri sheep is an indigenous breed, the severity of disease was more in the present outbreak.

The gross and histopathological findings recorded in the present study were in accordance with earlier findings[13]. The pox lesions dispersed over the body surface especially on hairless areas and lesions in visceral organs especially pneumonia might have caused increased mortality[14]. Moreover, the findings of sheep pox viral inclusion bodies in affected tissues of infected animals demonstrated through histopathology were further confirmed by PCR for the sheep pox virus, were comparable with earlier documented evidences[10].

Environmental contamination as a result of the virus getting excreted in the nasal secretions, milk, urine[15] and the improper husbandry practices with high stocking densities in the endemic areas increases the close contact between the affected and susceptible animals for the spread of infection. In the present outbreak, higher mortality was observed in adult females than in males and the outbreak was recorded in winter when cold stress and fodder scarcity acts as an important predisposing factor. It has been suggested that the sheep pox shows seasonal trends[16,17] and therefore the disease might have precipitated in the presence of the above factors. Therefore, the sheep farmers must keep a strict vigil on sheep pox among animals in susceptible areas by quarantine of new animals before introduction into herds, immediate implementation of mass vaccination, segregation of morbid animals and proper disposal of affected animals to prevent any further losses.

The present study underlines the clinico-pathological features of sheep pox outbreak in the Thanjavur district of Tamil Nadu in which the sheep pox emerges as one of the major economic hazard to the sheep farmers.

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