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# Histopathological studies of Sheep pox in a Flock

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## Abstract
A carcass of two years old female sheep was presented to the Department of Veterinary Pathology, College of Veterinary Science, Proddatur, Andhra Pradesh for post mortem examination with the history of pyrexia, nasal discharges, and erythematous skin lesions. On Post-mortem examination, skin, dental pad, buccal commissures and lung surface of the affected sheep exhibited distinct, round, slightly elevated, firm 1-2 cm papules. For Histopathological examination, pieces of skin, lung and heart were collected and preserved in 10% neutral buffered formalin. The tissue pieces were processed and stained with haematoxylin and eosin staining method as per standard protocol. Based on gross and histopathological findings it was diagnosed as pox.

**Keywords:** Sheep, pox, nodules, histopathology

## Introduction
Small ruminants, such as sheep and goats, are particularly important in small-holder agriculture because they grow faster than large ruminants, have shorter production cycles, need less capital, and are more tolerant of their environment. They provide much-needed protein to the poor and, by providing an extra source of income, help many tropical and subtropical farmers survive (Tibbo *et al.*, 2006; Notor *et al.*, 2012) [1, 2].

Out of many infectious diseases of sheep and goat, pox is highly contagious and causing significant economic losses to the sheep farming community due to high morbidity and mortality rate, mastitis, abortions, skin condemnation and loss of wool (Ramyar, 1965) [3]. The international trade of animals and animal products is being restricted by these two conditions (OIE, 2008) [4]. The size of the flock, number of adult animals, and the length of the sickness have a major impact on the profitability of the farming community (Senthilkumar V and Thirunavukkarasu M, 2010) [5].

Sheep pox is an extremely contagious and malignant cutaneous disease of sheep. The virus is a member of the Chordopoxvirinae sub-family of the Poxviridae family, specifically of the genus Capripox (Fenner *et al.*, 1993) [6]. The main host is the sheep. All age groups are impacted, although small lambs are most commonly affected, followed by yearlings and adults. The virus is spread by biting insects, close contact, and the aerosol route (Carn, 1993) [7]. Healing of pox lesions will take several weeks and leave permanent scars on the skin.

## Case History and Observations
A sheep farm in Gandikottala, close to Proddatur, which is distant from the village, was the site of an outbreak. In February 2023, A female sheep of 6 months old with an approximate weight of 20 kg and 3 months pregnant, was brought to the Department of Veterinary Pathology at the College of Veterinary Science, Proddatur, Andhra Pradesh for a necropsy investigation. The farmer claims to be the owner of 86 sheep, all of which he maintains in an extensive traditional rearing method. Of these, four animals died and twenty of them displayed clinical indications of anorexia, pyrexia, nasal discharges, and erythematous skin lesions. Not implemented a regular vaccination and deworming programme.

## Materials and Methods
Necropsy of sheep was conducted and various gross lesion in different organs were recorded.

For histopathological examination, Samples from affected skin, lung and heart were preserved in 10% neutral buffered formalin, dehydrated in ascending grades of alcohol and clearing in paraffin. Tissue sections with a thickness of 4-6 mm were cut by using a microtome and stained with standard Haematoxylin and Eosin technique (H & E) (Luna, 1968) [8].

**Results and Discussion**

The present investigation focuses on the outbreak of sheep pox in a flock. Highly contagious diseases like sheep pox have a detrimental effect on the commerce of small ruminants and result in large economic losses. The sheep and goat pox are ranked third in the most frequently reported animal diseases and second in small ruminants during 2015-16 in India (AICRP on ADMAS, 2015). At necropsy, many small round macules and papules (1-2 cm size) with a central depressed grayish area surrounded by hemorrhage and congestion were noticed in the ventral thigh region, gums, dental pad and oral commissures (Fig.1). It is marked by fever, lacrimation, salivation, nasal discharge, and distinctive skin papules. These are similar to those of Zangana *et al.*, 2013 [10] and Ozmen *et al.*, 2009 [11]. It is mainly transmitted by direct contact. High morbidity (23%) and low mortality (4%) were recorded in the present study. The sick animal displayed a greater degree of the typical clinical signs of the malignant form, which is the most prevalent type of illness that is documented in lambs (Mirzaie K *et al.*, 2015) [9]. The liver was pale with a regressed gall bladder. Kidneys showed small, multiple diffuse necrotic areas (Fig.2). Mucosa of the small intestine showed pox nodules (Fig.3) Lymph nodes throughout the body were enlarged. Upon opening of the thoracic cavity, the diaphragmatic lobes of lungs showed small (1-2 cm) circumscribed, uniformly distributed pox lesions and the accessory lobe was consolidated (Fig.4). A Cut section of the lungs showed froth and pox nodules (Fig.5). The Heart showed irregular grayish white nodules and accumulated with the currant jelly clot (Fig.6). The recorded lesions in the lungs and heart which are commonly reported in malignant form of sheep pox. These lesions are in accordance to that of Mirzaie K *et al.*, 2015 [9]; Plowright *et al.*, 2012 [12]. Dead foetus was noticed in the uterus. Abortions and secondary pneumonia are complications of sheep pox reported by Radostits, 2006 [14] and Iran veterinary journal, 2014 [15].

Histopathological investigations demonstrated hydropic degeneration of keratinocytes and acidophilic intracytoplasmic inclusion bodies in the stratum spinosum of the skin (Fig.7). The lungs showed hyperplasia of the bronchial epithelium encircled by mononuclear inflammatory cell infiltration and the peribranchial blood vessels were extremely congested (Fig.8). Alveoli contain eosinophilic oedematous fluid, a higher concentration of red blood cells, and a low concentration of leukocytes (Fig.9). There is oedema, congestion, and a mononuclear inflammatory cell infiltration in the outer lobular septa. The myocardial part of the heart displayed a sarcocyst and congested blood vessels (Fig.10). These lesions are in accordance to those of Mirzaie K *et al* 2015 [9], Verma *et al.*, 2011 [13], Ozomen *et al.*, 2009 [11], Plowright *et al.*, 2012 [12].

**Conclusion**

Based on the available records, the farmer overlooked to pay attention to the recommended vaccination schedule and had recently introduced new stock in to the farm. According to the current study, the spread of the outbreak could be caused by the mobility and interaction of healthy and sick animals. Therefore, vaccination in endemic areas with live attenuated vaccines is a safe and effective way to prevent highly contagious and economically significant illnesses. Adopting st ringent hygienic protocols is necessary. Purchasing animals from endemic regions must to be avoided. Before adding additional animals to the flock, quarantine procedures must be properly followed.

**Fig 1:** Circumscribed pox nodules in the gingiva and buccal commissures

**Fig 3:** Multiple small necrotic areas on the kidney

**Fig 3:** Circumscribed pox nodules in the mucosa of small intestine

**Fig 4:** Circumscribed scattered pox nodules in the diaphragmatic surface of the lung

**Fig 5:** Cut section of lungs and trachea showed nodules and froth

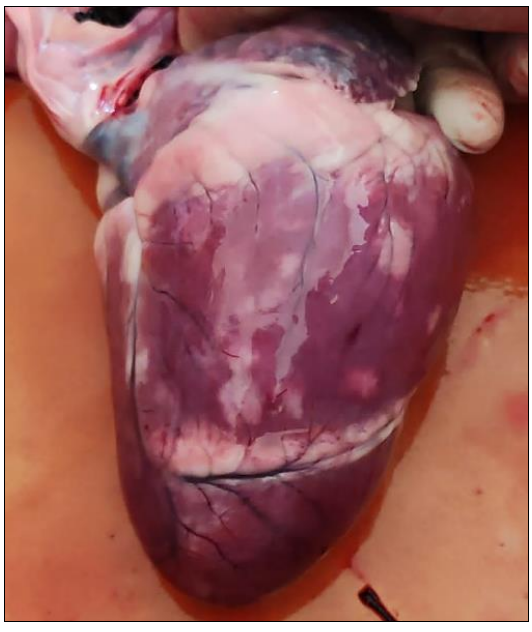

**Fig 6:** Epicardium of heart showing pox nodules

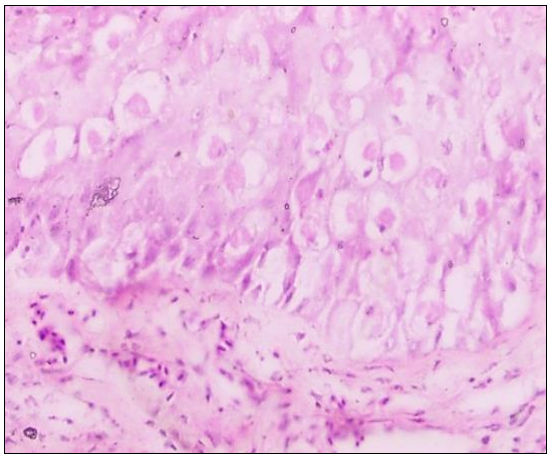

**Fig 7:** Note ballooning degeneration of keratinocytes and acidophilic infiltration of intra cytoplasmic inclusion bodies.

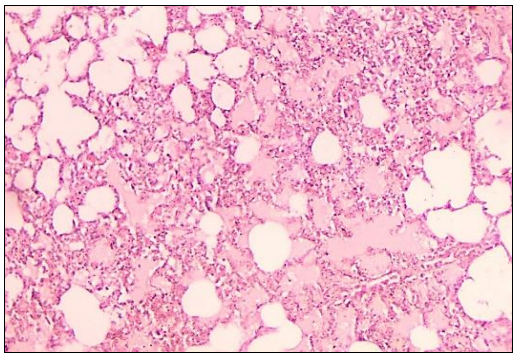

**Fig 8:** Alveoli are filled with the edematous fluid and septa showing RBC's and infiltration of inflammatory cells.

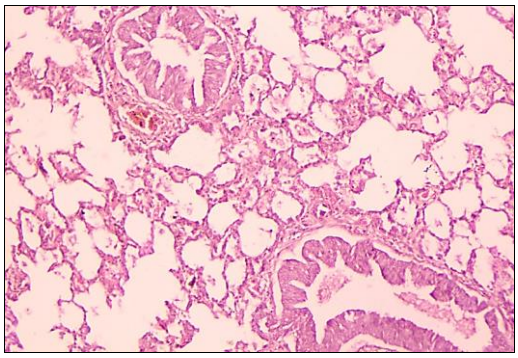

**Fig 9:** Section of lung showing hyperplasia of bronchial epithelium and peribronchial infiltration of mono nuclear cells.

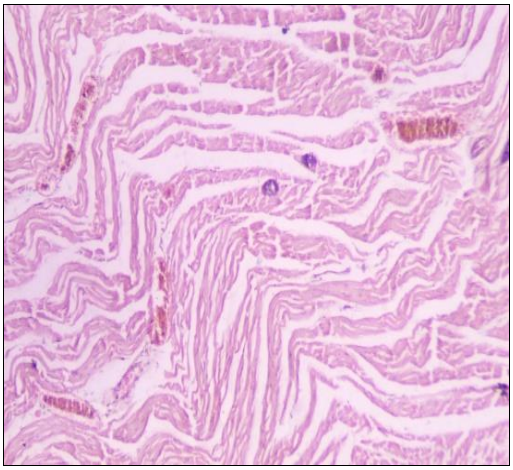

**Fig 10:** Myocardium of heart section showing severely congested blood vessels and sarcocyst.

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**Conflict of Interest**
None

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