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## Contagious ecthyma associated pathological changes in sheep and goats in Jammu & Kashmir, India

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**Abstract**

Contagious ecthyma is an acute contagious disease of small ruminants characterized by proliferative lesions on oral mucosa, commissures of lips and around the nostrils. This study reports investigation of disease and the associated pathological changes in sheep/goats (Total number of cases=207) in Jammu & Kashmir- India during November-2016 to May-2017. Scab samples from suspected cases were subjected to PCR targeting B2L gene of ORFV for confirmation. The results indicated anatomical-site predilection of the lesions in the order of oral commissures (69.08%) > lips (56.04%) > muzzle (50.72%) > nostrils (42.51%) > gums (31.40%) > coronary band (1.93%) > udder = tongue = hard palate (0.97%) > scrotum (0.48%). Gross and histopathological changes were recorded. Cauliflower-like proliferations in buccal cavity, liver congestion and pneumonic lesions in lungs were the major gross pathological changes observed during the study. Epithelial hyperplasia, ballooning degeneration, necrosis of epithelium and leucocytic infiltration were the notable histopathological changes observed. Complications like bronchopneumonia (N=13; 6.30%), gastroenteritis (N=6; 2.90%) and mastitis (N=1; 0.50%) in nursing mothers were observed. Death due to inanition because of wool ball (trichobezoar) lodgment was a significant post-mortem finding.

**Keywords:** contagious ecthyma, pathology, postmortem findings, small ruminants

**Introduction**

Contagious ecthyma is a highly contagious, zoonotic, viral skin disease affecting sheep, goat and wild small ruminants (Housawi. 2009) [9]. The disease is also known as Orf, Sore Mouth, Scabby Mouth, Contagious Pustular Dermatitis and Contagious Pustular Stomatitis (Housawi. 2009) [9]. Contagious ecthyma results from infection by ORF Virus (ORFV), a double-stranded DNA virus of genus Parapoxvirus in the sub-family Chordopoxvirinae and family Poxviridae (Gallina *et al.*, 2006, Nandi *et al.*, 2011) [4]. ORFV is related to bovine papular stomatitis virus (BPSV), Pseudocowpox virus (PCPV), and Parapoxvirus of red deer in New Zealand (PVNZ) (Hosamani *et al.*, 2006) [7]. Orf virus is an enveloped virus, with the size of about 260 nm (length) and 160 nm (width). Contagious ecthyma is usually diagnosed symptomatically but it must be differentiated from similar conditions like ulcerative dermatosis, FMD, Bluetongue and Staphylococcal folliculitis. The disease is characterized clinically by proliferative and often self-limiting lesions on the skin of lips, oral mucosa and around the nostrils, resulting in anorexia or starvation. In some cases the lesions can be found on the teats of nursing mothers leading to abandonment of the off springs, and rarely on the tongue, gums, esophagus, stomach, intestines or respiratory tract of the affected animal. The lesions in goat and sheep evolve through a series of stages commencing with macule followed by papule, vesicle, pustule and finally scab formation which indicates initial signs of resolution (McKeever *et al.*, 1988) [10]. The disease is more severe in goats than sheep especially Boer goats and Boer-Cross goats (Ndikuwera *et al.*, 1992) [12]. Characteristic histopathological changes like epidermal hyperkeratosis, parakeratosis and acanthosis; ballooning and degenerative changes in stratum spinosum and mononuclear cell infiltration have been reported (Radostitis *et al.*, 2007) [14]. Intracytoplasmic eosinophilic inclusion bodies may be present in infected cells but is not a consistent feature (Guo *et al.*, 2004; Barraviera, SRCS. 2005) [6, 11]. The present study reports the pathological changes (both gross and histopathological) associated with Contagious ecthyma affected cases in sheep/goats in Jammu and Kashmir, India.

**Materials and Methods****Study subjects**

Suspected Contagious ecthyma outbreaks (N=12, Total number of cases=207) that occurred in four different districts of Jammu & Kashmir, India during November-2016 to May-2017 were

included in the study. Animals affected included both sheep and goats from organized as well as unorganized sectors.

### Disease confirmation

As an important step in livestock disease outbreak investigation, representative scab samples were collected from the affected animals and subjected to B2L gene based PCR for diagnostic confirmation.

### Necropsy and histopathological examination

The anatomical site predilection in the affected animals was recorded. Animals that died during the study period were subjected to post-mortem examination. Histopathology of the relevant tissue samples (oral cavity, lungs, liver) was also carried out.

### I) Postmortem examination

The animals died of having Orf lesions externally were subjected to postmortem examination. The postmortem examination conducted on these animals and relevant tissue samples from oral cavity as well as visceral organs like lungs, liver, heart and intestines were collected for the histopathological alterations that can be associated with primarily affected organ(s).

### II) Processing of tissue

Tissue samples were collected in 10% neutral buffer formalin for fixation. After fixation, tissue samples were given overnight washing under tap water to remove formalin. Then dehydration of sample was done through ascending grades of alcohol followed by clearing agent with acetone and benzene. Tissues were embedded in paraffin wax and later were cut at 4-5  $\mu$ m thickness sections. Tissue sections were routinely subjected for hemotoxylin and eosin staining (Luna, 1968). Staining sections were observed under light microscope at different objections (10X, 40X, 100X) and photographed accordingly.

## Results and Discussion

### Gross and histopathology

Contagious ecthyma outbreaks (N=12, Total number of cases=207) were investigated during the study period. The significant gross pathological changes observed were proliferative lesions on gums and tongue, congestion of liver, intestinal ballooning, lesions on lungs indicative of pneumonia and lung adhesions. The anatomical site predilection of the lesions in descending order observed was oral commissures (N=143; 69.08%) > lips (N=116; 56.04%) > muzzle (N=105; 50.72%) > nostrils (N=88; 42.51%) > gums (N=65; 31.40%) > coronary band (N=04; 1.93%) > udder = tongue = hard palate (N=02; 0.97%) > scrotum (N=01; 0.48%) as depicted in Table 1, Figure 1. The lesion distribution pattern observed could be due to predilection of ORF virus on these anatomical sites (Guo *et al.*, 2003) [5]. The complications observed in affected animals were bronchopneumonia (N=13; 6.30%), gastroenteritis (N=6; 2.90%) and mastitis (N=1; 0.50%) in nursing mothers as presented in Table 2, Figure 2. The complications noted could be due to more susceptibility of ORF affected animals to secondary bacterial infections (Gallina *et al.*, 2006) [4]. The findings are in agreement with the observations (complications like pneumonia, myiasis, foot lesions, comorbidity with papilloma virus and sheep pox virus, mastitis

in nursing ewes) reported by other researchers (Housawi and AbuElzein, 2000; Wilson *et al.*, 2002; Mavrogianni *et al.*, 2006) [8, 15, 11]. ORF affected lambs and kids suffered severely because of restricted suckling and grazing, and lesions of udder skin might also result in abandonment of offspring due to painful suckling (Chan *et al.*, 2007) [3].

Bilateral mucosal proliferation, trichobezoars (wool ball) in stomach, pneumonic lesions on lungs as shown in Figure 3A, B & C respectively were observed on post-mortem examination. Proliferative lesions in buccal cavity could be due to replication of ORF virus in the cells of underlying replacement epidermal layer (Radostits *et al.*, 2007) [14]. The histopathological tissue section of affected areas of tongue was characterized by thickened epithelium due to hyperplasia and ballooning degeneration in the deeper layers as depicted in Figure 4. The cytoplasm of the affected cells was mostly clear and nucleus was shrunken. Light to dense eosinophilic inclusion bodies were observed in the cytoplasm of epithelial cells, especially, in the cells at the active margin of the lesion. There was abundant infiltration of leukocytes in the affected areas. The scab formation overlying lesion revealed infiltration of neutrophils and the epithelium was associated with erosion and necrotic cells. Tissue section from the other visceral organs did not reveal any appreciable pathological changes except liver and lungs. The liver tissue revealed congestion and lung tissue section revealed mostly bronchopneumonia as presented in Figure 5. Intestinal ballooning observed could be attributed to hindrance to the passage of upper gastrointestinal contents due to blockade by wool ball formation. Pneumonic lung lesions found in some cases could be due to secondary bacterial infections. At necropsy, besides characteristic skin lesions cauliflower like proliferations in buccal cavity (tongue, gums, hard palate) and rumen have been observed. Liver abscesses and death due to pneumonia have been seen in complicated cases of ORF (Nandi *et al.*, 2011) [13]. In ORF affected lambs and kids, the lesions usually develop at the area of mouth, lips and nose Epithelial hyperplasia and ballooning degeneration in the deeper layers observed could be due to lateral and uniform spread of infection from new epidermis, initially in the outer stratum spinosum and subsequently throughout entire depth of epidermis (Radostits *et al.*, 2007) [14]. Leukocytic infiltration in the affected areas and the subsequent epithelial erosions and necrosis observed indicated a cutaneous response to infection including delayed type hypersensitivity reaction and an influx of inflammatory cells especially neutrophils and is in agreement with other researchers who reported similar histopathological changes in ORF affected cases (Radostits *et al.*, 2007; Bouznach *et al.*, 2013) [14, 2].

**Table 1:** Percentage-wise distribution of lesions

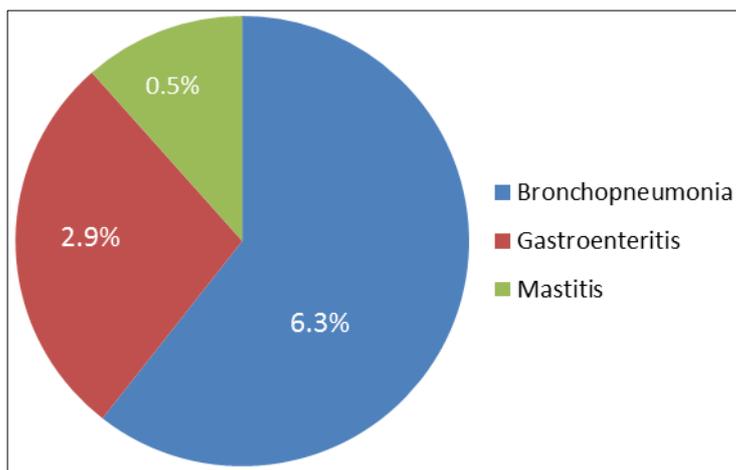
Site of lesion	No. of cases	Percentage (%)
Oral Commissures	143	69.08
Lips	116	56.04
Muzzle	105	50.72
Nostrils	88	42.51
Gums	65	31.40
Coronary Band	04	1.93
Hard Palate	02	0.97
Udder	02	0.97
Tongue	02	0.97
Scrotum	01	0.48
Teat	00	0.00

**Table 2:** Percentage-wise distribution of complications

S. No.	Complications	No. of cases	Percentage (%)
1.	Bronchopneumonia	13	6.3%
2.	Gastroenteritis	06	2.9%
3.	Mastitis	01	0.5%



**Fig 1:** Proliferative lesions of Contagious ecthyma on lips, muzzle, nostrils & gums of affected animals



**Fig 2:** Complications observed



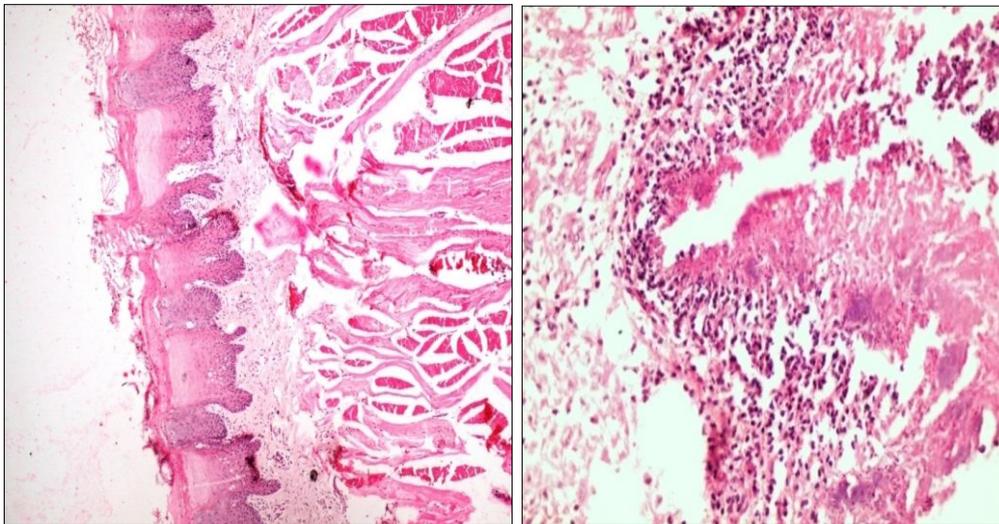
A

B



C

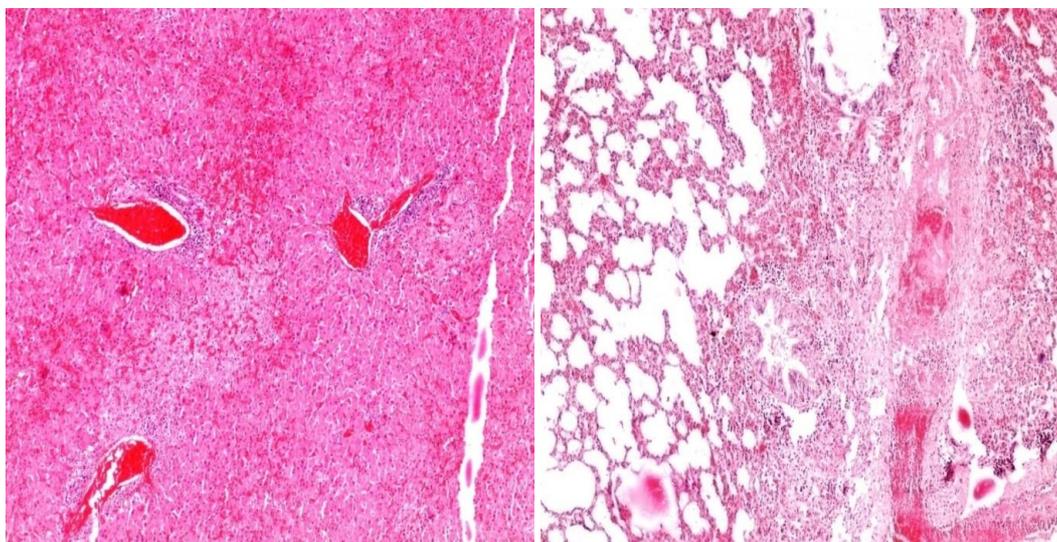
**Fig 3:** A: Bilateral mucosal proliferation in the molar region of ORF affected lamb; B: Trichobezoar (wool ball) lodgment near pylorus of ORF affected lamb; C: Pneumonic lesions on lungs of ORF affected lamb



A

B

**Fig 4:** Tongue: A: Necrosis and desquamation (N) of superficial layer; hyperplasia and ballooning degeneration (arrow) of underlying epithelial layer. H&E 100X; B: Neutrophilic infiltration in superficial layer of epithelium associated with erosion and necrotic cells. H&E 100X



A

B

**Fig 5:** A Liver: Congestion along with perivascular infiltration of leukocytes. H&E 100X; B: Lung: Bronchopneumonia with leukocytic infiltration, mostly neutrophils in bronchiole and alveoli. H&E 100X

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