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Intestinal pathology in sheep: Investigating diarrhoea and its underlying causes

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Abstract
The goal of the current study was to look at the pathology of sheep with diarrheal stools in their intestines. 22 sheep who had died with a history of diarrhoea underwent post-mortem, and a total of 22 samples were collected for additional histological analysis. In 22 cases, there was gross intestinal congestion, 11 cases had both haemorrhages and congestion, 2 cases had necrotic enteritis, 4 cases had haemorrhagic enteritis, and 5 cases had suppurative enteritis. Congestion, Necrotic enteritis, catarrhal enteritis, haemorrhagic enteritis, and suppurative enteritis were all visible under a microscope. Necrotic enteritis is distinguished by the necrosis of villi, infiltration of leucocytes in mucosa, primarily eosinophils, and formation of diphtheritic membrane.

Keywords: Sheep, pathological examination, diarrhoea, diphtheritic membrane, catarrhal enteritis, suppurative

1. Introduction
Sheep stand out among domestic animals for their capacity to adapt to challenging circumstances. supplying mutton, wool, skin, milk, and other byproducts. Except for particular physiological phases of life, sheep have the unique capacity to grow on natural grasses and do not require any additional nourishment. In actuality, there is no animal class that can compare to sheep for using field weeds or wastelands. According to the 2019 livestock census, India had 74.26 million sheep, ranking third in the world. Since 1951, the number of sheep in India has generally increased across all livestock censuses.

The detection and treatment of diseases will undoubtedly increase the potential richness of sheep for the benefit of the national economy. (DADF, 2019) [1].

An increased frequency, fluidity, or volume of faeces excreted is referred to as diarrhoea. The excrement may smell bad and contain blood or mucus. It's possible that the faces' colours are odd and different from the norm. However, based just on the colour, texture, or fragrance of the faces, it is impossible to identify the infecting organism. A sample for clinico-pathological examination is necessary for certain identification.

There are numerous factors, both infectious and non-infectious, which change the gastro intestinal tract's normal histological structure, reduce absorption, and induce diarrhoea.

2. Material and Methods
2.1 Sample collection
A total of 22 sheep carcass were opened for gross- histopathological examinations. Samples for present study were collected from Various sheep farms and Veterinary clinics of southern region of Rajasthan. Sheep carcasses submitted to Department of Veterinary Pathology, College of Veterinary and Animal Science, Navania, Udaipur died with a history of diarrhoea for post-mortem examination also included in the present study. A total of 22 samples were collected during the period from January 2020 to December 2020.

2.2 Histopathology examination
Formalin-fixed tissues were processed by routine acetone-xylene technique, impregnated and embedded in paraffin wax. Sections were cut at 4-5 µm thickness with the help of a semi-automatic rotary microtome (Lillie, 1965) [5]. The sections were stained with haematoxylin and eosin (H&E) stain following conventional procedure (Luna, 1968) [6].

3. Results and Discussion
In intestine, major changes observed Congestion with petechial haemorrhages on mucosa and various types of enteritis.

Necrotic changes observed in intestine in some cases, Mucosa was blackened and adhering forming diphtheritic membrane. This may be associated with severe bacterial infection with *Pseudomonas*, *E. coli*, *Klebsiella* and heavy parasitic burden, which causes severe necrotic changes. Some cases also reported haemorrhagic enteritis in which severe haemorrhages on serosa as well as mucosa was noticed along with hemorrhagic exudate in lumen. Haemorrhagic enteritis may be because of simultaneous infection of viral infection and *E. coli*. Virus damages microvilli of small intestine which causes reduced starch digestion, results in promotion of excess bacterial (*E. coli*) growth simultaneously. It induces an osmotic effect resulting in diarrohea. In lambs, rotavirus enteritis is more severe when complicated with simultaneous infection of enterotoxigenic *E. coli*. In some cases intestine revealed suppurative enteritis, grossly mucosa wall as thickened and lumen was filled with pus which was in one case casseated. Chronic enteritis was also observed in some case in which wall was thickened twice the normal. Theses observation are in agreement with Raoofi *et al*. (2012) [8]; Ershaduzzaman *et al*. (2013) [2] and Kumar *et al.* (2015) [3]. Histopathological examination of Intestine Congestion and Enteritis was most common change observed during histopathological examination. Acute enteritis was characterized by congestion of blood vessels, infiltration of neutrophils, lymphocytes in lamina propria, core of villi and around the glands.

In Suppurative enteritis mucosa, submucosa and even in some cases muscularis was severely infiltrated with polymorphonuclear cells along with severe necrosis and atrophy of intestinal gland. In Haemorrhagic enteritis, haemorrhages were prominent in the lamina propria of the villi and tips of villi. Various layer of the intestinal wall showed focal extravasations of blood. Chronic enteritis was observed in which severe desquamation of epithelium infiltration of neutrophils, lymphocytes, macrophages and plasma cells in lamina propria, core of villi, in and around the glands. In Necrotic enteritis severe Necrosis and desquamation of intestinal villus epithelium, leading to exposed underlying tissue was observed with fibrinous exudate. These finding are in agreement with earlier report of Maratea and Miller (2007) [7]; Kumar *et al.* (2015) [4].

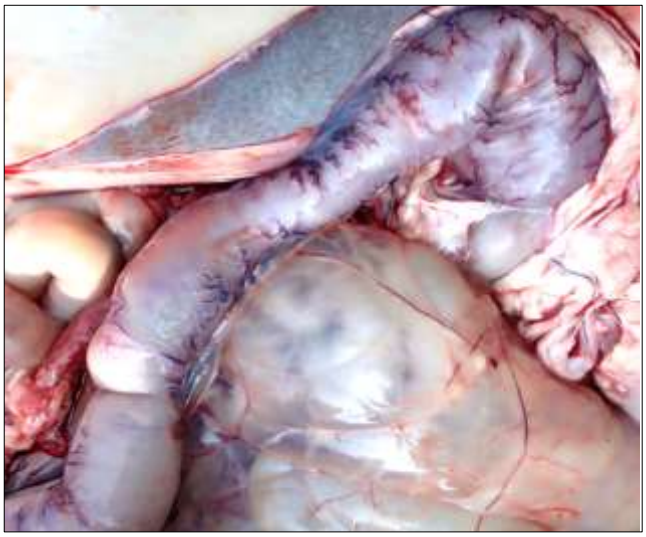

Fig 1: Gross photograph of intestine showing severe congestion

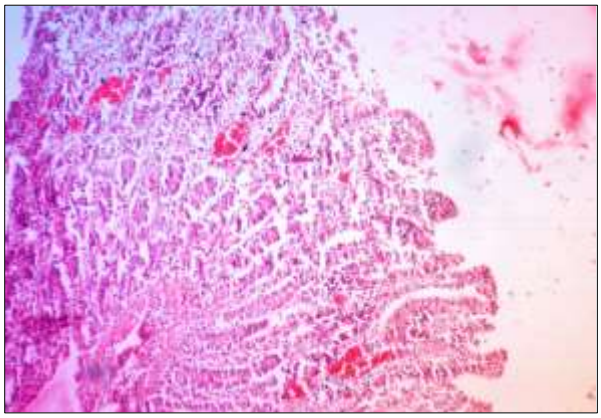

Fig 2: Microphotograph of intestine showing congestion, enlargement of blood vessels with RBC H&E 100x

Fig 3: Gross photograph of intestine showing haemorrhagic intestine

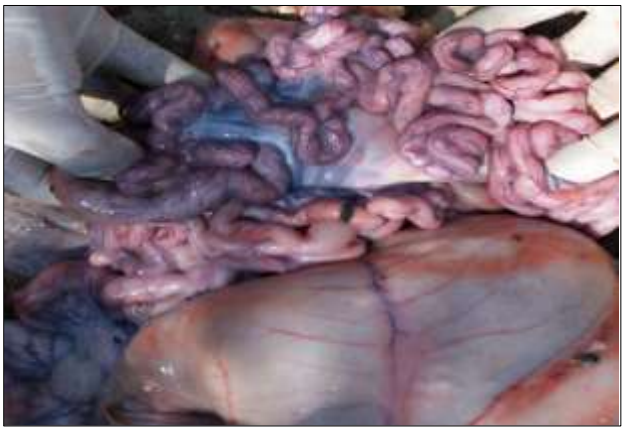

Fig 4: Gross photograph of intestine showing haemorrhagic intestine

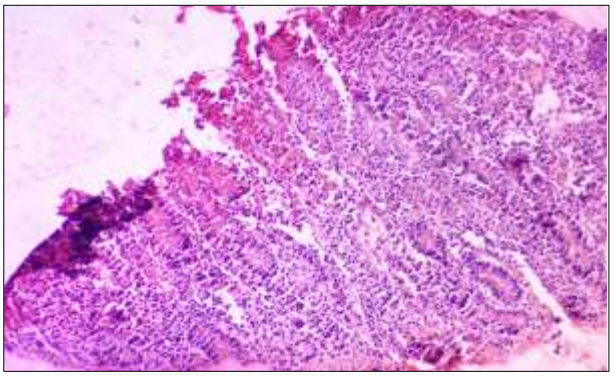

Fig 5: Microphotograph of intestine showing haemorrhagic enteritis. H&E-100x

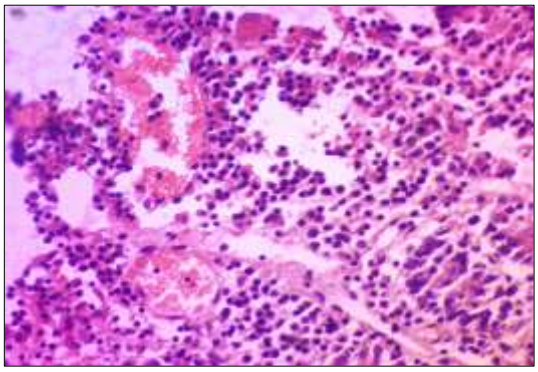

Fig 6: Microphotograph of intestine showing haemorrhagic enteritis. H&E-400x

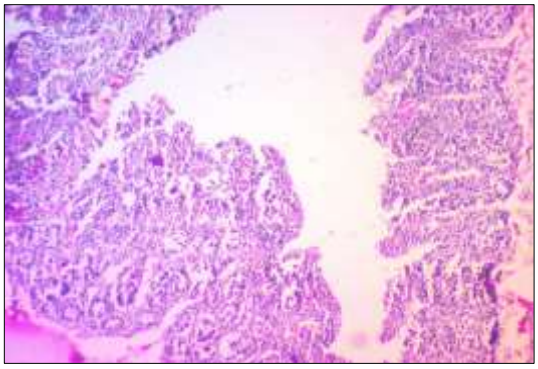

Fig 7: Microphotograph of intestine showing haemorrhagic enteritis. H&E-100x

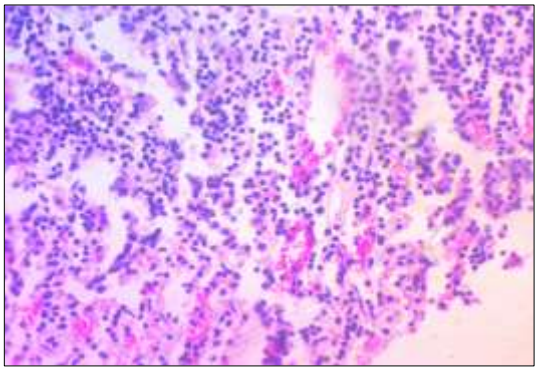

Fig 8: Microphotograph of intestine showing haemorrhagic enteritis. H&E-400x

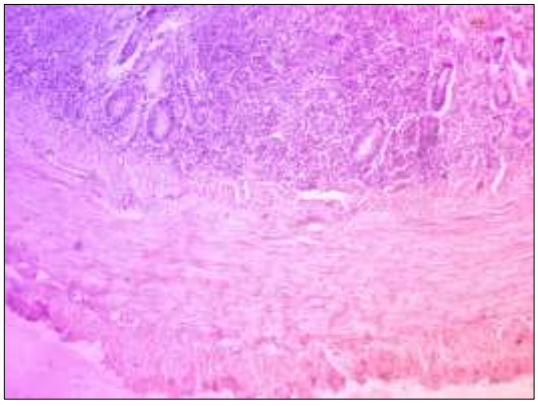

Fig 9: Microphotograph of intestine showing supportive enteritis, mucosa, Sub mucosa severely infiltrated with polymorphonuclear cells along with severe necrosis and atrophy of intestinal gland. H&E-100x

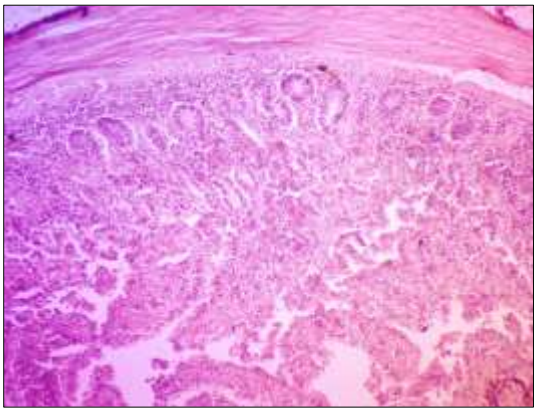

Fig 10: Microphotograph of intestine showing suppurative enteritis. H&E-100x

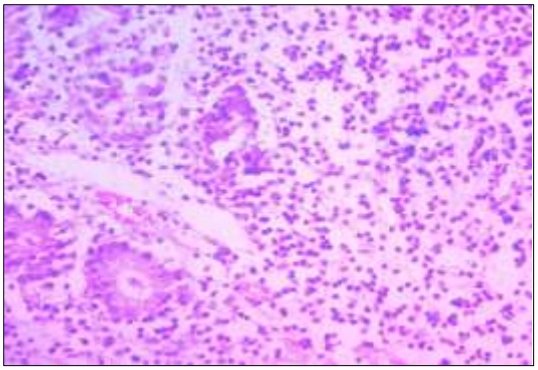

Fig 11: Microphotograph of intestine showing suppurative enteritis. H&E-400x

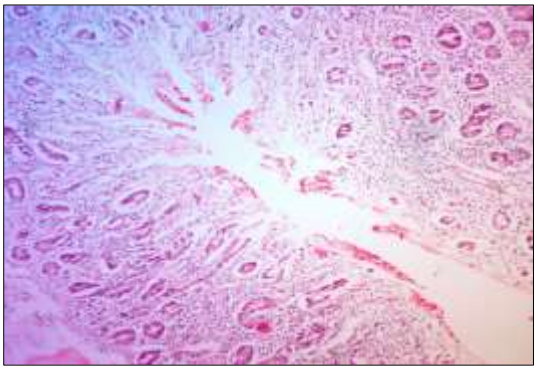

Fig 12: Microphotograph of intestine showing chronic enteritis with haemorrhagic with cellular infiltration of lymphocytes and plasma cells. H&E-100 x

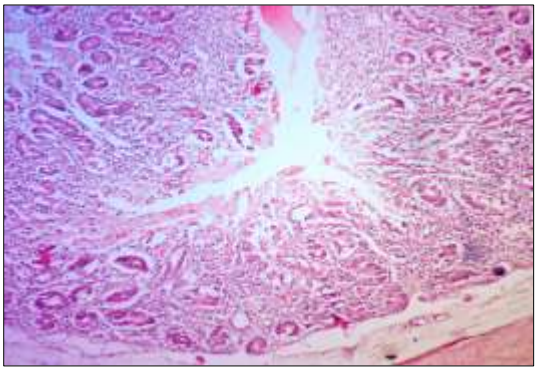

Fig 13: Microphotograph of intestine showing chronic enteritis with haemorrhagic and cellular infiltration of lymphocytes and plasma cells. H&E-100 x

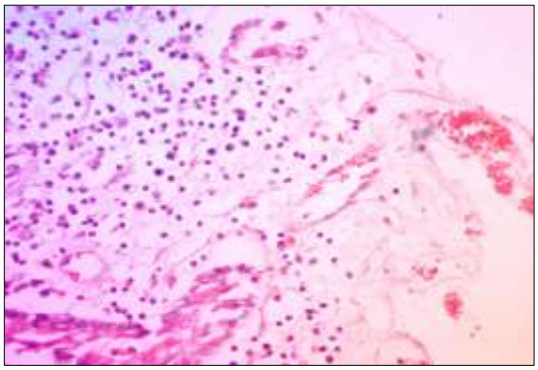

Fig 14: Microphotograph of intestine showing chronic enteritis with haemorrhagic with cellular infiltration of lymphocytes and plasma cells. H&E-400 x

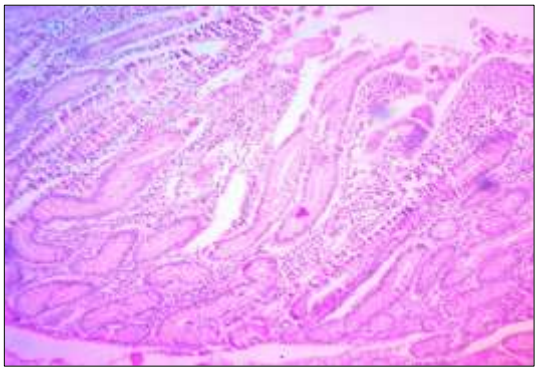

Fig 15: Microphotograph of intestine showing catarrahal enteritis, showing hyperplastic goblet cells along with infiltration around the glands. H&E-100x

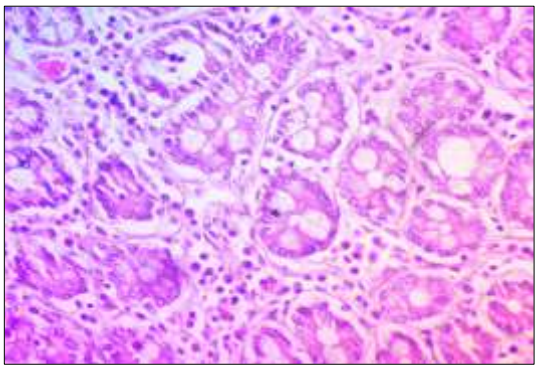

Fig 16: Microphotograph of intestine showing catarrhal enteritis and hyperplastic goblet cells along with infiltration around the glands. H&E-400x

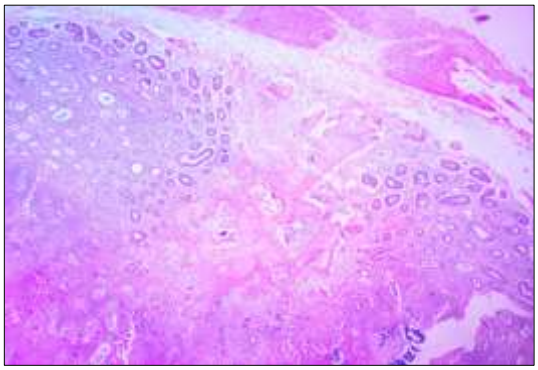

Fig 17: Microphotograph of intestine showing necrotic enteritis, severe necrosis with fibrinous exudates. H&E-400x

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