SHORT COMMUNICATION

Pathomorphological Changes in the Liver of Goats Affected by *Escherichia coli* Infection

Priya Saini[1*], Sarjna Meena[2], Priyanka Saini[3], Pawan Saini[4]

Abstract

The present study was aimed to document the gross and microscopic findings in the livers of goats from Jaipur region. A total of 712 liver samples were collected from organized slaughter houses and various meat outlets in Jaipur. Among these, 253 samples of liver exhibiting suspected abnormalities were selected for analysis. These samples were subjected to microbiological examination using MacConkey agar and eosin methylene blue agar, along with detailed histopathological evaluation. *Esherichia coli* infections were observed in 15 out of 253 samples accounting for an incidence rate of 5.93% *E. coli* infection in necropsied goat livers.

Key words: Abnormalities, *Esherichia coli*, Goat, Histopathology, Liver.

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Introduction

Small ruminants provide much needed livelihood support to the land less and weaker sections and hold considerable potential for commercialization. The liver is considered one of the most important vital organs for animal health, production and reproduction because many metabolic activities of the body occur in the liver. The liver is also susceptible to various affections, and so any disturbance in the liver affects the total health status of the animal (Subhash *et al*., 2024). Systemic diseases such as *Echerichia coli*, *Salmonella*, *Staphylococcus*, *Streptococcus* infections and other bacterial pathogens also have an impact on the liver. Spontaneous lesions caused by subacute and chronic conditions were most commonly discovered during slaughter. Because the liver is a highly valued edible organ, partial or total liver condemnation results in financial losses. It is the leading cause of organ/carcass condemnation in goats and the financial losses incurred as reported previously by Jibat *et al*. (2008) and Mandefro *et al*. (2015). Economic importance of *Esherichia coli* infection is due to severe losses that it produces in different sectors of animal production. Therefore, there was a need to study the *Esherichia coli* infection in goat liver, so as to gain a better understanding of this disease in Rajasthan.

Materials and Methods

Source and Collection of Samples

In all 712 liver samples were collected from goat carcasses. The tissue specimens for the investigation were collected from organized slaughter houses and various meat outlets in Jaipur, Rajasthan (India). The tissue samples were also collected from the goat carcasses submitted to the Department of Veterinary Pathology and Veterinary Clinical Complex, Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur, for routine post-mortem examinations, along with tissue samples from the Government Veterinary Hospitals. The liver samples received from the field veterinarians, in the Department of Veterinary Pathology for the histopathological examination were also included in this study. In a few suspected cases of bacterial infection, tissue samples were collected aseptically for isolation of *Escherichia coli* organism.

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Isolation and Identification of Bacteria from Goat

The bacterial isolation and identification work was carried out in Department of Veterinary Microbiology, PGIVER, Jaipur. At the time of slaughter/necropsy, the microbiological swabs were collected from various liver lesions (n=253) and transported to the laboratory at 4°C. The swabs were inoculated in Nutrient broth and incubated at 37°C for 24 h. Then the broth culture material showing bacterial growth was examined by Gram's staining, and were further streaked on the MacConkey agar - a selective medium for isolation of *Escherichia coli* and incubated at 37°C for 24 h. Further all suspected single lactose fermenting pink colonies were picked on nutrient agar. After purification, each suspected isolate was checked for metallic sheen on eosin methylene blue (EMB) agar to confirm organism as *E. coli*. The growth patterns on the different media were observed for the identification of bacteria particularly for *Escherichia coli* as described by Quinn *et al*. (2001).

Collection of Tissue Sample for Histopathology

The tissue samples of goat showing frank macroscopic lesions (n=15) were collected and preserved in 10% formal saline after recording gross observations and microbiological swabing. The tissue samples were processed mechanically for paraffin embedding by Acetone and Benzene technique (Culling, 1974). Then, 4-6 µm thick sections of tissue were cut and stained by haematoxylin and eosin method (Culling, 1974; Suvarna *et al*., 2008) for histopathological evaluation.

Results and Discussion

Grossly, in all cases the liver was enlarged and congested. Microscopically, liver showed congestion, cloudy swelling, coagulative necrosis and mononuclear infiltration of inflammatory cells. The gross and microscopic findings noticed in the study were consistent with the reports of Sharma *et al*. (2003), Sastry and Rao (2012), Madhav *et al*. (2015), Giri *et al*. (2015), Ibrahim *et al*. (2016), Sonawane *et al*. (2016) and Marodia (2017).

In present investigation, liver samples were collected aseptically from the slaughtered goats and the organism isolated from abnormal liver specimens on selective media was identified as *Escherichia coli* based on the colony characteristics and Gram staining (Quinn *et al*. (2001). The overall *Esherichia coli* infection was observed in 15 cases, out of 253 abnormal liver specimens screened microbiologically and histopathologically, with an overall *E. coli* occurrence of 5.93 %. In microbiological examination, Gram staining showed numerous Gram negative baclli (Fig. 1). Characteristic pink coloured and lactose fermenting colonies on MacConkey agar were contingently considered as *Escherichia coli* (Fig. 2), which on EMB agar plates resulted into colonies exhibiting greenish metallic sheen, a characteristic feature of *Escherichia coli* (Fig. 3). Grossly, in all cases the liver was enlarged and congested (Fig. 4). Microscopically, liver showed congestion, cloudy swelling, coagulative necrosis and mononuclear infiltration of inflammatory cells (Fig. 5). These results were in line with those reported by Omer *et al*. (2012), Borai *et al*. (2013), Giri *et al*. (2015), and Kumar *et al*. (2015). However, a higher occurrence of 21.48% and 58.14% of *Esherichia coli* infection was recorded by Madhav *et al*. (2015) and Venkateswara (2018), respectively. This difference in the occurrence might be due to seasonal variation, nutritional status, stress factor, management factor, geographical and climatic difference.

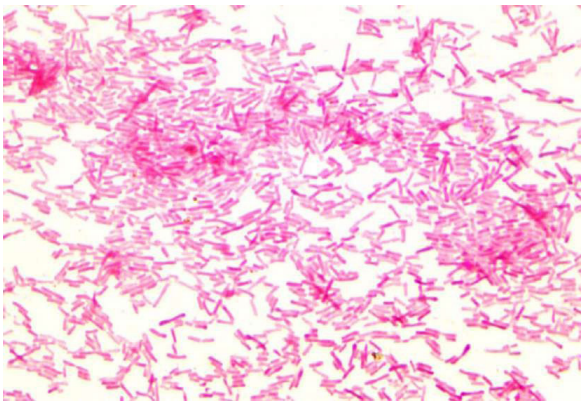

Fig. 1: Microphotograph exhibiting numerous Gram negative baclli (Gram stain 100X).

Fig. 2: Photograph showing lactose fermenting bright pink colonies of *Escherichia coli* on MacConkey agar.

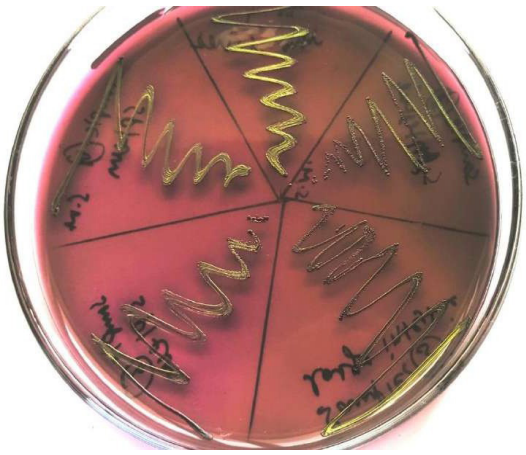

Fig. 3: Photograph showing green metallic sheen of *Escherichia coli* colonies on Eosine Methylene Blue agar (EMB Agar).

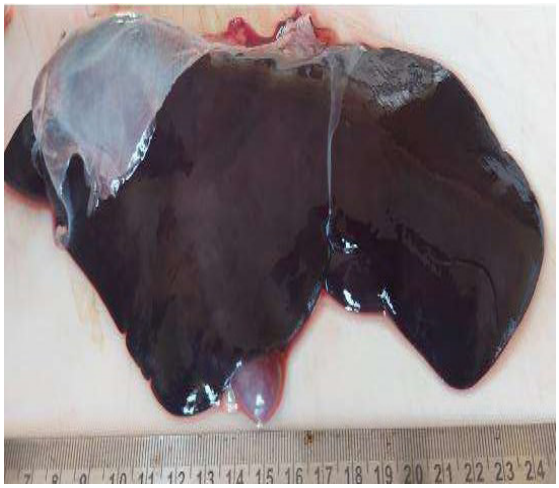

Fig. 4: Gross Photograph of liver showing *Esherichia coli* infection enlarged and congested

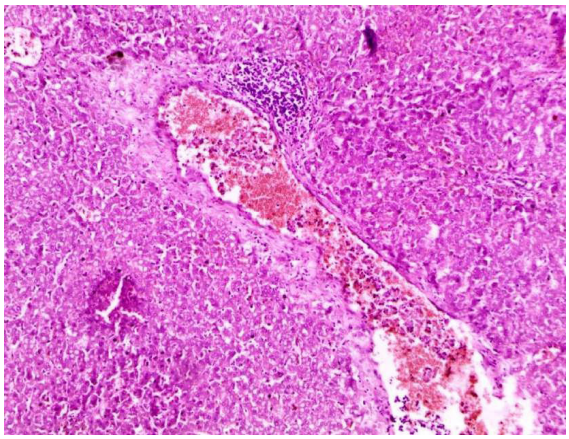

Fig. 5: Microphotograph of liver section infected with *Esherichia coli* infection showing congestion, cloudy swelling, coagulative necrosis and mononuclear infiltration of inflammatory cells. H&E, 100X.

The findings of the present study in general showed that *E. coli* bacteria have a high contribution to the occurrence of digestive system problems, its associated gland-liver and diarrheal syndrome in goats especially in the intensive rearing system, which can be reduced by controlling the environmental health, including litter hygiene, lactation hygiene and avoiding over-crowding. The disease can be prevented with proper farm management and can be controlled by early diagnosis and prompt treatment to prevent great economic losses in the ruminant industry.

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