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Isolation and antibiogram of aerobic bacterial pathogen associated with respiratory tract of apparently healthy goats

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Abstract

The study was designed for isolation and characterization of probable bacterial pathogens associated with respiratory tract of apparently healthy goats and antibiogram of the isolates. A total of 117 nasal swab samples were collected aseptically from healthy goats and standard microbiological techniques were used for isolation and identification of bacterial species. Antibiotic sensitivity of bacterial isolates was performed. The isolated bacterial species were *Staphylococcus* spp. (24%); *Bacillus* spp. (24%); *E. coli* (24%) and *Pseudomonas* spp. (28%). From this study it can be concluded that most of the isolated bacteria commonly act as primary pathogens and also as opportunistic pathogens capable of causing disease if they cross normal defenses of the host.

Keywords: Respiratory tract, aerobic bacteria, isolation, antibiogram, goat

Introduction

Rearing of goats is an easy, less laborious, less expensive and highly profitable in developing country like India. In India, goat diseases constitute a major limiting factor in small ruminant production. Bacterial diseases are most important with variable clinical manifestations, severity of diseases, and re-emergence of strains resistant to a number of chemotherapeutic agents^[1]. Respiratory tract infections may affect individuals or groups in goats, resulting poor growth and high mortality. Adverse weather conditions, stress, pregnancy, lactation, immunosuppression, and old age of the animals favour the infection by normal inhabitants of the respiratory tract pathogens such as *Mannheimia haemolytica*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Bordetella parapertussis*, *Mycoplasma* species, *Arcanobacterium pyogenes*, and *Pasteurella* species^[2, 3]. Respiratory tract infection like pneumonia caused by *P. multocida* and *P. haemolytica* can lead to wide range of financial losses because of death, reduced live weight, delayed marketing, treatment cost and unthriftiness among survivors^[4]. In this context, it is important to characterize the bacterial pathogens associated with respiratory infections and selection of appropriate antibiotic for treatment of small ruminants.

Materials and Methods

A total of 117 samples were collected from apparently healthy goats. Samples were transported on ice to the laboratory.

Bacterial Identification

Preliminary morphological identification was based on Gram's staining. Specific identification and biochemical characterization of the isolates was done as per the standard techniques^[5, 6]. Primarily biochemical tests of the isolates were characterized by Potassium Hydroxide string (KOH) test, Catalase, Oxidase and Oxidation- Fermentation (O-F) tests. Following primary biochemical tests, the isolates were characterized by various secondary biochemical tests; viz. Indole test, Methyl-Red (MR) test, Voges-Proskauer (VP) test, Citrate utilization Test, Urease test, Nitrate reduction test, Hydrogen Sulphide production (H₂S) on TSI agar and Carbohydrate fermentation test.

In-vitro Antibiotic sensitivity test for the isolates

The isolates obtained from nasal samples collected from respiratory tracts were subjected to in-vitro antibiotic assay by disc diffusion method for their sensitivity to different antibiotics^[7].

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Diameters of the clear zone of inhibition were measured and the interpretation of the results was made in accordance with the instructions supplied by the manufacturer (HiMedia Table).

Results and Discussion

Prevalence of bacterial pathogens

In the present study, a total of 150 bacterial isolates were obtained from 117 nasal swab samples collected from apparently healthy goats. From all isolates, 4 different bacterial species were isolated; of them 2 were Gram positive and 2 Gram negative. The isolated bacterial species were *Staphylococcus* spp. (24%), *Bacillus* spp. (24%), *E. coli* (24%) and *Pseudomonas* spp., (28%). The findings were in agreement with the results of others^[8, 9], who isolated *Staphylococcus* spp., *Bacillus* spp. and *E. coli* from all the anatomical sites of apparently healthy sheep and goats. However, *M. haemolytica* and *Klebsiella* spp. were isolated mainly from apparently healthy sheep and goats^[10]. Detection of mixed bacterial pathogen was common because respiratory tract acts as a reservoir for potentially pathogenic microorganisms following stress, heat, overcrowding, poor ventilation, reduced immune system, decline of hygiene measures or climatic conditions

Biochemical characteristics of isolates

In the present study, the detailed primary and secondary biochemical characteristics are presented in the table 1 and 2 respectively.

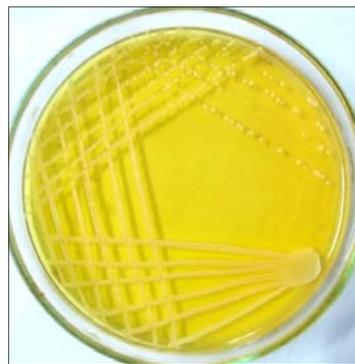


Fig 1: Colonies of *Staphylococcus* on Mannitol salt agar



Fig 2: Lactose positive colonies of *E. coli* on MacConkey's agar

Table 1: Primary biochemical characteristics of the isolates from apparently healthy animals

Bacterial isolates	KOH test	Catalase	Oxidase	O-F test
<i>Staphylococcus</i> spp.	-	+	-	Fermentation
<i>E. coli</i>	+	+	-	Fermentation
<i>Pseudomonas</i> spp.	+	+	+	Oxidation
<i>Bacillus</i> spp.	-	+	-	No action

Table 2: Secondary biochemical characteristics of the isolates from apparently healthy animals

Bacterial isolates	Indole test	MR test	VP test	Citrate test	Urease test	Nitrate reduction test	H ₂ S production on TSI agar
<i>Staphylococcus</i> spp.	-	+	+	-	-	+	+
<i>E. coli</i>	+	+	-	-	-	+	+
<i>Pseudomonas</i> spp.	-	-	-	+	+	+	-
<i>Bacillus</i> spp.	-	-	+	-	-	+	-

In this study, fermentation reactions for different sugars were studied by Carbohydrate Fermentation Test. The isolates of *Staphylococcus* spp. were found to ferment mannitol, sucrose, mannose, maltose, lactose and glucose, they were xylose non-fermenter. The *Bacillus* spp. were found to ferment salicin, glucose, maltose and sucrose. The isolates of *E. coli* were found to ferment glucose, xylose, maltose, lactose and mannose and negative for inositol. However, the isolates of *Pseudomonas* spp. were found to ferment glucose but negative for maltose, lactose, inositol. This is consistent with previous reports from respiratory tract isolates of apparently healthy goats^[9, 11].

In-vitro antibiotic sensitivity assay

In the present study, all the isolates of *Staphylococcus* spp. recovered from healthy animals were found sensitive to ampicillin (100%), amoxicillin (100%), tetracycline (91.67%), chloramphenicol (83.34%), streptomycin (75%) and penicillin-G (75%), while resistant to erythromycin and amikacin. *Bacillus* spp. were sensitive to chloramphenicol

(100%), enrofloxacin (100%), gentamicin (100%), pefloxacin (85.71%), ciprofloxacin (85.71%) and tetracycline (71.43%), while resistant to amoxicillin and erythromycin. All the isolates of *E. coli* recovered from healthy animals were sensitive to chloramphenicol (100%), amoxicillin (100%), norfloxacin (100%), enrofloxacin (100%), gentamicin (91.67%) and ciprofloxacin (83.34%), while the isolates were resistant to tetracycline and amikacin. However, all isolates of *Pseudomonas* spp. recovered from healthy animals showed sensitivity towards gentamicin (100%), ciprofloxacin (100%), pefloxacin (92.86%), ceftriaxone (85.71%) and enrofloxacin (71.43%), while resistant to erythromycin, tetracycline and amoxicillin. These observations were in accordance with the results of previous researcher^[9]. The present study was in contrast with the findings of other, in clinically sick Black Bengal goat^[10]. The antibiotic resistant could be due to earlier and repeated use of these antibiotics for some or the other ailments which might have lead to development of resistant.

Conclusion

From the present study, it is indicated that several bacterial species inhabit the respiratory passageways of apparently healthy goats. Considering the extremes of weather and other poor managerial conditions, which subject the animals to a considerable stress under this environment, the pathogenic role of these apparently commensal organisms could be enormous.

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