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# PLAGIARISM CERTIFICATE

I, Sharmin Zaman, would like to strongly assure you that I have performed all works furnished here in this report. The information has been collected from different books, national and international journals, websites and references. All the references have been acknowledged duly.

Therefore, I reserve entire responsibility of this report.

…………………….

**The Author**

**September, 2015**

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# LIST OF ABBREVIATION AND SYMBOLS

|  |  |
| --- | --- |
| **Abbreviation and symbols** | **Elaboration** |
| % | Percentage |
| +ve | Positive |
| -ve | Negative |
| < | Less than |
| > | Greater than |
| No. | Number |
| ºC | Degree Celsius |
| BPW | Buffered Peptone water |
| BGA | Brilliant green agar |
| EMB | Eosin methylene blue |
| XLD | Xylose lysine deoxycholate |
| MSA | Mannitol salt agar |
| TSI | Triple sugar iron |
| RAJ | Recto-Anal Junction |
| EHEC | Enterohaemorrhagic *Escherichia coli* |
| EIEC | Enteroinvasive *Escherichia coli* |
| EPEC | Enteropathogenic *Escherichia coli* |
| ETEC | Eenterotoxigenic *Escherichia coli* |
| EaggEC | Enteroaggregative *Escherichia coli* |
| VTEC | Verotoxigenic *Escherichia coli* |
| e.g. | Example |
| etc. | Et cetera |
| SAQTVH | Shahedul Alam Quadery Teaching Veterinary Hospital |
| CVASU | Chittagong Veterinary and Animal Sciences University |

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**Author**

**September, 2015**

**ISOLATION AND IDENTIFICATION OF BUCCAL AND INTESTINAL FLORA IN GOAT AT SAQTVH, CHITTAGONG.**

# ABSTRACT

An investigation was carried out to determine the prevalence of common bacterial pathogens in goats admitted at S. A. Quadery Teaching Veterinary Hospital (SAQTVH) in Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong, Bangladesh. One hundred swab samples were taken to find out the level of bacterial burden in the study population. All samples were subjected to various cultural and biochemical tests to isolate the bacterial pathogens from goats. From these tests *Staphylococcus sp, Escherichia coli* and *Salmonella sp* were identified. Out of 100 buccal swab samples 10% were revealed to be positive for *Staphylococcus sp* in all cultural and biochemical tests. Twenty *E. coli* isolates were screened out from fecal swab samples that reflected the prevalence was 20% in goats. 12% prevalence of *Salmonella sp* was recorded and found to be positive in all cultural and biochemical tests. Although there was no significant difference (P>0.05) between different variables like age, sex and breed with prevalence of bacteria but these variables were proportionately differed. Extensive studies are recommended for the molecular study of these bacterial pathogens and for assessing the effects on goat population.

**Key words:** Goat, Prevalence, *Staphylococcus sp*, *E. coli*, *Salmonella sp.*

# CHAPTER –I

## INTRODUCTION

Bangladesh is an agriculture based country. As such goat rearing is considered superior to the others in agricultural sector because of an almost assured in a relatively short period of time. In many parts of the world, it is kept as a source of meat, milk and fiber. Besides of its high productivity various notable diseases including pneumonia, enteritis, different respiratory and gut associated illness are considered as common throughout the world that increase production costs with expensive treatments. The disease is mostly caused by bacteria (Tsolis et al., 2012). However, a very little is known on the associated bacterial agents in goats reared and probably little or nothing is published hitherto in the literature on its magnitude in goats in any part of the world including Bangladesh. In Bangladesh, large number of goat population die each year due to bacterial disease at the early stage of their lives (Asaduzzaman et al., 2013). There are several, well recognized and both infectious and non-infectious species of the organisms in goats causing high morbidity and mortality of adult animals and their young offspring (Momin et al., 2011). Most common bacterial pathogens include *Staphylococcus sp, Escherichia coli, Bacillus sp* etc. Beside these there are several other organisms reported for the occurrence of diseases in goats such as *Actinomyces pyogenes*, *Arcanobacterium pyogenes*, *Neisseria catarrhalis* and *Proteus vulgaris*, *Pasteurella multocida* (Shafarin et al., 2007), *Streptococcus pyogenes* (Obasi et al., 2001); *Mycoplasma capricolum* (Ostrowski et al., 2011).

*Escherichia coli* is considered as the normal bowel flora of different species of mammals and birds but some strains of *E*. *coli* possess pathogenic character due to the acquisition of virulent factors. Microbial characteristics associated with virulent *E*. *coli* include production of enterotoxin, verotoxin, colicins and siderophores, type-1 pili and motility, resistance to the lytic action of the host complement and antibiotics (Dho and Lafont, 1984;). The enteric *E*. *coli* are divided into six groups on the basis of their virulence properties such as enterotoxigenic (ETEC, causative agent of diarrhea in humans, pigs, sheeps, goats, cattle, dogs and horses), enteropathogenic (EPEC, causative agent of diarrhoea in humans, rabbits, dogs, cats and horses), enteroinvasive (EIEC, found only in humans), verotoxigenic (VTEC, found in pigs, cattle, dogs and cats), enterohaemorrhagic (EHEC, found in human, cattle, and goats) and enteroaggregative *E. coli* (EAggEC, found only in human).

Three common conditions caused by *Salmonella* are gastroenteritis, enteric fever, and bacteremia. *S. typhimurium*, *S. enteritidis*, and *S. newport* are serotypes associated with human and animal gastroenteritis, *S*. *typhi* and S. *paratyphi* species are associated with human enteric fever and *S. choleraesuis* is associated with bacteremia in pigs. *S. choleraesuis* is found mostly among animals other than humans, yet it is not as deadly in animal hosts as it is in human hosts (Gray and Fedorka-Cray, 2002).

*Staphylococcus sp* is a ubiquitous commensal bacterium on skins and anterior nares, but frequently causes severe infections. Rapid and direct identification of *Staphylococcus sp* is crucial for proper management of patients with skin infections, abscesses, septicemia/ bacteremia, gastroenteritis, endocarditis, toxic shock syndrome and certain food intoxications (Kateete et al., 2010). Staphylococcal food poisoning includes symptoms such as sudden onset of nausea, vomiting, abdominal cramps and diarrhea (Balaban and Rasooly, 2000). On heating at normal cooking temperature, the bacteria may be killed but the toxins remains active (Presscott et al., 2002). Staphylococcalenterotoxins are highly heat resistant and are thought to be more heat resistant in foodstuffs than in a laboratory culture medium (Bergdoll, 1983). Besides these, enterotoxins producing *Staphylococcus sp* are most dangerous and harmful for the human health. About 50 % strain of this organism are able to produce enterotoxins associated with food poisoning (Putturu, 2013). Illness through *Staphylococcus sp* range from minor skin infection such as pimples, boils, cellulites, toxic shock syndrome, impetigo, and abscesses to life threatening disease such as pneumonia, meningitis, endocarditis, and septicemia (Soomro et al., 2003).s

Poor management, transportation stress, overcrowding pens, sudden environmental changes, poor housing conditions, concurrent viral infections (e.g. parainfluenza-3virus), lung parasites and other stressful conditions increase goat’s susceptibility to diseases. Bacterial pathogens have evolved numerous strategies to exploit their host's cellular processes so that they can survive and persist in the host animal (Sandhu, 1996). Despite the fact that most of the bacteria usually remains harmlessly confined to the intestinal lumen; however, in the debilitated or immunosuppressed host, or when gastrointestinal barriers are violated, even normal “nonpathogenic” strains can cause debilitating and sometimes fatal diseases in animals, birds as well as in human (Jafari et al., 2012). Enteritis associated with bacteria is the most important cause of diarrhea in small ruminants particularly in goats. Bacterial enteritis is considered as an inflammation of the intestines caused mainly by pathogenic strains of *E. coli and Salmonella sp* (Meshram et al., 2009)*.*Enteric disease, often presenting as a bloody or profuse watery diarrhoea with pyrexia, is the commonest clinical manifestation, but a wide range of clinical signs, which include acute septicemia, abortion, arthritis, necrosis of extremities and respiratory disease may also be seen (Meshram et al., 2009). One of the virulent strains of *E. coli* is associated with enterotoxigenic *E. coli*, which has two virulence factors responsible for diarrhea. *E. coli* is causative agent of white scour in goat (Bhat et al., 2008). Systemic infection caused by *E. coli* in kids resulting in septicemia and enteritis, characterized by fever, anorexia, and weakness, followed by coma and death which is similar to colibacillosis in calves (Abdullah et al., 2010). Animals suffering from white scour have severe colitis characterized by abdominal pain, pasty feces, sever enteritis may culminates into death due to severe dehydration. Amongst the common zoonotic bacterial diseases of adult goats characterized by diarrhea, the most frequent one is salmonellosis (Radostits et al. 2007).*Salmonella enteritidis* produces enterotoxins which are invasive to cause inflammatory change within the intestine leading to diarrhea. Bacterial enteritis remains the most common clinical problem in the Goats (Meshram et al., 2009). *Staphylococcus* are among the important commensals of farm animals that often bear different diseases. Despite improvement in management practices, prevention and treatment strategies, bacterial diseases are still the most common and costly fact affecting small ruminants. Indiscriminate use and misuse of antibiotics in animals against bacterial infections has led to emergence of multidrug-resistant strains.

Keeping in view the importance of goat as a vital source of meat, and a potential zoonotic threat, the present study was designed to conduct the following objectives:

1. To estimate the prevalence of *Escherichia coli*, *Salmonella sp* and *Staphylococcus sp* in the study population of goats.
2. To determine the phenotypic characterization of bacterial isolates in different bacteriological culture media and biochemical tests.

# CHAPTER -II

## MATERIALS AND METHODS

### 2.1 Study Population and Sample Collection

The study was carried out for the periods of 2 months from January, 13-March, 15; 2015. The samples were collected from the goats that were admitted to S. A. Quadery Teaching Veterinary Hospital (SAQTVH) in Chittagong Veterinary and Animal Sciences University (CVASU). About One hundred goats (n=100) were sampled during the study period. The sample was collected by inserting a sterile swab into RAJ (Recto-Anal junction) and oral cavity of the animal. The collected swab was placed in a falcon tube (5ml) containing Stuart’s transport medium (Oxoid, Basingstoke, Hampshire, UK), and sent to the Microbiology Laboratory, CVASU for laboratory analysis.

### 2.2 Experimental design

The entire study was divided into three major steps: The first step included collection of samples from different areas, their transportation to the laboratory and inoculation into different culture media. In the second step, isolation and identification of the bacterial isolates was done based on their cultural characteristics including pigment production, hemolytic activity, Gram’s staining character etc. In the third step, characterization of the organism was done using various biochemical tests.

### EXPERIMENTAL DESIGN

Collection of samples from diseased goats in SAQTVH

Transportation of samples to the Microbiology Lab, CVASU

Pre-enrichment in buffered peptone water (BPW)

**ISOLATION AND IDENTIFICATION OF BECTERIA**

BGA agar

XLD agar

EMB agar

MacConkey agar

Mannitol Salt agar

Blood agar

***Escherichia coli***

***Salmonella sp***

***Staphylococcus sp***

**CHARACTERIZATION**

Determination of cultural characters including pigment production and hemolytic activity

Determination of staining properties of different species of bacterial isolates

**BIOCHEMICAL ANALYSIS**

Indole test

TSI test

Coagulase test

Catalase test

Carbohydrate fermentation test

Carbohydrate fermentation test

***Escherichia coli***

***Staphylococcus sp***

***Salmonella sp***

They were re-inoculated into BHIB ,incubated at 37 ºC for 20hours

Preservation of pure culture at -80 ºC with 50% glycerol until investigation for more diversity at molecular level.

**Fig: Schematic illustration of experimental design**

### 2.3 Bacteriological Investigation

#### 2.3.1 Isolation and identification of Staphylococcus sp

Buccal swab (n=100) from transport media was placed into sterile Buffered Peptone Water (BPW) (Oxoid ltd, Basingstoke, Hampshire, UK) and enriched for 24 hours at 37 °C (Thaker et al., 2013). Both Mannitol salt agar medium and Blood agar base were prepared according to the instructions of manufacturer (Oxoid ltd, Basingstoke, Hampshire, UK). Blood agar was prepared by adding 5% citrated-bovine blood in the blood agar base. A loopful of inoculum from enrichment were streaked on Blood Agar (Oxoid ltd, Basingstoke, Hampshire, UK) and incubated at 37°C for 24 hours for detection of hemolysis. Growth of yellow colonies on MSA (Oxoid ltd, Basingstoke, Hampshire, UK) surrounded by yellow zones as a result of fermentation of mannitol after 24 hours of incubation at 37°C indicated a positive result (Kateete et al., 2010). Smear was prepared from the isolated colony on clean grease free microscopic glass slide and stained with Gram's Method of staining. All the positive samples were subjected to coagulase and catalase tests for biochemical confirmation of *Staphylococcus sp* as described by (Monica, 1991).

#### 2.3.2 Isolation and identification of Escherichia coli

Samples from Recto anal junction and pre-enrichment of *E. coli* was done in BPW broth (Oxoid ltd, Basingstoke, Hampshire, UK) using fecal (n=100) swab samples (Thaker et al., 2013). A loopful of culture inoculates on MacConkey (Oxoid ltd, Basingstoke, Hampshire, UK) agar. Pink colonies obtained from MacConkey agar were taken and inoculated on Eosin methelene blue (EMB) (Oxoid ltd, Basingstoke, Hampshire, UK) agar to verify whether the bacterial population was *E. coli* or not. Dyes Eosin and Methylene Blue react with products released by *E. coli* from lactose or sucrose as carbon and energy source, forming metallic green sheen regarded as positive isolate (Virpari et al., 2013). Indole and Carbohydrate fermentation test were performed for confirmation of *E. coli* as biochemical tests (Edward and Ewing, 1972).

#### 2.3.3 Isolation and identification of Salmonella sp

Swabs were collected from Recto-Anal junction (RAJ) that were pre-enriched in BPW (Oxoid ltd, Basingstoke, Hampshire, UK) and incubated at 37˚C for 16 hours. One ml of inoculums was transferred into Selenite-cystein broth (Oxoid ltd, Basingstoke, Hampshire, UK) after pre-enrichment (Putturu et al., 2013). A loopful of inoculums plated onto Xylose Lysine Deoxycholate (XLD) (Oxoid ltd, Basingstoke, Hampshire, UK) medium and incubated at 37˚C for 24 hrs. Black centered colony from XLD was inoculated in Brilliant Green Agar (BGA) (Oxoid ltd, Basingstoke, Hampshire, UK) and incubated as well. TSI agar slant and Sugar fermentation test are performed for the confirmation of *Salmonella sp.*

### 2.4Microscopic study by staining method

Grams staining method was applied for identification of Morphology and staining characters. Suspected colony from EMB (*E. coli*), BGA (*Salmonella sp*) and Mannitol salt agar (*Staphylococcus sp*) was stained as described by manual of veterinary investigation laboratory Technique (OIE, 2000). The procedure was as follows: A small colony was picked up with a bacteriological loop, smeared on glass slide and fixed by gentle heating. Crystal violet solution was then applied on smear to stain for two minutes and then washed with running water. Few drops of Gram’s iodine were then added to act as mordant for one minute and poured off excess fluid. Acetone alcohol was then added for few seconds who act as a decolorizer. After washing with water, safranin was added as counter stain and allowed to stain for 2 minutes. The slides were then washed with water, blotted and dried in air and then examined under microscope with high power objective (100X) using immersion oil.

### 2.5 Statistical analysis

All the data like age, sex and breed from the goats were entered into MS excel (Microsoft office excel-2007, USA). Data management and data analysis were done by STATA version-13 (STATA Corporation, College Station, Texas). The association of three bacterial isolates with different variables were evaluated by using chi-square (χ2) test. P<0.05 set for significance.

# CHAPTER -III

## RESULTS

### 3.1 An overview of the samples collected and tested

The study was undertaken at SAQTVH, Chittagong Veterinary and Animal Sciences University, Chittagong. A total of 100 goats were sampled and investigated to determine the occurrences of common bacterial isolates and distribution of different risk factors during the study period.

### 3.2 Prevalence of *Staphylococcus sp* in goat

A total number of 14 samples were positive out of 100 collected swab samples. The numbers were confirmed by their colonial growth characteristics on mannitol salt agar and biochemical test (Table 3.1). The samples were further characterized by coagulase test. In Coagulase test, 10 samples were found positive among 14 samples that were positive to mannitol salt agar and blood agar test . Female had a little higher prevalence(17%) than the male animals (11%) but it was not statistically significant (p<0.05). In relation to age and breed there was found no significant difference. However, Adult animal had comparatively higher prevalence than young animals.

**Table 3.1: Association of different categorical variables with prevalence of *Staphylococcus sp* (Buccal swab) in goat.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Category** | **N** | **Positive** | **Negative** | **Prevalence (%)** | **χ2**  **value** | **P-**  **Value** |
| Age | Young | 36 | 04 | 32 | 11 | 0.389 | 0.532 |
| Adult | 64 | 06 | 58 | 16 |
| Sex | Male | 54 | 04 | 50 | 11 | 0.814 | 0.367 |
| Female | 46 | 06 | 40 | 17 |
| Breed | Black Bengal | 27 | 02 | 25 | 11 | 0.088 | 0.957 |
| Jamunapari | 32 | 04 | 28 | 19 |
| Cross | 41 | 04 | 37 | 12 |
| Total |  | 100 |  |  |  |  |  |

### 3.3 Isolation and Identification of *Staphylococcus sp*

For the isolation and identification of *Staphylococcus sp*, each sample was cultured on different culture media. The colonies which reflected various morphological characteristics were identified based on their staining, cultural, morphological and biochemical properties.

## 

## C:\Users\User\Desktop\final thesis madam\thesis picture\microscope\DSC01651.JPGMannitol Salt for Staph 3.jpg

## 

**b**

**a**

## C:\Users\User\Desktop\final thesis madam\thesis picture\catalase\DSC00120.JPGfig3.jpg

**Control**

**+Ve**

**Control**

**+Ve**

**d**

**c**

**Figure 3.1: (a) Bright yellow colonies indicating the growth of *Staphylococcus sp* on Mannitol salt agar plates (b) Grape like cluster under microscope (c) Slide coagulase test for confirmation of *Staphylococcus sp* (d) Slide catalase test for confirmation of *Staphylococcus sp.***

### 3.4 Prevalence of *Escherichia coli* in goat

The prevalence of *E. coli* (fecal swab) in the study population was 20% based on their growth pattern on different culture media and positive reaction to different biochemical test. The association of fecal *E. coli* in isolates (n=100) with different categorical variables (age, sex and breed) were not significantly associated that were shown in Table 3.2.

**Table 3.2: Association of different categorical variables with prevalence of *E. coli* (fecal isolates) in goat.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Category** | **N** | **Positive** | **Negative** | **Prevalence (%)** | **χ2**  **value** | **P**-  **Value** |
| Age | Young | 36 | 05 | 31 | 14 | 1.313 | 0.252 |
| Adult | 64 | 15 | 49 | 23 |
| Sex | Male | 54 | 09 | 45 | 17 | 0.815 | 0.367 |
| Female | 46 | 11 | 35 | 24 |
| Breed | Black Bengal | 27 | 4 | 23 | 15 | 0.113 | 0.945 |
| Jamunapari | 32 | 6 | 26 | 19 |
| Cross | 41 | 10 | 31 | 24 |
| Total |  | 100 |  |  |  |  |  |

### 3.5 Isolation and Identification of *E. coli*

For the isolation and identification of *E. coli*, each sample was subjected to different cultural and biochemical tests. According to staining, cultural and bio-chemical properties the organism were identified as *E. coli.*



**a**

**b**

## C:\Users\DELL\Desktop\report\colony mixed with broth.JPG

**Control**

**c**

**d**

**Figure 3.2: (a) Growth of *E. coli* on EMB agar (b) Growth of *E. coli* on MacConkey agar (c) Inoculating bacterial colony into broth (d) Indole test for confirmation of *E.coli***

### 3.6 Prevalence of *Salmonella sp* in goat

From one hundred fecal samples (n=100), 12 were isolated as *Salmonella sp* depending on their growth pattern on different selective media and biochemical profiles. Therefore the prevalence of *Salmonella sp* in the study population was 12% depicted in Table 3.3.

**Table 3.3: Association of different categorical variables with prevalence of *Salmonella sp* (fecal isolates) in goat.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Category** | **N** | | **Positive** | **Negative** | **Prevalence (%)** | **χ2**  **value** | **P-**  **Value** |
| Age | Young | 36 | | 03 | 33 | 08 | 1.160 | 0.281 |
| Adult | 64 | | 09 | 55 | 14 |
| Sex | Male | 54 | | 05 | 49 | 09 | 0.088 | 0.767 |
| Female | 46 | | 07 | 39 | 15 |
| Breed | Black Bengal | | 27 | 04 | 23 | 15 | 0.614 | 0.736 |
| Jamunapari | 32 | | 03 | 29 | 09 |
| Cross | 41 | | 05 | 36 | 12 |
| Total |  | 100 | |  |  |  |  |  |

### 3.7 Isolation and Identification of *Salmonella sp*

Each sample was cultured on different culture media to isolate *Salmonella sp*. The colonies which showed various morphological characteristics were identified based on their staining, cultural, morphological and biochemical properties.



**a**

**b**



**d**

**Figure 3.3: (a) Gram negative rod shaped *Salmonella sp* under microscope(b) Black centered colonies on XLD agar (c) Pink colored colonies on BGA agar (d) *Salmonella sp* giving positive reaction on TSI agar slant.**

**c**

**d**

# CHAPTER -IV

## DISCUSSION

In this study we found that out of 100 buccal samples 10% were positive for *Staphylococcus* , 20% for *E. coli* and 12% for *Salmonella* in rectal swab samples. *Staphylococcus* was a commensal in the buccal mucosa of goat. In our study only 10 samples were positive for *Staphylococcus* by coagulase test. It indicates the 10% samples were pathogenic in case of goat buccal mucosal samples.

In case of rectal swab only 20% were positive for *E coli*. The shedding of *E coli* is increased in stress condition. In our case most of the goats were diseased conditions. However diseased animal were not only includes dirraheic individual it also includes other enteric diseases.

*Staphylococcus sp* is considered as one of the major cause of respiratory infection and frequently isolated from goats. Although a single agent may be the primary determinant of the disease but in most instances the situation is aggravated by secondary invaders (Islam et al., 2006). On the basis of bacteriological culture 10 (10%) out of 100 samples were found positive for *Staphylococcus sp* in the study population. This finding is lower than that of the findings of (Adamu et al., 2010) that depicted 30% prevalence in goat population. Emikpe et al., (2009) found 26% prevalence of *Staphylococcus sp* in West African dwarf goats. This type of variation in isolation of *Staphylococcus sp* might attributable to geographic variation of the region from where the samples were collected, mixed bacterial population in animals, variation of the techniques adopted by different laboratories for conducting the experiments.

The prevalence of *Staphylococcus sp* was found to be higher in female goats than male goats, but the difference was not statistically significant (p>0.05). It is because of small ruminants producers keep more females for breeding purposes which increase their probability to expose to bacterial invasion thus might higher compared with males which is in agreement with (Abdulla et al., 2012). Jamunapari goats shown little higher prevalence than other breeds, this might be due to to susceptibility of different breed to infection, not supported by ([Loomba](http://www.ncbi.nlm.nih.gov/pubmed/?term=Loomba%20PS%5Bauth%5D) et al., 2010). Apparently the prevalence does not differ significantly (p>0.05) between different age groups, but adult animals found to be comparatively higher than young goats might be due to malnutrition, poor immunity and poor management systems.

Fecal swabs were collected from one hundred goats to characterize *Escherichia coli* in the study population. Out of 100 swab samples, 20 (20%) isolates were found to be positive in all cultural tests. The prevalence was lower than the findings of (Mugalu et al., 2006) who reported 31.2% of prevalence of *E. coli* in the clinically suspected goats. The variation might be due to sampling variation, climatic and geographical diversity of the animal examined. There was no significant association between different variables like age, sex and breed with the prevalence of *E. coli* in the goats.

*Salmonella* is an important human food-borne pathogen and is found in the intestinal tract of many animals. In the present study, 12 out of 100 samples were found to be positive in cultural tests. The prevalence of *Salmonella sp* of the current study (12%) varies with findings of earlier workers reporting 9.01% and 46.3% of prevalence in goat fecal samples (Duffy et al., 2009; Turkyilmaz et al., 2013). Variation in the prevalence of *Salmonella sp* might be attributable to varying climate and husbandry practices at different places in different countries and to number and type of goats sampled in different studies.

There was found no significant difference between prevalence of *Salmonella sp* and different variables like breed, age and sex of goats. However, the occurrence of *Salmonella sp* was significantly higher (p<0.05) in female goats than male which is in agreement with (Carattoli, 2003). Higher prevalence in female might be attributable to reduced body defense, impact of breeding, lactation which expose animal to multiple bacterial invasions. Apparently the prevalence does not differ significantly (p>0.05) between different age groups, but adult goats depicted be higher prevalence compared to young goats supported by (Carattoli, 2003). This might be due to malnutrition, poor immunity and poor management systems.

# 

# CHAPTER -V

## CONCLUSION

The detection of *Staphylococcus sp* in buccal samples, *E. coli* and *Salmonella sp* in feces of goats from field conditions indicate that the prevalence of the organism in goats is common. Though it is a silent threat to human health, its presence instigates the steps required to control such a disease of zoonotic potential, which may lead to dire consequences if not addressed. Further extensive experiment is required for the identification of possible risk factors of the organism which will help in taking the prevention and control strategies.

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# ANNEX

**Hospital based data of affected goat**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Age** | **Sex** | **Breed** | ***E. coli*** | ***Salmonella*** | ***Staphylococcus*** | **Disease** |
| Goat | 1.2yr | Male | Jamunapari | No | No | No | PPR |
| Goat | 1.4yr | Male | Black Bengal | No | No | No | Ruminal acidosis |
| Goat | 1.3yr | Male | Jamunapari | Yes | No | No | Pneumonia |
| Goat | 1.5m | Female | Cross | No | No | No | Pneumonia |
| Goat | 1.5yr | Male | Black Bengal | No | Yes | No | PPR |
| Goat | 1.4m | Male | Black Bengal | No | No | No | Inappetance |
| Goat | 1.6yr | Female | Jamunapari | No | No | No | Parasitic infestation |
| Goat | 1.3m | Male | Black Bengal | No | No | No | Nutrient deficiency |
| Goat | 1.2yr | Male | Black Bengal | Yes | No | No | Protozoal infection |
| Goat | 1.4yr | Female | Black Bengal | No | No | No | Ruminal acidosis |
| Goat | 1.5yr | Male | Cross | No | No | No | Inappetance |
| Goat | 1.2yr | Male | Cross | No | No | Yes | PPR |
| Goat | 1.5yr | Female | Cross | No | No | No | Nutrient deficiency |
| Goat | 1.3yr | Male | Cross | No | No | No | Simple indigestion |
| Goat | 1.6m | Female | Cross | No | Yes | No | Pneumonia |
| Goat | 1.1yr | Male | Jamunapari | Yes | No | No | PPR |
| Goat | 1.8yr | Male | Jamunapari | No | No | No | Respiratory infection |
| Goat | 1.5yr | Female | Cross | No | No | No | Parasitic infestation |
| Goat | 10m | Male | Jamunapari | No | No | No | PPR |
| Goat | 1.4yr | Female | Black Bengal | Yes | No | No | Respiratory infection |
| Goat | 11d | Male | Cross | No | No | No | PPR |
| Goat | 1yr | Male | Jamunapari | No | No | Yes | Inappetance |
| Goat | 1m | Female | Cross | No | No | No | Myiasis |
| Goat | 1.6yr | Female | Black Bengal | No | No | No | Pink Eye |
| Goat | 17d | Male | Black Bengal | Yes | No | No | Parasitic infestation |
| Goat | 1m | Female | Cross | No | No | No | Tick infestation |
| Goat | 1.2m | Male | Cross | No | No | No | Respiratory Infection |
| Goat | 1m | Female | Cross | No | Yes | No | Inappetance |
| Goat | 1.3yr | Female | Cross | No | No | No | Ruminal acidosis |
| Goat | 1.1m | Male | Jamunapari | Yes | No | No | Inappetance |
| Goat | 1yr | Male | Black Bengal | No | No | Yes | PPR |
| Goat | 1.4yr | Female | Black Bengal | No | No | No | Tick infestation |
| Goat | 1m | Male | Cross | Yes | No | No | PPR |
| Goat | 1yr | Female | Cross | Yes | No | No | Anaplasmosis |
| Goat | 1.5yr | Female | Cross | No | No | No | Nutrient deficiency |
| Goat | 1.2yr | Female | Black Bengal | No | No | Yes | Pneumonia |
| Goat | 1.5m | Male | Jamunapari | Yes | No | No | Inappetance |
| Goat | 1yr | Female | Jamunapari | No | No | No | Fibrous osteodystrophy |
| Goat | 1.3yr | Female | Black Bengal | No | No | No | Gangrenous mastitis |
| Goat | 1.2yr | Male | Cross | No | Yes | No | Ruminal acidosis |
| Goat | 1.3yr | Female | Cross | Yes | No | No | Ruminal acidosis |
| Goat | 1.1yr | Male | Jamunapari | No | No | No | Cyst on submandible |
| Goat | 1yr | Female | Jamunapari | No | Yes | No | Pneumonia |
| Goat | 1.4yr | Female | Black Bengal | No | No | No | Parasitic infestation |
| Goat | 1.2yr | Male | Jamunapari | No | No | No | Parasitic infestation |
| Goat | 1.1yr | Female | Black Bengal | Yes | No | No | Goat pox |
| Goat | 1.2m | Female | Jamunapari | No | No | No | PPR |
| Goat | 2.5yr | Female | Black Bengal | No | No | No | Anaplasmosis |
| Goat | 2.5yr | Female | Jamunapari | Yes | No | No | Fibrous osteodystrophy |
| Goat | 1.4yr | Female | Jamunapari | No | No | Yes | Ruminal acidosis |
| Goat | 25d | Female | Cross | No | No | No | PPR |
| Goat | 1.5yr | Female | Cross | Yes | No | No | Mastitis |
| Goat | 2.2m | Female | Jamunapari | No | No | No | Tail myiasis |
| Goat | 2.5m | Male | Black Bengal | No | No | No | Inappetance |
| Goat | 1.9yr | Male | Jamunapari | No | No | Yes | Simple indigestion |
| Goat | 1.8yr | Female | Cross | No | Yes | No | Hypocalcemia |
| Goat | 1.5yr | Female | Cross | No | No | No | Mastitis |
| Goat | 1.7yr | Female | Jamunapari | No | No | No | Udder edema |
| Goat | 1.8yr | Female | Jamunapari | No | No | No | Mastitis |
| Goat | 2yr | Female | Black Bengal | No | No | No | Fibrous osteodystrophy |
| Goat | 1.6yr | Female | Black Bengal | No | No | No | Endometritis |
| Goat | 1yr | Female | Black Bengal | No | Yes | No | Vaginal myiasis |
| Goat | 1.8yr | Female | Cross | No | No | No | Agalactia |
| Goat | 1.5yr | Female | Jamunapari | No | No | No | Hypocalcemia |
| Goat | 2yr | Male | Black Bengal | Yes | No | No | PPR |
| Goat | 1.9yr | Female | Black Bengal | No | No | No | PPR |
| Goat | 3yr | Male | Cross | No | Yes | No | Acidosis |
| Goat | 2.5yr | Female | Cross | No | No | No | Fascioliasis |
| Goat | 1.9yr | Female | Cross | No | No | No | Simple indigestion |
| Goat | 2yr | Female | Cross | No | No | Yes | Parasitic infestation |
| Goat | 1yr | Male | Cross | No | No | No | Urolithiasis |
| Goat | 4m | Male | Cross | No | Yes | No | Nutrient deficiency |
| Goat | 10m | Female | Jamunapari | No | No | No | PPR |
| Goat | 1.2yr | Female | Cross | Yes | No | No | Nutrient deficiency |
| Goat | 4m | Female | Cross | No | No | Yes | Monieziasis |
| Goat | 11m | Female | Cross | No | No | No | PPR |
| Goat | 5m | Male | Black Bengal | No | No | Yes | Fascioliasis |
| Goat | 15d | Female | Cross | No | No | No | Fracture |
| Goat | 1yr | Female | Cross | No | Yes | No | PPR |
| Goat | 5m | Female | Black Bengal | No | No | Yes | PPR |
| Goat | 6m | Female | Black Bengal | No | No | No | Ruminal acidosis |
| Goat | 11m | Male | Cross | No | No | No | Fascioliasis |
| Goat | 1.5yr | Male | Cross | Yes | No | No | Fibrous osteodystrophy |
| Goat | 2yr | Female | Jamunapari | No | No | No | Hypothricosis |
| Goat | 5m | Female | Cross | Yes | No | No | PPR |
| Goat | 4m | Female | Jamunapari | No | Yes | No | Respiratory infection |
| Goat | 7m | Female | Jamunapari | No | No | No | Myiasis |
| Goat | 1yr | Male | Jamunapari | No | No | No | PPR |
| Goat | 2.6yr | Male | Jamunapari | No | No | No | Simple indigestion |
| Goat | 11m | Female | Black Bengal | Yes | No | No | Protozoal infection |
| Goat | 6m | Female | Cross | No | No | No | Fracture |
| Goat | 5m | Male | Jamunapari | Yes | No | No | Respiratory infection |
| Goat | 4m | Male | Black Bengal | No | No | No | Fascioliasis |
| Goat | 1.1yr | Male | Jamunapari | No | No | No | Anaplasmosis |
| Goat | 2yr | Female | Black Bengal | No | No | No | Fibrous osteodystrophy |
| Goat | 2.2yr | Female | Jamunapari | No | No | No | Fibrous osteodystrophy |
| Goat | 8m | Male | Jamunapari | Yes | No | No | PPR |
| Goat | 10m | Female | Black Bengal | No | No | No | Acidosis |
| Goat | 6m | Male | Jamunapari | No | Yes | No | Nutrient deficiency |
| Goat | 1.5yr | Female | Cross | No | No | No | Abortion |

yr=Year, m=Month, d=Day

|  |  |
| --- | --- |
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