# Isolation and Identification of Bacterial population in goat meat in Dibrugarh

Sudakshina Das & Pradyut Saikia,

Abstract—Meat is considered as an important source of proteins, essential amino acids, vitamins and minerals. Due to rich composition, meat favors good environment for the growth of pathogenic bacteria. Micro-organisms that occur in meat and meat products most times are responsible for food borne illness. In the present study goat meat was collected from different market areas of Dibrugarh and samples were prepared in both raw and boiled condition. Four strains were isolated from different samples and the names of the bacterial species are *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterobacter* spp and *Escherechia* spp. The present study reveals that raw meat is highly contaminated with pathogenic bacteria. Among the isolates, it was observed that *Staphylococcus aureus* and *Escherichia coli* shows the presence in all the samples. Therefore, It is important to trained meat handlers regarding food safety and must give concerned to the consumers to avoid eating raw and inadequately cooked food.

Keywords: Dibrugarh, Goat meat, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterobacter* spp and *Escherechia* spp.

## 1 INTRODUCTION

Meat was the first important food that met up the hunger of ancient people living in cave. It plays a very vital role in keeping the human body strong in order to provide energy, health and vigor. But, microorganisms present in meat may be harmful for human and may cause spoilage. It may be used as indicator organisms. Many researchers have isolated and identified heterogeneous types of micro flora from fresh meat. Meat is very popular food item particularly in North East. In the world, especially in china, India, Pakistan and Nigeria goat meat represent important food stuff in nutrition of people. Goat meat is increasingly consumed in Serbia owing to its distinctive taste and desirable chemical composition. As a foodstuff of animal's origin it is rich in protein, vitamins and minerals and it contains fat, especially cholesterol. Meat is considered as an important source of proteins, essential amino acids, vitamins and minerals. Due to its rich composition, meat favors good environment for the growth of pathogenic bacteria [1]. Hence, there is a question of hygiene and health. According to the food safety education efforts [2] raw retail meats have been identified as potential vehicles for transmitting food-borne diseases. Food borne pathogens are the leading cause of illness and death in developing countries costing billions of dollars in medical care and medical and social costs [3]. More over diseases caused by pathogenic bacteria hampers production of society. Micro-organisms that occur in meat and meat products most times are responsible for food borne illness.

- *Sudakshina Das is currently the Associate Professor of Department of Zoology, DHSK College, Dibrugarh, Assam-786001. E-mail: sdasbordoloi@gmail.com*

- *Pradyut Saikia is currently the Junior Research Fellow of Institutinal Level Biotech Hub of DHSk College, Dibrugarh, Assam-786001. E-mail: pradyutsaikia9@gmail.com*

Micro-organisms like Bacillus sp, Clostridium sp, *Escherichia coli, Salmonella sp, Shigella sp, Staphylococcus aureus, Streptococcus pyogenes, Proteus, Pseudomonas, Leuconostoc, Lactobacillus* sp, *Micrococcus, Mycobacterium* sp, *Vibrio* sp etc. [4] are usually found in raw meat. Rearing of goat is also a mean of Livelihood. Meat consumption is not only conditioned by religion, tradition and customs, but also by consumer habit and availability in market. Bacteria can find their way into meat of healthy goats or goats with no clinical symptoms pre mortally (infection) or post mortally (contamination).

For these reasons EU has included microbiological pathogens in its new directive on the monitoring of zoonosis and zoonotic agents which cause the majority of alimentary diseases in human today and which can be transferred to human from farm animals through contaminated meat and meat products [5]. Among them, *Campylobacter* and *Salmonella* cause by far the large number of infections in human and followed by *Listeria monocytogenes.* [6].

Food-borne infections leading from microbial contamination of meat begin from slaughter house and meat stalls continue to be a health concern for the public at large [1]. As a source of animal protein, goat meat has occupied a special place in the diet for a variety of reasons including taste preference, prestige, religion, tradition and availability.

## 2 METHODS

### 2.1Study Area

The district of Dibrugarh with only one sub division is situated in the eastern part of Assam in the south bank of the Brahmaputra. Dibrugarh district occupies an area of 3,381 square kilometers. The district extends from 27° 5' 38" N to 27° 42' 30" N latitude and 94°33'46"E to 95°29'8"E longitude. It is bounded by Dhemaji district on the north, Tinsukia district on the east, Tirap district of Arunachal Pradesh on the south-east

and Sibsagar district on the north and south-west. There is a large tract of Tropical Rainforest in its eastern and southern regions, which is a part of the Dehing Patkai wildlife sanctuary. Different market areas of Dibrugarh where meat retail shops are available:-

1. Medical market area.
2. Paltan bazaar market area.
3. Graham bazaar market area.
4. Naliapool market area.
5. New market area.
6. Digholi market area.
7. Amalapaty market area.
8. Chiringchapri nmaket area.
9. Chowkidinghee market area.
10. Milan nagar market area.
11. Development market area.
12. Santipara market area.
13. Overbridge market area.

The meat samples are collected from different selected markets of Dibrugarh. The names of the market are as follows- Graham bazaar market, naliapool market, over bridge market and chowkidinghee market.


Fig 1: Map of Dibrugarh

### 2.2 Collection of Sample

The goat meat sample and water sample used to wash meat in meat shops has been collected from markets of Dibrugarh as mentioned earlier.

Numbers of sample collected are four and those are from chowkidinghee area, naliapool market, over bridge and graham bazaar market area.

### 2.3 Preparation of the Sample:

The sample collected i.e Goat meat was aseptically cut into thin pieces using sterile knife. The sample was then divided into two parts and placed in 10 ml distilled water after one wash in normal water and mixed thoroughly to get a good stock. Meat water sample is separately taken in glass war . One part was boiled with water in oven in a beaker. From this four samples are prepared such as- raw meat, raw water, boiled meat, and boiled water.

### 2.4 Isolation of Microorganism

Nutrient Agar media was prepared for the isolation of microbes. Under aseptic condition each sample were placed on the agar plate by using forcep/glass spreader and incubated at 37◦C for 24 hours. Mixed culture was obtained on the plates after 24 hours. Pure culture was obtained by streaking technique after incubation at 37 ◦ C for 24 hours by picking single colony from different mixed culture plates. The shape and colors of the colonies were examined under the microscope after Gram staining.

### 2.5 Identification and Characterization of Microbes

Selective / Differential media were used such as MacConkey agar medium, Eosine Methylene Blue agar medium, and Mannitol salt agar medium to differentiate and identify bacterial Isolates. Selective / Differential media plates were incubated at 37°C for 24 hours from the pure culture plates that was grown on nutrient agar medium. The isolates were then biochemically analyzed for the activities of Catalase, MR-VP test, Starch hydrolysis, Phenylalanine Agar test, Tryptone test, Nitrate test, Indole production and Citrate utilization. The tests were used to identify the isolates according to Bergey's Manual of Systematic Bacteriology [7].

## 3 Result and Discussions

### 3.1 Morphological Characterization

Four numbers of strains were isolated from the samples collected from different sites of Dibrugarh Market. Identification and characterization of isolated bacteria were performed on the basis of microscopic morphological study such as shape, arrangement, colonies etc. and biochemical tests such as indole production test, methyl red , Voges-proskauer test, citrate utilization test, catalase test and MacConkey test growth at 37°C. Selective media were prepared and the isolated bacteria were inoculated under sterilized conditions incubated at 37°C for 24 hours and the results were recorded following the handbook of Bergey's Manual of Systematic Bacteriology. The isolates identified were *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterobacter* spp and *Escherechia* spp.

### 3.2 Figures and Tables

In Figure 2; *S aureus* was identified on Mannitol Salt Agar Medium due to presence of yellow color caused by change of pH of phenol red by fermentating Mannitol Sugar where as *S epidermidis* was identified as it does not fermented mannitol and pink color remains.

In Figure 3: *Enterobacter* spp. was identified by Methyl red and Voges Proskauer test. In VP test *Enterobacter* spp. shows red pigmentation on addition of omera's reagent.

In Figure 4: *E. coli* of pure culture was obtained on Nutrient Agar and identified on EMB Agar medium by observing blue black with dark centres with green metallic sheen.

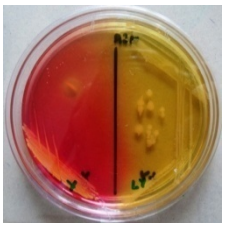

Fig 2

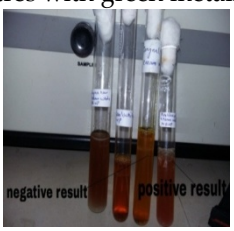


Fig 3

Fig 4

**Table 1: Colonies Isolated from different Market areas**

| Sl No | Sample Name | Colonies Isolated from Raw meat, Boil Meat, Raw meat water & Boil water | Colony Colour |
|---|---|---|---|
| 1 | Graham bazaar market, | Three | Yellow, Pale Yellow, Cream white |
| 2 | Naliapool market, | Two | Yellow and White |
| 3 | Over bridge market | One | Yellow |
| 4 | Chowkidinghee market. | Two | Yellow and White |

**Table 2: Number of Colonies formed from four samples:**

| Sl No | Sample Name | No.of Colonies formed | Colony Colour |
|---|---|---|---|
| 1 | Raw meat | Four | Yellow, Pale Yellow, Cream white and White |
| 2 | Raw meat water | Four | Yellow, Pale Yellow, Cream white and White |
| 3 | Boil meat | Three | Cream white, Yellow and White |
| 4 | Boil meat | Two | Yellow and White |

**Table 3: Morphological Characteristic of the bacteria**

| Isolates | Colony Colour | Gram Staining | Morphological Shape |
|---|---|---|---|
| Isolate 1 | Yellow | +ve | Cocci |
| Isolate 2 | Pale Yellow | +ve | Cocci |
| Isolate 3 | Cream White | -ve | Rod shaped |
| Isolate 4 | White | -ve | Bacilli |

**Table 4: Biochemical Analysis of the Samples:**

| Tests | Isolate 1 | Isolate 2 | Isolate 3 | Isolate 4 |
|---|---|---|---|---|
| Gram Stain | +ve | +ve | -ve | -ve |
| Indole | -ve | -ve | +ve | -ve |
| MR | -ve | -ve | +ve | -ve |
| VP | -ve | -ve | -ve | +ve |
| MSA | +ve | -ve | -ve | -ve |
| EMB | -ve | -ve | +ve | -ve |
| Catalase | +ve | +ve | +ve | +ve |
| Starch | -ve | -ve | -ve | -ve |
| Citrate | -ve | -ve | -ve | -ve |
| PA Agar | -ve | -ve | -ve | -ve |
| McConkey | -ve | -ve | +ve | -ve |
| Identified bacteria | *Staphylococcus aureus* | *Staphylococcus epidermidis* | *Escherichia coli* | *Enterobacter* spp. |

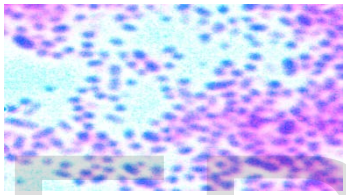

Fig5 (i)

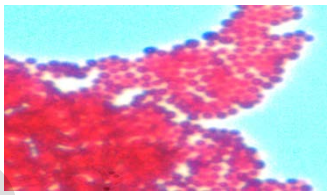

Fig 5(ii)

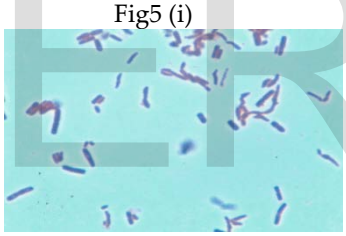

Fig5 (iii)

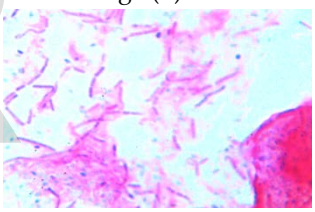

Fig 5(iv)

Fig 5 Microscopic images of (i) *Staphylococcus aureus* (ii) *Staphylococcus epidermidis* (iii) *Enterobacter* spp. and (iv) *Escherichia coli*

## 4. SUMMARY AND CONCLUSIONS:

Four strains were isolated from different samples and the names of the bacterial species are *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterobacter* spp and *Escherechia* spp. In thepresent study it was found that raw goat meat and water sample contains more bacteria than boiled goat meat and boiled goat meat water. The present study reveals that raw meat is highly contaminated with pathogenic bacteria. Among the isolates, it was observed that *Staphylococcus aureus* and *Escherichia coli* shows the presence in all the samples. The presence of those bacteria could cause gastrointestinal disorder, intra abdominal infection, urinary tract infection etc. Existence of those bacteria indicates that the contamination is due to poor personal hygiene during handling and processing of food. Source of contamination may from the insects such as flies can cause contamination by continuous contact with the product, so also dust particles from heavily contaminated

atmospheres around market places and motor parks [8].Therefore meat handlers and sellers should be educated on the adverse effects of lack of hygeine, and sanitation. It is important to trained meat handlers regarding food safety and must give concerned to the consumers to avoid eating raw and inadequately cooked food.

## ACKNOWLEDGMENT

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