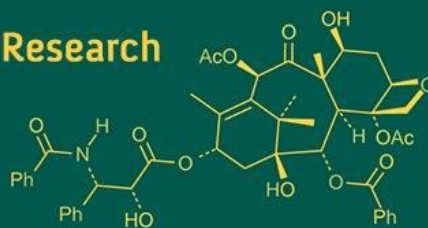
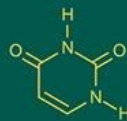
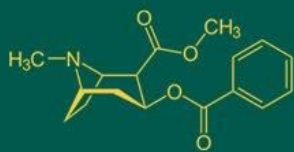


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A study on the microbiological quality of beef from retail outlets in Puducherry

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Abstract

A study on assessment of microbial quality of beef sold in five retail outlets in and around Puducherry was conducted. Twenty samples were collected, four samples from each outlet and analyzed for standard plate count (SPC), coliform count and also for the presence of *Salmonella* spp. The SPC and Coliform count ranged from 41×10^4 to 86×10^5 cfu/g and 37×10^2 to 81×10^3 cfu/g, respectively. Out of 20 samples 6 samples (30%) were positive for *Salmonella* spp. Among 6 positive samples one was positive for *Salmonella Paratyphi A* and remaining samples were positive for *Salmonella* subgenus based on sugar fermentation tests.

Keywords: Beef, Standard plate count, Coliform count, *Salmonella* spp., Food borne illnesses

Introduction

Food borne illnesses comprise a broad spectrum of diseases and are responsible for substantial mortality and morbidity worldwide. It is a growing public health problem in developing as well as developed countries. It is difficult to determine the exact mortality associated with food borne illnesses (Helms *et al.*, 2003) [8]. However, a worldwide estimate of two million deaths occurred due to gastro intestinal illnesses during the year 2005 (Fleury *et al.*, 2008) [7]. More than 250 different food borne illnesses are caused by various pathogens and by toxins (Linscott, 2011) [9]. Food borne illnesses result from consumption of food containing pathogens such as bacteria, virus, parasites or the food contaminated poisonous chemicals or biotoxins (WHO 2011). Although majority of food borne illnesses caused are mild and self-limiting, severe cases can occur at high-risk groups resulting high mortality and morbidity in this group. The high-risk groups for food borne illnesses include infants, young children, the elderly and the immune compromised persons (Fleury *et al.*, 2008) [7].

The diverse nutrient composition of meat makes it an ideal medium for the growth and propagation of spoilage micro-organism and common food borne pathogens. In spite of notable improvements in slaughter hygiene and food production techniques, food safety remains an increasingly important public health issue (WHO, 2012). Strong consumer demand for safe and high-quality foods can be attributed in part to the widespread availability and accessibility of quality health data and information. There are also new concerns about food safety due to increasing occurrence of food borne disease outbreaks caused by emerging pathogenic microorganism. In 2005 it was reported that 1.8 million people died from diarrheal diseases largely due to contaminated food and water. There are 168 million annual cases of typhoid fever, 1.3 billion cases of gastroenteritis and 3 million deaths occurred worldwide due to Salmonellosis (Bhunja, 2008) [3].

Materials And Methods**Collection of samples**

A random method was adopted to collect the beef samples during the month of August to September 2015. A total of 20 samples were collected from five selected retail outlets in Moolakulam, Reddiarpalayam, Othianpet, Sultanpet, and pitchaveeranpet of Puducherry. The samples were collected hygienically and transported to the laboratory and processed within 1 hour of collection. The agar and biochemical reagents used in this study were obtained from Himedia Pvt. Ltd., Mumbai.

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Standard plate count (SPC) and Coliform count were performed as per American public health association (APHA 1984), for SPC the plate count agar and for the coliform count Eosin methylene blue agar was used. The plates were incubated overnight and count was taken. The number of colonies were multiplied by the reciprocal of the respective dilution and expressed as Cf/g.

Isolation and biochemical characterization

Ten grams of beef sample was used for pre-enrichment in buffered peptone water (BPW) at 37 °C for 18 hours. One ml of pre-enriched broth was transferred into Selenite F broth and further incubated at 37 °C for 24 hrs for enrichment and small loopful of enrichments were streaked on to Mac Conkey agar. After overnight incubation the non-lactose fermenting colonies were streaked on to Brilliant green agar. The colorless or pink or opaque-white colonies often surrounded by pink or red zone were picked and streaked further on fresh Bismuth sulphite agar for purification and incubated overnight (Chaudhary *et al.*, 2015) [5]. The isolates were then gram stained and subjected for various biochemical tests including sugar fermentation tests (Veterinary Microbiology and Microbial Diseases, 2007).

Results and Discussion

There was no significant variation present in Standard plate count between the retail outlets but the Coliform counts are comparatively less in Moolakulam retail outlet than others based on the values in table no.1. The selective isolation was done with special reference to *Salmonella* spp. Total of 20 samples were analyzed among that 6 (30%) were given positive for *Salmonella* selective isolation. The selective isolate was subjected for various biochemical tests as per the standard microbiological methods. The isolates were positive for methyl red and triple sugar iron test and also utilized citrate. The one which was isolated from Othiyanpet retail outlet was not given positive for triple sugar iron test but remaining tests were positive.

The six *Salmonella* positive isolates (11, 04, 07, 12, 14, and 17) were subjected for sugar fermentation tests which include maltose, mannitol, sorbitol and xylose for species identification. The five isolates were fermented maltose, mannitol, sorbitol, and xylose suggestive of *Salmonella* subgenus. The isolate from Othiyanpet (no.11) fermented all sugars except xylose suggestive of *Salmonella* paratyphi A. One way Analysis of variance (ANOVA) table was done with above mentioned SPC and CF count results by using Statistical package for the social sciences (SPSS) software and the following results were obtained. There was no significant difference noticed between the five major outlets and shown in table no 1 and 2 respectively. Out of 20 samples analyzed from selected five different retail outlets, the SPC and coliform count ranged from 41×10^4 to 86×10^5 cfu/g and 37×10^2 to 81×10^3 cfu/g, respectively. There was no significant variation on statistical analysis ($p > 0.05$ non-significant). The SPC obtained were higher than reported by Bradeeba *et al.* (2012) [4] in Chidambaram, Tamil Nadu. Who reported SPC of 21×10^3 to 37×10^4 cfu/g. The comparison between the SPC and coliform count indicates the level of coliform count is less than SPC (for SPC, P value is 0.999 and for coliforms, P value is 0.647) as reported by Datta *et al.* (2012) [6] in kolkata.

Table 1: Mean ($\pm$ SD) standard plate count and coliform count of samples collected from different locations.

Place of collection	Standard plate count	Coliform count
Moolakulam	6.225 $\pm$ 0.235	4.375 $\pm$ 0.226
Reddiyarpalayam	6.312 $\pm$ 0.334	4.410 $\pm$ 0.289
Othiyanpet	6.272 $\pm$ 0.285	4.420 $\pm$ 0.210
Sulthanpet	6.340 $\pm$ 0.301	4.132 $\pm$ 0.331
Pichaveeranpet	6.330 $\pm$ 0.315	4.672 $\pm$ 0.021

Table 2: Statistical Analysis of The Results by ANOVA (One Way) Method

Methods	Df	Mss	Df	Mss	F	P value
SPC	4	0.009	15	0.351	0.026	0.999
CF	4	0.147	15	0.232	0.633	0.647

P > 0.05 for SPC and CF (non-significant)

In 20 beef samples 6 samples were positive (30%) for *Salmonella* among these a one isolate is positive for *Salmonella* Paratyphi A and remaining samples were suggestive of *Salmonella* subgenus based on sugar fermentation test. Whereas Ambili *et al.* (2007) [2] reported the absence of *Salmonella* organisms in fresh beef carcass in kerala. The result indicates that there is an increased prevalence of *Salmonella* mainly due to contamination of the carcass during processing and also from environmental contamination as reported by Chaudhary *et al.* (2015) [5].

Conclusion

Detection of *Salmonella* spp., is an indicative of contamination during slaughtering and processing of fresh beef carcass. Survival of these organisms in fresh meat is likely to cause menace to consumer health. Proper cooking may reduce the risk of the infections. Results of the study give an insight to the necessity to implement the principles of Hazard analysis critical control point (HACCP) during the production of meat in order to safeguard consumer health.

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