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ORIGINAL ARTICLE

Assessment of bacterial quality of raw meat samples (carabeef, chevon, pork and poultry) from retail meat outlets and local slaughter houses of Agra Region, India.

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Abstract

A total of 120 raw meat samples, 30 each from carabeef, chevon, pork and poultry were assessed for microbiological load i.e. Standard plate count (SPC), Coliform count (CC) and Staphylococcal count (SC). Mean values of SPC (log_{10}cfu/g) were found to be 7.03±0.07 for carabeef, 6.96±0.78 for chevon, 6.86±0.02 for pork and 6.75±0.04 for poultry meat. Mean values of Coliform count (CC) (log_{10}cfu/g) were found to be 3.04±0.08 for carabeef, 3.93±0.14 for chevon, 3.40±0.10 for pork and 3.82±0.12 for poultry. Mean values of Staphylococcus count (SC) (log_{10}cfu/g) were found to be 3.90±0.12 for carabeef, 3.84±0.12 for chevon, 2.81±0.11 for pork and 3.35±0.10 for poultry. The findings of this study revealed that hygienic quality was poor in case of the fresh meats sold at markets of Agra region.

Keywords: Microbiological quality, market meat, retail outlets, local slaughter-houses.

Introduction

Meat is an excellent source of high quality protein, fat, carbohydrate, vitamins and minerals and is delicious, palatable and easily digestible food item. This entire nutritional requirement can be met easily and efficiently if reasonable amount of meat is included in the diet. There are a number of diseases of bacterial, viral, rickettsial, mycotic and parasitic origin which may be transmitted from meat to humans like Salmonellosis, Staphylococcosis, Tuberculosis, Campylobacteriosis, Listeriosis, Colibacillosis, Pasteurellosis, NCD, Avian flu and *E. coli* specially Vero toxic *E. coli* (VTEC)/Shiga toxins producing *E. coli* (STEC) etc.

A microbial check must be carried out on regular basis and meat hygiene practices are necessary for public health point of view with objectives to ensure supply of disease free meat to the consumers, to check the spread of disease among meat consumers, to trace the source of disease by proper examination of animals before slaughter and the meat after slaughter, to check the spread of diseases which have a definite life cycle, to promote the honest butchers and retailers, to promote the trade of quality meat and meat products across the country that confirms to the international standards and eliminating the risk of rejections of foreign consignments of meat.

To study the meat and meat product regarding their microbial contamination in different types of meats is of great public health significance. As it is a well known fact that the microbial population that comes in contact with meat during the production, processing, transportation and distribution, presents a challenging menace to meat industry and poses problems of infection, spoilage and intoxications (Ramasastry *et al*., 1999; Dhanze *et al.*, 2012).

Materials and Methods

A total of 120 meat samples (Table 1), were collected aseptically with the help of sterilized scalpel and B.P blade and the meat samples were transported in (sterilized or UV irradiated) polythene bags in the morning immediately after slaughter of animals from the retail meat outlets and unorganized slaughter houses. The period of collection of samples was from July 201l to March 2012. The samples collected were processed immediately after being brought to the VPH laboratory under sterile conditions on ice for bacteriological examination i.e. evaluation of bacterial contamination. Parameters were taken for assessment of bacteriological contamination was Standard Plate Count (SPC), Coliform Count (CC), Staphylococcus Count (SC).

Samples were processed on the lines advocated by Cruickshank *et al.* (1975) and Gracey (1985). Meat homogenate was prepared according to ICMSF (1986). 25 gm of meat samples was homogenized with 225 ml of peptone dilution fluid (0.1 % peptone water, pH. 7.0,

sterilized at 121°C for 15 minutes), which provided a dilution of 10^{-1}, using sterile pipette 1 ml of prepared homogenate was transferred to 9 ml peptone dilution blank to get the dilution of 10^{-2}. Ten fold serial dilutions were prepared as 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7} by transferring 1ml of aliquot from diluted tube to dilution blank.

Table 1: Total number of samples collected for assessment of bacterial contamination.

Sl. No	Type of meat	Sample Number
1.	Carabeef	30
2.	Chevon	30
3.	Pork	30
4.	Poultry	30
	Total	120

Standard plate count, Coliform count and Staphylococcus count was performed as per the lines advocated by Cruickshank *et al*. (1975) and APHA (1992).

Results and Discussion

In the present study 120 meat samples were processed to assess the quantitative contamination by standard plate count (SPC), coliform count (CC) and staphylococcal count (SC). All the values of enumeration have been expressed in terms of $\log_{10}$. Mean values of standard plate count (SPC) ($\log_{10}$cfu/g) were found 7.03±0.07 for carabeef, 6.96±0.78 for chevon , 6.86±0.02 for Pork and 6.75±0.04 for poultry meat. The level of contamination of carabeef, chevon and pork was almost similar i.e. near the 10^7 (unacceptable limit of meat) indicating poor hygienic quality of meat. Only SPC count of poultry meat was satisfactory i.e. below the upper limit (10^6cfu/g) as per BIS. There was significant difference of SPC value for carabeef, chevon, pork and poultry meat (Table 2). From mean values of SPC we can say that highest contamination was in carabeef meat and lowest in poultry meat. The level of contamination of coliforms was much higher in chevon and poultry than pork and carabeef. In Chevon, mean values of coliform count were recorded highest (3.93), whereas mean values of carabeef were recorded lowest (3.04). For pork and poultry meat, the mean values were recorded in between 3.39 and 3.82 respectively. The range for staphylococcus count (cfu/g) were found to be 2.49-5.25 for carabeef, 2.59-5.14 for chevon, 2.20- 4.08 for Pork and 2.59 -5.00 for poultry meat.

Overall SPC finding of meats from retail outlets is higher when compared to ISI Standard of 1 x 10^7 (cfu/g) for meat indicating that meat are of poor quality. There was significant difference of SPC values for carabeef, chevon, pork and poultry meat (Table 3). The present SPC count values were almost similar to the findings record by Inthvang *et al.* (2006) who stated aerobic plate count of fresh pork which varied in between 4.4-5.3 ($\log_{10}$ cfu/g). Mukhopadhyay *et al.* (2009) reported his findings of aerobic plate count of fresh chevon which varied in between 5.93l to 10.94 ($\log_{10}$ cfu/g). Dhanze *et al.* (2012) reported that quality of meat sold in the market of palampur valley is poor and recommend for improvement in hygienic conditions during production, processing and storage of meat and meat products.

Lambey *et al.* (2010) conducted study on raw meat samples of goats and pigs from local markets of Mathura City to assess the bacteriological quality of chevon and pork. The mean of $\log_{10}$ standard plate count was 7.78 cfu/g and 7.03 cfu/g respectively for goat and pig meat which was higher to our findings. The other workers who reported findings of SPC for meat were Murthy (1976), John (1978).

Mean values of Coliform count ($\log_{10}$cfu/g) were found 3.93±0.14 for Chevon, 3.82±0.12 for Poultry, 3.40±0.10 for Pork and 3.04±0.08 for Carabeef. The level of contamination of coliforms was much higher in chevon and poultry than pork and carabeef. Nervy *et al*. (2011) reported Coliform count (CC) below the upper limit i.e. 1.83 $\log_{10}$cfu/g. Similarly heavy coliform count of meat samples was reported by Uzeh *et al.* (2006), Okonko *et al.,* (2010), Javadi and Safarmashaei (2011). The coliform count of carabeef, chevon, pork and poultry meat varied significantly in Chevon (highest coliform count mean values of 3.93), where as lowest values were recorded in meat of carabeef (mean values of 3.04 and for pork and poultry meat mean values were in between 3.39 and 3.82 respectively).

The coliform count under present study is greater than that of permissible count of 1 x 10^2 for meat samples (BIS). Similar heavy coliform counts of meat samples were reported by Tiwari *et al.* (2002). A study was conducted of raw meat samples of goats and pigs from local markets of Mathura City to assess the bacteriological quality of chevon and pork. The mean of $\log_{10}$ of total coliform count was 4.29 $\log_{10}$ cfu/g and 4.15 cfu/g respectively for goat and pig meat which was slightly higher than our findings (Lambey *et al.*, 2010).

Mean values of Staphylococcus count ($\log_{10}$cfu/g) were found, 3.90$\pm$0.12 for cara beef, 3.84$\pm$0.12 for chevon, 3.35$\pm$0.10 for poultry and 2.81$\pm$0.11 for pork. These counts were equal or less than reported by previous workers (Uzeh *et al.*, 2006;

Table 2: Showing Mean and Range of Standard plate count (SPC), Coliform count (CC) and Staphylococcus count (SC) in terms of log values (log_{10}cfu/g).

Sources	Attributes	SPC	CC	SC	P+value
Carabeef	Mean+SE	$7.03^{b}\pm0.07$	$3.04^{a}\pm0.08$	$3.90^{c}\pm 0.12$	0.00
	Range	6.49-8.32	2.54-4.46	2.49-5.25	
	N	30	30	30	
Chevon	Mean+SE	$6.96^{b}\pm0.78$	$3.93^{c}\pm0.14$	$3.84^{c}\pm0.12$	0.00
	Range	6.57 -8.38	2.61-5.32	2.59-5.14	
	N	30	30	30	
Pork	Mean+SE	$6.86^{b}\pm0.03$	$3.40^{b}\pm0.10$	$2.81^{a}\pm0.11$	0.00
	Range	6.53-7.45	2.44-4.44	2.20-4.08	
	N	30	30	30	
Poultry	Mean+SE	$6.75^{a}\pm0.04$	$3.82^{b}\pm0.12$	$3.35^{b}\pm0.10$	0.00
	Range	6.49-7.36	2.90-5.18	2.59-5.00	
	N	30	30	30	

Values with different superscript within the column are different significantly from each other.

Table 3: Showing Analysis of variance (ANOVA) for Standard plate count (SPC), Coliform count (CC), and Staphylococcus count (SC).

		Sum of Squares	Df	Mean Square	F	Sig.
Coliform count (CC)	Between Groups	15.097	3	5.032	13.329	.000
	Within Groups	43.797	116	.378		
	Total	58.894	119			
Staphyloco-ccus count (SC)	Between Groups	23.135	3	7.712	19.583	.000
	Within Groups	45.678	116	.394		
	Total	68.813	119			
Standard Plate Count (SPC)	Between Groups	1.308	3	.436	4.512	.005
	Within Groups	11.205	116	.097		
	Total	12.513	119			

Himanshu, 2003; Tiwari *et al.,* 2002; Rathod *et al.,* 2004). The higher counts were recorded by Javadi and Safarmashaei (2011).

The Staphylococcus count recorded in the present study was higher than the count reported by Seriven and Singh (1986). Similar findings have also been reported by (Adinarayanan *et al.,* 1984; Bachil, 1985; Tiwari *et al.,* 2002).

Conclusion

The findings of this study revealed that the quality of meat sold in the market of Agra region is poor and need improvement in hygienic conditions during production, processing and storage of meat for retail sale. It is suggested that the raw meat should be handled with appropriate hygienic measures and continuous microbial monitoring to safeguard the health of consumers.

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