http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (8): 1341-1342, 2000

Microbiology of Raw Minced Beef

A. Aslam, I. Mariam, I. Haq and S. Ali
Biotechnology Research Laboratory, Department of Botany,
Government College, Lahore, Pakistan

Abstract: The present study describes the microbial examination of the samples of raw minced beef. Samples were tested for total viable count, mould and yeast count, sporeformers and coliforms. Bacterial count was highest in the raw minced beef as 319 × 10^3. Moulds were found present in all the samples while yeasts were found absent in all the samples. Among the sporeformers, aerobic sporeformers were found present in all the samples while anaerobic sporeformers were found absent in few samples. Coliforms were found present in all the samples. Fecal coliforms were found absent in few samples, while non-fecal coliforms were present in all the samples.

Key words: Microbial examination, meat microbiology, minced beef

Introduction

Meat is an important food and it contains a large amount of proteins. The surfaces of meats cut support the growth of a large number of microorganisms and ground meats offer not only ample and desirable surfaces but a thorough inoculation of the meats during grinding (Banwart, 1987). Meats contain an abundance of all nutrients required for the growth of bacteria, yeasts and moulds, and an adequate quantity of these constituents exist in fresh meats in available form. Comminuted fresh red meats such as ground beef invariably have higher numbers of microorganisms than non-comminuted meats such as steaks (Kitzman, 1997; Bell *et al*., 1997). Lowry and Gill (1984) reported the following genera of moulds recovered from various spoilage conditions of whole beef: *Thamnidium, Mucor* and *Rhizopus,* all of which produce "whisker" on beef; *Cladosporium,* a common cause of "black spot"; *Penicillium,* which produce green patch and *Sporotrichum* and *Chrysosporium,* both of which produce "white spot". Roushdy *et al*. (1996) reported the lowest mean mould count as 1.4 × $10^4$19 and isolated *Aspergillus, Panic'llium, Mucor* and *Cladosporium* spp. in fresh meat. Among genera of yeasts recovered from fresh-spoiled beef were *Candida*, *Torulopsis*, *Rhototorula*, *C. lipolytica* and *C. zeylanoides* (Hsich *et al*., 1999). Eisel *et al*., (1997) determined aerobic plate count (APC), coliform count (CC), and *Escherichia coli* count (ECC) for samples of incoming beef products, food contact surfaces, environmental surfaces and air. Grunspan *et al*. (1996) studied 10 samples of minced beef and recorded total microorganisms by using PCA (plate counter agar) as 1.7 - 8.8 x 10^4 c.f. U/g. Skrokki (1997) studied minced beef and minced beef-pork samples and reported the medium counts of aerobic microorganisms as 1.4 × 106/g and 4.2 × 10^6/g for beef and beef-pork, respectively. A number of reports have been recorded about the microbial contamination of raw minced beef (Mousa *et al*., 1993; O'Toole, 1995; Gill *et al*., 1996; Kitzman, 1997; Garcia *et al*., 1998; Sutic *et al*., 1999). The present study highlighted the microbial contaminations as total viable count, mould and yeast count, sporeformers and presence of coliforms (fecal and non-fecal) from the samples of raw minced beef.

Materials and Methods

Twenty five samples of raw minced beef were collected from different localities of Lahore. The samples were collected under aseptic condition in sterile polythene bag. Dilution of samples were prepared using sterilized saline water, as 10^{-1}-10^{-6}.

Microbial Counts

Mould and Yeast Count: Malt extract agar medium consisting of g/l: malt extract, 20.0; agar 20.0 was used for determination of yeast and mould. The plates were incubated at 30°C for 24-48 hours, in an incubator.

All the culture media were sterilized in autoclave at 121°C for 15 minutes under 15 lbs pressure and Glassware were sterilized in oven at 180°C for 2 hours.

Total Viable Count: Nutrient agar medium (Lowry and Gill, 1984) consisting of g/l: peptone 6.0; caseinhydrolysate, 4.0; yeast extract 3.0; glucose, 2.0; beef extract 1.5; agar 15.0 was used for the determination of total viable count. The plates were incubated at 37°C for 24-48 hours.

Thermophilic sporeformers: The nutrient agar medium was also used for both aerobic and anaerobic sporeformers i.e. samples suspended in saline water were given heat shock at 90°C in water bath for 10 minutes, before adding to the agar plates. The plates were incubated at 37°C for 24 hours. For anaerobic sporeformers, however, sterile agar solution was poured on the incubated plates.

Coliform: The coliforms were determined by standard multiple tube fermentation technique (Deman, 1977) containing lactose broth consisting of meat extract 3 g; peptone 109; lactose 5 g; Bromothymol blue indicator, 1 ml; distilled water, 1000 ml.

Results and Discussion

Total Viable Count: Total viable counts of beef samples were ranged from 31 × 10^3 to 319 × 10^3/g (Table 1). The highest contamination i.e. 319 × $10^3$1g was observed in the sample taken from Shadbagh. One main factor might be the heaps of garbage that were scattered from place to place near the shop. In the secondary sources of contamination, the work-place, equipments and worker might be considered. The low total viable count was observed in the sample taken from Janazgah i.e. 31 × 10^3. Skrokki (1997) reported the total microorganisms as 1.4 × $10^6$1g from minced beef samples. Also Grunspan *et al*. (1996) reported the total microorganisms, 1.7 to 8.8 × 10^4 c.f. U/g minced beef.

Mould and Yeast Count: Moulds were present in all the beef samples and it was ranged from 7 × 10^3 to 32 × 10^3 (Table 1). The highest mould count was observed in the sample taken from Station (32 × 10^3/g) It might be due to that no hygienic measures were taken to prevent the entrance of dust in the shop. Lowry and Gill (1984) determined the mould and yeast count for samples of incoming beef products, food contact surfaces, environmental surfaces and air. The low mould count was observed in the sample taken from Canal View i.e.

Table 1: Microbial examination of raw minced beef

Locality	Replicate	Total viable	Coliforms/g			Sporeformers/g			
		count/9	Fecal	Non-fecal	MPN	Aerobic	Anaerobic	Mould/g	Yeast/g
Model Town	3	83×10^3	+	+	75	23×10^2	7×10^2	17×10^3	-
Anarkali	3	196×10^3	+	+	240	11×10^2	2×10^2	23×10^3	-
Janazghah	3	$3\ 1\times10^3$	+	+	43	26×10^2	4×10^2	13×10^3	-
Faisal Town	3	240×10^3	+	+	1100	32×10^2	3×10^2	20×10^3	-
Gawal Mandi	3	283×10^3	+	+	1100	14×10^2	19×10^2	16×10^3	-
Gulberg	3	109×10^3	+	+	240	19×10^2	4×10^2	11×10^3	-
Chauburji	3	37×10^3	+	+	150	8×10^2	2×10^2	12×10^3	-
Mozang	3	114×10^3	+	+	1100	14×10^2	0	15×10^3	-
Johar Town	3	87×10^3	+	+	2400	32×10^2	3×10^2	19×10^3	-
Bakker Mandi	3	278×10^3	+	+	1100	39×10^2	7×10^2	28×10^3	-
Gulshan-e-Ravi	3	285×10^3	+	+	1100	47×10^2	5×10^2	23×10^3	-
Iqbal Town	3	94×10^3	+	+	93	3×10^2	3×10^2	11×10^3	-
Yateem Khan	3	304×10^3	+	+	1100	32×10^2	3×10^2	23×10^3	-
New Mozang	3	298×10^3	+	+	240	28×10^2	7×10^2	27×10^3	-
Samanabad	3	49×10^3	+	+	43	19×10^2	0	9×10^3	-
Station	3	302×10^3	+	+	110	37×10^2	4×10^2	32×10^3	-
Scheme More	3	194×10^3	+	+	1100	34×10^2	20×10^2	12×10^3	-
Muslim Town	3	288×10^3	+	+	240	20×10^2	7×10^2	21×10^3	-
Canal View	3	197×10^3	+	+	39	18×10^2	2×10^2	7×10^3	-
Mughalpura	3	312×10^3	+	+	1100	48×10^2	5×10^2	19×10^3	-
Shadbagh	3	319×10^3	+	+	1100	39×10^2	9×10^2	28×10^3	-
General Hospital Area	3	277×10^3	+	+	96	28×10^2	6×10^2	26×10^3	-
Akbary Mandi	3	219×10^3	+	+	1100	40×10^2	12×10^2	21×10^3	-
Cants. Area	3	203×10^3	+	+	240	14×10^2	0	10×10^3	-
Secretariate	3	168×10^3	+	+	1100	34×10^2	9×10^2	18×10^3	-

7×10^3/g. Because the shop had no direct mean for the entrance of dust particles.

Sporeformers: The aerobic sporeformers were present in all the samples and it ranged from 8×10^2/g to 48×10^2/g (Table 1), The highest contamination was observed in the sample taken from Mughalpura i.e. 48×10^2/g. It might be due to dissemination of dust particles by air current. Niamy *et al*. (1997) suggested that meat safty could be improved by better hygienic conditions during slaughter and transport of meat. The anaerobic sporeformers ranged from 0 to 20×10^2/g. The highest contamination of anaerobic sporeformers were observed in the sample taken from Scheme More i.e. 20×10^2/g. It might be due to unhygienic handling of meat.

Coliforms: Fecal coliforms were present in all the samples (Table 1) while non-fecal coliforms were absent in the samples taken from Scheme More and Canal View. The absence of noncoliforms indicate the hygienic handling including proper washing and subsequent treatment of meat. Banwart (1987) reported the coliform count of beef in the range of 10-1100 and obtained a mean reduction of 50 fold in bacterial numbers on carcasses by washing treatments. Most probable number of samples ranged from 39 to 2400. The highest MPN i.e. 2400 was observed in the sample taken from Johar Town. It might be reflected the more prevalence of coliforms while low MPN i.e. 39 in the sample taken from Canal View might indicate the hygienic handling during all practices of meat.

It can be concluded from the present study that assurance of meat consumption to public health depends upon the hygienic conditions during washing treatments, transportation, storage and finally processing of the meat. Fecal coliforms were present in most of the samples due to poor sanitary conditions. However, appropriate hygienic measures can minimise or eliminate this problem. Those samples which were highly contaminated reflects the unhygienic handling in all practices of meat. So the consumption of these samples can create the problems for public health. But appropriate hygienic measures including proper washings of carcasses, then transportation, storage and finally processing of meat can solve this problem.

References

Banwart, J., 1987. Basic Food Microbiology. 2nd Edn., Connective, New York, pp: 431-530.

Bell, K.Y., C.N. Cutter and S.S. Sumner, 1997. Reduction of foodborne micro-organisms on beef carcass tissue using acetic acid, sodium bicarbonate and hydrogen peroxide spray washes. Food Microbiol., 14: 439-448.

Deman, J.C., 1977. MPN tables for more than one test. Eur. J. Applied Microbiol., 4: 307-316.

Eisel, W.G., R.H. Linton and P.M. Muriana, 1997. A survey of microbial levels for incoming raw beef, environmental sources and ground beef in a red meat processing plant. Food Microbiol., 14: 273-282.

Garcia, M.L., W.H. Holzapfel, V.M. Dillon, C.O. Gill and N.M. Bolder, 1998. The microbiology of meat and poultry. J. Gen. Applied Microbial., 48: 129-131.

Gill, C.O., M. Badoni and T. Jones, 1996. Hygienic effects of trimming and washing operations in a beef-carcass-dressing process. J. Food Protect., 59: 666-669.

Grunspan, E.D., S.N. Ulon, G.P. Herrmann, V.R. Shirmer and A.F. D. Santos, 1996. Microbial contamination of Minced meat from butcher's shops in Santa Maria. Ciencia-Rural, 26: 263-267.

Hsich, D.Y., M. Martyn and J.M. Jay, 1999. Yeasts of Fresh and spoiled ground beef. J. Food Microbial., 1: 141-147.

Kitzman, P., 1997. Prediction of total count of aerobic microorganisms in meat and meat products by automated turbidimetry. Polish J. Food Nutr. Sci., 6: 125-132.

Lowry, P.D. and C.O. Gill, 1984. Temperature and water activity minima for growth of spoilage moulds from meat. J. Applied Bacteriol., 56: 193-199.

Mousa, M.M., H.A. Awed, N.M. Yassein and H.I. Gouda, 1993. Microbial quality of some meat products. Vet. Med. J. Ciza, 41: 59-62.

Niamy, V.S., S. Keia and B. Guillotea, 1997. Survey of the microbiology of meat sold in Conakry, Guinea. J. Food Sci., 68: 123-125.

O'Toole, D.K., 1995. Microbiological quality of pork meat from local Hong Kong markets. World J. Microbiol. Biotechnol., 11: 699-702.

Roushdy, S.A., Ibrahim, N. Aldanaf, H. Hammed and R. Moustafa, 1996. Meat residues and meat products. Vet. J. Ciza, 44: 181-187.

Skrokki, A., 1997. Hygienic quality of commercial minced meat as indicated by aerobic micro-organisms and Coliform bacteria. Zeitschrift fur Lebensmitteluntersuchung und-Forschung A, 204: 391-394.

Sutic, K., P. Choptra and T. Marija, 1999. Mycotonins in food. Microbiol. Technol. J., 32: 97-106.