Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2013, 5(1):64-67

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Antibiotic susceptibility of selected pathogenic bacteria isolated from raw meat sample obtained from Chidambaram, Tamil Nadu

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ABSTRACT

This study was carried out on 75 samples of raw meats collected from chidambarm.The bacteria cultured from the samples were Pseudomonas aeroginosa, Bacillus sp, Proteus mirabilis, Acinotobacter sp, Aeromonas sp. Nine antibiotics were used to determine the antibiotic susceptibility of selected meat borne pathogens.. Pseudomonas aeroginosa, Bacillus sp, Aeromonas sp and proteus mirabilis were found to be sensitive to most of the antibiotics used (Ciprofloxacin tetracycline, Erythromycin and Gentamycin). Most of the antibiotics were resistance to Acinotobacter sp.The study illustrates the presence of pathogenic bacteria in the meat around Chidambaram probably due to the poor sanitary conditions during processing. It also shows the insensitivity of the bacteria to antibiotics and this may be of potential public health importance.

Keywords: Meat, Pseudomonas aeroginosa, sensitive, Antibiotics, public health

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INDRODUCTION

Meat is the main edible part of domestic mammals; however, recent definition includes species, as well as fish, shellfish, poultry and exotic species such as frogs and allegation [8]. Similarly, meat refers to animal tissue used as food, mostly skeletal muscles and associated fat but it may also refer to organs including lungs, livers, skin, brains, bone marrow, kidney and a variety of other internal organs as well as blood [5]. Recent increase in the consumption of meat and its products arises from reasons including high protein contents, vitamins, minerals, lipids and savory sensation.

Ready-to-eat foods including red meats have been found to serve as carriers for several bacterial pathogens and food borne outbreaks that have been associated with the consumption of contaminated foods [3]. A number of studies have reported outbreak of infections due to consumption of contaminated food and poor hygiene and in most of the cases, data are loosely based on laboratory isolates which do not reflect the actual ratio of food-borne infections. During slaughtering process the meat is exposed to many sources of *Bacillus cereus* contamination [7]. The incidence of *Bacillus cereus* is higher in cooked and processed (ground beef) meat than in raw meat samples [9,12] . Microbial contamination of raw meat results from processing, and starts during slaughter, when the carcass becomes contaminated with microorganisms residing on external surfaces, the gastrointestinal tract and lymph nodes of the animal, and in the plant environment [16]. Furthermore, certain processing steps increase contamination by spreading the existing contaminants attached to the fresh meat surface to its entire mass or by introducing additional contaminants. For example, meat chopping or grinding results in greater microbial loads because of larger areas of

exposed surface, more readily available water and nutrients, additional processing time, and contact with more sources of contamination such as equipment [6].

A wide spectrum of Gram negative bacteria (*Pseudomonas*, *Acinetobacter*,*Serratia*, *Enterobacter*, *Proteus* and *Vibrio*) were recovered from hides and work surfaces within the abattoir, from carcasses, butchered meat as well as from environmental samples in meat processing plants [4,13]. Commonly, isolated spoilage microorganisms include genera in the family *Enterobacteriaceae*, *Shewanella putrefaciens*, *Br. thermosphacta*, *Pseudomonas* spp. *Acinetobacter* spp., *Moraxella* spp., *Aeromonas* spp. and lactic acid bacteria [8,14]. The minimization of microbial contamination is essential in meat handling systems in order to retard meat spoilage as well as to prevent health hazards that may arise from meat consumption.

Antibiotics used to combat bacterial infections can be classified as bactericidal which kill bacteria, or bacteriostatic which prevent bacterial growth. Different antibiotics inhibit distinct process in the pathogen which is different from that found in the host. For example, the antibiotics chloramphenicol and tetracycline inhibit the bacterial ribosome, but not the structurally-different eukaryotic ribosome, and so exhibit selective toxicity [17].

This study was conducted to determine the level of antibiotic sensitivity to bacteria isolated from meat samples in Chidambaram.

EXPERIMENTAL SECTION

Sample collection

The samples were collected from approximately 200 g of meat obtained from the supermarkets. The types and numbers samples collected from each of the sources are shown in Table 1. All samples were stored at 4^0C after sampling, until the analysis is conducted.

Meat sample preparation

Twenty-five grams of collected meat samples were weighed and transferred to sterile flasks containing 100 ml of phosphate buffer saline (PBS). Samples were homogenized using a meat grinder under aseptic conditions and was stored for further analysis.

Isolation and identification of bacteria

Meat samples were collected from Chidambaram and its surrounding provinces. The samples were put in sterile whirl-pak bags and transported ice-cooled to the microbiology laboratory in Annamalai University. Bacteria from these samples were cultured onto Aeromonas Isolation Medium Base, Cetrimide Agar, HiCrome Bacillus Agar, MacConkey agar (MA), were incubated overnight at 37^oC. Colony morphology on the plate was observed and Gram staining was conducted. Biochemical tests were performed to identify pathogenic bacteria related to food contamination. These tests included Oxidase, TSI, Urease, Motility, Catalase, Indole, Simmons citrate, Nitrate reduction, and Methyl red and veges proskauer.

Antibiotic susceptibility test

The antibiotic susceptibility test was performed by using the standard disc diffusion method (Kirby-Bauer) on Mueller-Hinton agar plates. The standard procedure of the Clinical and Laboratory Standards Institute (CLSI) were strictly followed throughout the test procedure. All the identified *Proteus mirabilus*,Aeromonas sp *Pseudomonas aeroginosa*., *Acinotobacter sp* and *Bacillus sp.* cultures were tested for penicillin G (P) 10 µg, rifampin (RD) 5 µg, kanamycin (30 mg), erythromycin (E) 15 µg, chloramphenicol (C) 30 µg, tetracycline (TE) 30 µg, ampicillin (AMP) 10 µg, ciprofloxacin (CIP) 5 µg,Sulbactam 10 µg and gentamycin (CN) 10 µg . After incubation at 37^0C for 24 hours, the isolates were recorded as susceptible, intermediate or resistant to each antibiotic tested according to the zone diameter interpretive standards recommendations by CLSI (2005).

RESULTS AND DISCUSSION

The present study evaluated the microbial quality of raw meat sold in Chidambaram. Our findings showed that out of 75 meat samples analyzed for microbial quality. The pathogenic bacteria related to food hygiene cultured from the meat samples included *Proteus mirabilis, Bacillus sp. ,Pseudomonas aeroginosa, Acinotobacter sp* and Aeromonas sp. From the study, *Pseudomonas aeroginosa* was the most isolated (36%,20%,48%),followed by

Proteus mirabilis (12%,28%,32%),Bacillus sp (20%,40%,28%) and least isolated Acinotobacter (8%0,16%,) *and Aeromonas spp* (1%,2%,3%). *Bacillus cereus* is one of the potential spoilage bacteria associated with red meat [11]. In a study done by [9], *Bacillus cereus* was predominont in both raw and prepared food stuffs. They also mentioned that the presence of *Bacillus cereus* at high levels, indicate a potential risk of producing toxins. The isolated bacteria were identified as *Proteus mirabilis, Bacillus sp., Pseudomonas aeroginosa, Acinotobacter sp* and Aeromonas sp. On the basis of their morphological and biochemical characteristics [1] (Table 2).

Nine different antibiotics were used against identified bacterial species from meat samples. The results are shown the bacterial susceptibility profiles presented in table 3, Ciprofloxacin were the most effective antibiotics against 5 bacterial isolates, followed by Gentamicin > Erythromycin >Tetracycline >Chloramphenicol >Amphicilin >Penicillin G>kanamycin>Sulbactam. *Bacillus sp* was recorded as highly sensitive to Amphicilin, Ciprofloxacin, Penicillin G and Tetracyclin.Moderate effects of Erythromycin and Tetracycline. *B. cereus* was a resistant to Gentamicin, kanamycin and Sulbactam . [2] also observed that *B. cereus* was a resistant species to penicillin and sulphamethoxazsole/ trimethoprim, but showed susceptibility to gentamycin, erythromycin, clindomycin and chloramphenicol.

During the present study, the organism was observed sensitive to Ciprofloxacin, Gentamicin and Tetracycline. Whereas, Amphicilin, Penicillin G, Erythromycin, chloramphenicol. kanamycin and Sulbactam were seen as resistance active against *P. aeruginosa*.[15] also showed that gentamycin, kanamycin, chloramphenicol and sulphamethoxazole were highly effective against *P. aeruginosa* and their efficacy was recorded as 86.6, 80, 86.6 and 80%, respectively

Proteus mirabilis was sensitivity to Ciprofloxacin and Erythromycin. Moderate effects of Amphicilin and Gentamycin against *Proteus mirabilis*. Resistance to Penicillin G, Tetracycline, Chloramphenicol. Kanamycin and Sulbactam, most of these bacteria exhibited multidrug resistance to all other antibiotics used in this study, while Sulbactam was totally ineffective against most of the tested bacterial species. Aeromonas sp was recorded as highly sensitive to Ciprofloxacin, Gentamycin Chloramphenicol and kanamycin .Moderate effects of Erythromycin resistance to Amphicilin, Penicillin G, Tetracycline and Sulbactam. *Acinetobacter sp only sensitivity to* Sulbactam other antibiotics are resistance

Table 1: Percentage of selected bacteria isolated from meat samples obtained from Chidambaram and surrounding provinces

Bacteria	**Number isolates (%)**		
	Beef	Mutton	Pork
Bacillus sp	5(20)	10(40)	7(28)
Proteus mirabilis	3(12)	7(28)	8(32)
Pseudomonas aeroginoas	9(36)	5(20)	12(48)
Acinotobacter sp	2(8)	0	4(16)
Aeromonas sp	1(4)	2(8)	3(12)

Table 2: Biochemical of bacteria strains isolated from meat samples

Bacteria	Zone of incubation				
	Acinetobacter sp	*Aeromonas sp*	*Bacillus sp*	*Proteus mirabilis*	*Pseudomonas aeruginosa*
Morphology	Cocci	Rod	cocci	Rod	coccobacillus
Gram staining	-	-	+	-	-
Catalase	+	+	+	+	+
Oxidase	-	+	+	-	+
H_2S on TSI	-	+	-	-	-
Simmons Citrate	+	-	+	-	+
Urease	+	-	+	+	-
Nitrate reduction	-	-	+	+	+
Methyl red	-	+	-	+	-
Veges Proskauer	-	+	+	-	-
Indole	-	-	-	-	-

Table 3: Antimicrobial sensitivity of bacteria strains isolated from meat samples

Bacteria	Zone of incubation				
	Bacillus sp	*Proteus mirabilis*	*Pseudomonas aeruginosa*	*Acinetobacter sp*	*Aeromonas sp*
Amphicillin	S	I	R	R	R
Ciprofloxacin	S	S	S	R	S
Gentamycin	R	I	S	R	S
Penicillin G	S	R	R	R	R
Erythromycin	I	S	R	R	I
Chloramphenicol	I	R	R	R	S
Tetracycline	S	R	S	R	R
kanamycin	R	R	R	R	S
Sulbactam	R	R	R	S	R

CONCLUSION

The study illustrates the presence of pathogenic bacteria in the meat sold in and around Chidambaram probably due to the poor sanitary conditions during processing. It also shows the insensitivity of the bacteria to antibiotics and this may be of potential public health importance.

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