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Full Length Research Paper

Antibiotic resistance pattern in bacterial isolates obtained from frozen food samples of animal origin in Sanandaj and Ahvaz

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One of the major public health challenges nowadays is the rapid emergence of antibiotic resistant pathogens. This study investigated the antibiotic resistance pattern in bacterial isolates obtained from frozen food samples of animal origin in Sanandaj and Ahvaz Iran. A total of 250 packages of food of animal origin were purchased from different separate grocery stores in Sanandaj and Ahvaz during one year. Bacteria were isolated and identified based on national procedures. Antibiogram was done according CLSI guideline. From a total of 250 samples collected from Sanandaj and Ahvaz, 68 (54.4%) and 71 (56.8%) were positive for bacteria respectively. In Sanandaj Prevalence of *Escherichia coli, Citrobacter* Spp*, Enterobacter* Spp*, Staphylococcocus* Spp, *and Bacillus cereus* was 40, 18, 05, 03 and 2% respectively. The most contaminated food was chicken nuggets (80%). Antibiogram results clearly showed that resistance to Tetracycline and Ampicillin was 55 and 50% respectively. Similarly, in Ahvaz also prevalence of *E. coli, Salmonella* Spp, and *Proteus* Spp, were 52, 03.2 and 02.4% respectively. The above bacteria were 39 and 26% resistance to Ampicillin and Tetracycline respectively. The frozen food samples are perhaps the potential vehicles for transmitting food-borne diseases. Antimicrobial resistance among enteric organisms in food animals was generally low; however, the significance of this study lies in the detection overall resistance of bacterial isolates from the frozen food samples of animal origin in Ahvaz and Sanandaj against different antibiotics.

Key words: Frozen food, antimicrobial resistance, *Escherichia coli.*

INTRODUCTION

There is an increasing trend in production and consumption of meat, poultry meat, fish and their products. This, of course, requires adequate control and inspection both during poultry rearing and in slaughterhouses, processing plants and shops. Consumers are also a link in the chain of food-borne human diseases, because of the way they store and cook meat, poultry meat, fish and their products (Kozacinski et al., 2006; Lei et al., 2008). Therefore, microbial safety of food is a significant concern of consumers and industries today.

The rapid and accurate identification of food-borne pathogenic bacteria in food is important; both for quality assurance and to trace pathogens within the food supply (Kye et al., 2008; Hyun-Joong et al., 2008). Major food-borne pathogens include *Bacillus cereus*, *Listeria*

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Table 1. Prevalence of bacterial contamination of frozen food samples in Ahvaz and Sanandaj.

Frozen food sample	City	Total number	Percent
Chicken	Ahvaz	25	12 (48)
	Sanandaj	25	36 (9)
Fish	Ahvaz	25	0 (0.0)
	Sanandaj	25	52 (13)
Kabab	Ahvaz	25	21 (84)
	Sanandaj	25	80 (20)
Minces	Ahvaz	25	20 (80)
	Sanandaj	25	60 (15)
Beef burger	Ahvaz	25	18 (72)
	Sanandaj	25	44 (11)

monocytogenes, *Staphylococcus aureus*, *Clostridium botulinum*, *Clostridium perfringens*, *Campylobacter jejuni*, *Vibrio parahaemolyticus*, *Yersinia enterocolitica*, *Escherichia coli* O157:H7 and *Salmonella enteric* serovar Typhimurium (Laboratório, 2006). Some of these foodborne pathogens can cause life-threatening diseases to humans and animals. Whilst all are well recognized, some are considered emerging because they have recently become more common.

In addition, food contamination with antibiotic resistant bacteria could be a major threat to public health as the antibiotic resistance determinants can be transferred to other pathogenic bacteria, causing compromise in the treatment of severe infections. The prevalence of antimicrobial resistance among food-borne pathogens has increased during recent decades (Boerlin et al., 2005; Choi et al., 2001). Therefore, this study aimed to determine the antibiotic resistance pattern in bacterial isolates obtained from frozen food samples of animal origin in Sanandaj and Ahvaz.

MATERIALS AND METHODS

A total of 250 packages of food of animal origin consisting of frozen chicken, chicken nuggets, frozen fish, mince, and beef burger were purchased from different separate grocery stores in Sanandaj and Ahvaz during one year. Field personnel collected the samples on a weekly basis. Retail samples was sealed in a plastic bag, labeled with a unique identifying number, and placed into a cooler with ice packs. Field personnel transport the specimens to food and drug laboratory, within 1 h of collection.

Isolation and identification of bacteria

Bacteria were isolated and identified based on Institute of Standards and Industrial Research of Iran. Antibiogram was done using the agar disc diffusion method on Muller-Hinton agar (Merck, Germany), according to CLSI (Clinical and Laboratory Standards Institute, 2010).

RESULTS

From a total of 125 samples collected from Sanandaj, 68 (54.4%) were positive for bacteria (Table 1). Prevalence of *E. coli, Citrobacter* Spp, *Enterobacter* Spp, *Staphylococcocus* Spp, and *Bacillus cereus* was 40, 18, 05, 03 and 2% respectively (Table 2). The most contaminated food was chicken nuggets (80%).

Antibiogram results clearly showed that resistance to Tetracycline and Ampicillin was 55 and 50% respectively. We also observed resistance to Chloramphenicol, and Erythromycin (Table 3). Similarly, Ahvaz results are as follows: out of 125 food samples, 71 (56.8%) were contaminated. A total of 76 bacteria were isolated and identified. Prevalence of *E. coli, Salmonella* Spp, and *Proteus* Spp, were 52, 03.2 and 02.4% respectively. The above bacteria were 39 and 26% resistance to Ampicillin and Tetracycline respectively.

DISCUSSION

A major goal for the food processing industry is to provide safe, wholesome and acceptable food to the consumer. Control of microorganisms is essential to meeting this goal. Many food pathogenic and spoilage bacteria are able to attach to food and remain viable even after cleaning and disinfection. This can seriously affect the quality and safety of the food processed and pose a potential risk to the consumer (Bagge-Ravn et al., 2003).

The present study demonstrated that three major

Table 2. Distribution of bacteria isolated from the frozen food samples of animal origin in Ahvaz and Sanandaj.

City		E.c	Cit	Ente	S. a	Co.NS	B.c	Sal	Prot	List
Ahvaz		05	-	-	-	-	-	04	03	-
Sanandaj	Chicken	08	-	-	01	-	-	-	-	-
Ahvaz		-	-	-	-	-	-	-	-	01
Sanandaj	Fish	04	09	-	-	-	-	-	-	-
Ahvaz		20	-	-	-	-	-	-	-	01
Sanandaj	Kabab	-	07	03	-	-	-	-	-	-
Ahvaz		20	-	-	-	-	-	-	-	-
Sanandaj	Mince	11	-	-	-	-	04	-	-	-
Ahvaz	Beef burger	20	-	-	-	02	-	-	-	-
Sanandaj		07	02	-	01	-	01	-	-	-

E. c= *E. coli*, Cit= *Citrobacter,* Ent= *Enterobacter*, S.a. *Staphylococcus aureus*, CoNS= Coagulase negative *Staphylococcus*, B.a= *Bacillus cereus*, Sal= *Samonella,* Prot= *Proteus*, Lis= *Listeria.*

Table 3. Overall resistance of bacterial isolates from the frozen food samples of animal origin in Ahvaz and Sanandaj against different antibiotics.

Antibiotic	Resistance to	
	Ahvaz	Sanandaj
Ampicillin	03	50
Ciprofloxacin	01	09
Clindamycin	0.0	08
Cephotoxim	0.0	05
Nalidixic Acid	0.0	09
Erythromycin	0.0	13
Gentamycin	0.0	0.0
Tetracycline	02	ND
Chloramphenicol	01	19
Trimetoprim-Sulfametoxazol	ND	10

enteric bacterial taxa were present in frozen food samples of animal origin obtained from supermarkets in the Sanandaj and Ahvaz. The findings presented herein suggest that there was not much a significant difference in the occurrence of bacteria among the evaluated food samples. The most prevalent bacteria in both the cities were *E. coli*. A study performed in the Washington, D.C reported *E. coli* prevalence of 38.7% in poultry (Cuiwei et al., 2001), which is much lesser to the results of the present survey. Several studies have shown that *E. coli* O157:H7 and other STEC are present in meat products, mostly beef products (Brooks et al., 2001; Heuvelink et al., 1996; Samadpour et al., 1994).

As regards antibiotic resistance, 55 and 50% of the bacterial strains which isolated from Sanandaj were resistant to Tetracycline and Ampicillin respectively. Many studies have reported almost same results concerning Tetracycline and Ampicillin resistant (Soltan et al., 2007; Bywater and Deluyker, 2004). Similarly, Tansuphasiri et al. (2006), evaluated 239 isolates of enterococci (113 from frozen foods and 126 from environmental water) for their resistance to 8 antibiotics by agar disk diffusion method. Most isolates from both sources were resistant to tetracycline (64.1% food strains; 46.8% water strains) and ciprofloxacin (53.4% food strains; 48.4% water strains). A relatively high prevalence of chloramphenicol, trimethoprim-sulfamethoxazole and vancomycin resistance was present, ranging from 9.7 to 27.2% for food strains and 10.3 to 15.9% for water strains.

A recent study reported that the prevalence of antimicrobial resistance in commensal microflora is very useful in monitoring and understanding the process of antimicrobial-mediated selection in a population (Caprioli et al., 2000). The previous studies on resistance from developing countries have concentrated on pathogenic bacteria (Byarugaba et al., 2005; Kassa et al., 2007), but our study lead to isolation of one important resistance indicator; *E. coli.*

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