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PREVALENCE OF PSYCHROTROPHIC BACTERIA IN BEEF AND CHICKEN PRODUCTS

(With 3 Tables)

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مدى تواجد البكتريا المحبة للبرودة فى منتجات اللحوم والدواجن

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تم تجميع ١٠٠ عينة من منتجات الدواجن واللحوم عبارة عن ٢٠ عينة لكل من صدر الدجاج المدخّن، صدرَ رومي جاهز ، قشطة دجاجٍ مطهية مدخّنة، لحمَ بقرى جاهز وسلامي لحم بقرٍ جافٍ وذلك عن طريق شرائها منْ الأسواق في محافظات الجيزة والقاهرة وذلك لتقييمها من الناحيةِ الصحيةِ. وباجراء الطرق القياسية لتقدير العد البكتيرى للميكروبات المحبة للبرودة والباسيلس سيرس كان متوسط العد البكتيرى بالنسبة للميكروبات المحبة للبرودة في العينـــات السابقـــة ٣,٢ ×١٠^{٢} ± ٣ x ١٠^{٢} ، ١,٦ x ١٠^{٣} ± ١,٢ x١٠^{٣} ، ٣,٦ ×١٠^{٢} ± ٣,٣ x ١٠^{٢} ، ٢ x ١٠^{٣} ± ١,٨ x ١٠^{٣} و ٢,٦ x ١٠^{٣} ± ١٠^{٣} على التوالى وبالنسبة لميكروبات الباسيلس سيرس كانت ٢ x ١٠ ± ٢ x ١٠ ، ١ x ١٠^{٣} ± ٤ x١٠^{٢} ، ٥ x ١٠ ±٣ x١٠ ، ٣ x ١٠^{٢} ± ٢ x ١٠^{٢} و ٤ x ١٠ ± ٤ x١٠ على التوالى. وكانت نسبة العزل لميكروب الباسيلس سيرس فى العينات ٥، ١٠، ٥، ١٠ و ٥% على التوالى ولم يتم عزل ميكروب الليستريا مونوسيتوجين من قشطة الدجاجَ المطهية المدخّنة، والسلامي البقرى الجافِ بينما تم عزله بنسبة ٥% من كل من الثلاث منتجات الاخرى وكذلك بالنسبة لميكروب اليرسينيا انتيروكوليتيكا لم يتم عزلها من السلامي البقرى الجافِ ولكن عزلت بنسبة ١٠% من اللحم البقرى الجاهز وبنسبة ٥% من كل من الثلاث منتجات الاخرى.

SUMMARY

One hundred samples of beef and chicken products, 20 each of smoked chicken breast, pressed turkey breast, cooked smoked chicken roll, pressed beef and dry beef salami were purchased from supermarkets in Giza and Cairo Governorates for sanitary evaluation. Standard methods were used to determine psychrotrophic and *Bacillus cereus* counts where the mean values of psychrotrophic counts for smoked chicken breast, pressed turkey breast, cooked smoked chicken. roll, pressed beef and dry beef salami were 3.2x 10^2 ± 3x10^2, 1.6 x 10^3 ± 1.2x10^3, 3.6x10^2 ± 3.3 x

10^2, 2 x 10^3 ±1.8 x 10^3 and 2.6 x 10^3 ± 10^3 respectively while of *B.cereus* count were 2x 10 ± 2 x10, 1 x 10^3 ± 4 x10^2, 5 x10 ± 3 x 10, 3 x 10^2 ± 2 x 10^2 and 4 x 10 ± 4 x 10 respectively. The incidence of *B.cereus* in the examined samples was 5, 10, 5, 10 and 5% respectively. *L.monocytogenes* couldn't be detected in cooked smoked chicken roll and dry salami while it was 5% in each of the other three products. In addition, *Y.enterocolitica* couldn't be detected in dry salami while it was 10% in pressed beef and 5% for each of the other three products.

Key words: *Psychrotrophs, chicken products, meat products, L.monocytogenes, B.cereus, Y.enterocolitica.*

INTRODUCTION

Microorganisms, individually and as a group, grow over a very wide range of temperatures. Therefore, it would be well to consider at this point the temperature growth ranges for organisms of importance in foods as an aid in selecting the proper temperature for the storage of different types of foods. Psychrotrophs are those organisms that grow well at or below 7°C and have their optimum between 20°C and 30° C.*Bacillus cereus*, *Listeria monocytogenes* and *Yersinia enterocolitica* were found among the psychrotrophic microorganisms, and their presence or contamination of food creates a great risk as they lead to food poisoning and /or spoilage of the food products (Jay, 2000). Ready-to- eat meat and poultry products processed by drying, fermentation and /or smoking have become increasingly popular in recent times and they are becoming an important new class products found in supermarket. Unfortunately, these types of food possess some potential microbial safety problems (Bischoff, 1989). Refrigeration is often the main and frequently the only factor to control food-borne pathogens in these types of foods. Hence, temperature abuse of such foods can result in food-borne illness. In addition, some psychrotrophic pathogens can grow in refrigerated foods with little or no obvious change of sensory characteristics (Berrang *et al.*, 1989).

The Center for Disease Control (CDC, 1989) reported that at least one case of illness has resulted when a supposedly ready-to-eat food was not properly cooked before consumption; as most of ready-to-eat foods receive little or no final heat treatment before being consumed because such foods are assumed to be and often labeled as fully cooked. *Bacillus cereus* were increasingly reported in food poisoning incidents. The *B cereus* can give rise to two distinct forms of food-borne disease,

the emetic and the diarrhoeal syndromes. The emetic syndrome believed to be associated with an emetic toxin performed in food while the diarrhoeal type is caused by an enterotoxin. The finding that a psychrotrophic isolate of *B.cereus* can produce emetic toxin is the first ever such observation and suggests the possibility that psychrotrophic isolate could grow in refrigerated fresh foods and cause emesis (Altayar and Sutherland, 2006). *Listeria monocytogenes* is psychrotrophic Gram-positive food- borne pathogens, which has been involved in several outbreaks. It has also been isolated from various foods, including poultry, meat and seafood (Elsvan *et al.*, 2004). *L. monocytogenes* has been strongly implicated particularly in the contamination of foods stored at low temperature, recent outbreaks of listeriosis were associated with consumption of precooked refrigerated chicken and turkey Franks stored at 4°C (Kerr *et al.*, 1990). *Yersinia enterocolitica* usually dose not cause large outbreaks compared with other pathogens, this organism can grow at refrigerated temperature because of its psychrotrophic nature (Jiang *et al.*, 2000). The incidence of human disease attributed to *Y. enterocolitica* is less than the other major microbial food-borne disease agents. Certain biological characteristics of *Yersinia* and human demographics and behaviours suggest that it is an emerging microbial threat (Funk *et al.*, 1998).

The widespread occurrence and psychrotrophic nature of these bacteria could increase the risk as refrigerated ready-to-eat foods may serve as vehicles of food-borne illness. The aim of this study was to assess the presence of some psychrotrophic microorganisms in ready-to-eat poultry and meat products. The health risks due to these pathogens for consumers were also assessed.

MATERIALS and METHODS

Collection of samples: -

A total of 100 beef and chicken products samples, 20 each of smoked chicken breast, pressed turkey breast, cooked smoked chicken roll, pressed beef and dry beef salami were purchased from supermarkets in Giza and Cairo Governorates. The collected samples were transferred in an icebox immediately to the laboratory.

The samples were prepared according to the technique recommended by (ICMSF, 1978). The prepared samples were examined immediately for the presence of psychrotrophic bacteria.

Determination of psychrotrophic bacterial count:

Standard plate count agar was used as recommended by APHA (1992). The average number of colonies per gram was determined and psychrotrophic count / g of samples was calculated and recorded.

Enumeration and identification of B.cereus (ISO, 1987):

The spreading technique was applied on the surface of *Bacillus cereus* selective agar which incubated at 37°C for 24 hours, then the count was recorded. Colonies thought to be *Bacillus cereus* were identified by microscopical examination and biochemical reactions.

Isolation and identification of *L. monocytogenes* (APHA, 1992):

By surface plating onto Modified Oxford Agar plates that were incubated at 37°C for 48 hours. Gram staining and biochemical tests were performed for colonies suspected to be *L. monocytogenes*.

Isolation and identification of *Yersinia enterocolitica* (APHA, 1992):

Using Yersinia selective agar plates (Oxoid. CM 653) with Yersinia selective supplement. Plates were incubated at 25°C for 48 hours. Suspected colonies were subjected to Gram staining and biochemical examinations.

RESULTS

Table 1: Statistical analysis of psychrotrophic count in beef and chicken products

	Smoked chicken breast	Pressed turkey breast	Cooked smoked chicken roll	Pressed beef	Dry beef salami
Minimum	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$
Maximum	6×10^3	3×10^4	6.8×10^3	2×10^4	1.4×10^4
Mean	3.2×10^2	1.6×10^3	3.6×10^2	2×10^3	2.6×10^3
SE ±	3×10^2	1.2×10^3	3.3×10^2	1.8×10^3	10^3

Table 2: Statistical analysis of *B. cereus* count in beef and chicken products

	Smoked chicken breast	Pressed turkey breast	Cooked smoked chicken roll	Pressed beef	Dry beef salami
Minimum	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$
Maximum	2×10^2	3×10^3	3×10^2	2×10^3	4×10^2
Mean	2×10	1×10^3	5×10	3×10^2	4×10
SE±	2×10	4×10^2	3×10	2×10^2	4×10

Table 3: Incidence of isolated psychrotrophic microorganisms in beef and chicken products

Products / Types of Isolates	Smoked chicken breast		Pressed turkey breast		Cooked smoked chicken roll		Pressed beef		Dry beef salami	
	No.	%	No.	%	No.	%	No.	%	No.	%
B.cereus	1	5	2	10	1	5	2	10	1	5
L. monocytogenes	1	5	1	5	0	0	1	5	0	0
Y. enterocolitica	1	5	1	5	1	5	2	10	0	0

DISCUSSION

Microorganisms that have experienced environmental stresses such as heating, freezing and exposure to acids can become sub-lethally injured (Smith and Archer, 1988). In the injured state, bacteria become sensitive to agents to which they would otherwise show resistance, although injured cells lose disease-producing capacity, these bacteria can regain the capacity to multiply under favorable growth conditions (Jay, 1986). This may explain why the results in this study were low. As in Table (1), the psychrotrophic count in the examined products was less than that recorded by Yassein (1988), Sharma *et al.* (1996) and Ouf (2001).

The temperature attained during cooking or processing would be able to kill any vegetative pathogenic food-borne bacteria, but bacterial spores that survived cooking and any bacteria that contaminated the meat as a result of graving or subsequent handling could multiply after cooking or processing (Bryan *et al.*, 1980). Hence, it is clear from the statistical analysis of *Bacillus cereus* count in the examined products as presented in Table (2) that the counts were mainly less than 10^3 C.F.U. except for pressed turkey breast and this may be due to post processing contamination by hands of workers or the cutting knives. Higher results were recorded by Bryan *et al.* (1988); El-Khateib *et al.* (1988) and Torky (1995).

It is evident from the Table (3) that the incidence of *B. cereus* in the all examined products was low, this may attributed to the heat treatment of the samples during processing while higher results were recorded by Nassif *et al.* (2002) and Fang *et al.* (2003). During thermal processing *B. cereus* spores may be killed, injured or uninjured and

spore resistance is often related to the heating medium composition. This agreed with Pendurkar and Kulkarni (1989).

L.monocytogenes has become a pathogen of concern for the food industry since documentation of its association with several serious outbreaks of food-borne illness and due to its ability to grow at refrigeration temperature as well as the serious illness that it can cause specially in immunocompromised individual (Yeu-Hsin and Donnelly, 1992). From Table (3) it is evident that the incidence of *L.monocytogenes* was low in three products and can not be isolated from cooked smoked chicken roll and dry beef salami. Nearly similar results were recorded by Brakat and Harris (1999) while higher results were shown by Steven *et al.* (2004). The incidence of *Y. enterocolitica* was higher in pressed beef than the others and can not be detected in the dry beef salami (Table, 3). Nearly similar results were recorded by Brakat and Harris (1999). Occasional post process contamination of cooked ready-to-eat food has been documented for *L.monocytogenes* and *Y. enterocolitica* (Toora *et al.*, 1994 and Wang and Muriana, 1994). The results which obtained in this study may be as a result of post processing contamination of the examined samples from refrigerators or cutting knives used in the stores. In a research made in Ireland where swabs recovered from domestic refrigerators in household were analyzed, *L.monocytogenes* and *Y.enterocolitica* could be detected with an incidence of 6% and 2%, respectively (Kennedy *et al.*, 2005). The consumers must be informed with some basic food safety knowledge to reduce the level of bacterial contamination in their refrigerators and so reduce the incidence of food associated illnesses. In this study the examined samples was ready-to-eat poultry and meat products either smoked, cooked or dried; so they were nearly clean and free from psychrotrophic bacteria except if they exposed to contamination during storage or marketing. In conclusion to improve the hygienic quality of the products to be safe for human consumption the following recommendations should be adopted: Application of strict hygienic measures during preparation, handling and serving the products; store the products carefully in clean refrigerators; avoid contact between raw food and cooked products; protect food from insects; use clean cutting knives and periodic medical examination of workers and they must have medical certificate.

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