Bacteriological quality of some meat products processed in supermarkets in Cairo

Fatin S. Hassanin [1], Amani M. Salem [1], Azza H. Elbaba [2], Samar A. Elmonsef [2]

[1]*Department of Food Control, Faculty of Veterinary Medicine, Benha University, Moshtoher, Benha, Egypt,*[2] *Animal Health Research Institute, Dokki, Egypt.*

A B S T R A C T

A total of 150referigeratedrandom samples of processed meat products in supermarkets (minced meat, oriental sausage, beef burger, chicken whole leg and marinated chicken whole leg 30 of each) were collected from different hygienic levels supermarkets (A, B, C) in Cairo Governorate Egypt, The highest count of Aerobic plat count (APC) and coliform in category A and B were (6.51±0.16& 4.04±0.2) and (6.93±0.1& 4.50±0.16)in oriental sausage, while in category C were (7.37± 0.12) of APC in beef burger, (5.36±0.16) of coliform in oriental sausage. At the same time highest pathogenic load of *Staphylococcus aureus* were (1.87±0.12), (2.38±0.09), (2.84±0.13) in oriental sausage in A, B & C, respectively. And also, *Escherichia coli* count was higher in beef burger (1.91±0.06) in A, oriental sausage (2.21±0.04) in B and finally, in marinated chicken whole leg (2.46±0.20) in C. *Salmonella* failed to be detected in all examined meat product samples. The most contaminated product in the three categories was the oriental sausage where the unaccepted samples were the higher one.

Key words: Refrigerated meat products, APC, *Staph.aureus*, *E.coli* and *Salmonella*.

(http://www.bvmj.bu.edu.eg) **(BVMJ-34(1): 496-501, 2018)**

1. INTRODUCTION

Meat and meat products are the most palatable of highly nutritive value foods for human being. In Egypt, the expansion policy of establishing a large number of productive supermarkets, increased consumer awareness, as well as the growth in the number of working women, all of these factors are resulting in significant shifts in the food demand to refrigerated meat products due to its desirable nutritional qualities , provide convenience to consumers and assists in reducing time of preparation of meals, such as minced meat, beef burger, oriental sausage, chicken whole leg and marinated chicken whole leg. The product quality became more significant factor in meat products marketing (Agamy and Hegaz, 2011; Potter, 2001). Meat may be contaminated from environmental exposure, unhygienic handling, during processing from the operator's hands and equipment resulting in food born bacterial illnesses. Food consumers also comprise a link in the chain of food-borne bacterial illnesses with inappropriate storage and cooking of meat and meat products (Sachindra et al. 2005; Kozacinski et al. 2006).

Escherichia coli, *Salmonellae* and coagulase positive *Staphylococcus aureus* are the most important bacterial pathogens in chicken meat, beef meat and meat products that are responsible for food-borne infections (Abdaslam, 2014; Ezzat *et al*. 2014 and Saif-marwa, 2015).The failure of the food manufacture to assure the production and distribution of safe food products leads to many serious food borne diseases which cause considerable morbidity & mortality as well as reduction in economic production (Alexandratos,1995).Therefore, this study was conducted to throw out a light on the bacterial quality of some processed meat products in supermarkets in relation to different hygienic levels of these markets.

2. MATERIALS AND METHODS

2.1. Samples

A total of 150 refrigerated random samples of processed meat products in supermarkets of minced meat, beef burger, oriental sausage, chicken whole leg and marinated chicken whole leg (30 of each) were collected from different hygienic levels of supermarkets (A, B & C) in Cairo. Each sample was aseptically transferred, without delay, in an insulated ice box to the laboratory and then subjected to the following examinations.

2.2. Preparation of samples (ISO 6887 - 2003)

Twenty-five grams of the examined samples were stomached by using (stomacher 3,serial no.010410226, France) with 225 ml of 0.1 % sterile buffered peptone water to give a dilution of (1:10), from which decimal serial dilutions were prepared.

2.3. Bacteriological examination

Determination of APC (APHA 2001), coliform count (Feng et al 2002), isolation and identification of coagulase positive *Staphylococcus aureus* were carried out according to (FDA 2001), *Escherichia coli* (ISO 16649 – 2:2001) and *Salmonella* (ISO 6579: 2002).

2.4. Statistical Analysis

The obtained results were statistically analyzed by application of Analysis of Variance (ANOVA) test according to Feldman et al. (2003).

3. RESULTS

Table 1: Mean values ± SE and acceptability of Aerobic Plate Count (APC) and Coliform counts (log CFu/g) in meat product samples from different hygienic levels supermarkets (n=10)

		APC	P.L	Coliform	P.L	Unaccepted Sampels	
A	Minced meat	$5.38^{A} \pm 0.21$	10^{7}	$2.4^{A} \pm 0.27$	-	NO	%
	Beef burger	$5.89^{A} \pm 0.14$	10^{7}	$3.84^{a} \pm 0.14$	$5x10^{2}$	10	100
	Oriental sausage	$6.51^{A} \pm 0.16$	10^{7}	$4.04^{a} \pm 0.2$	$5x10^{2}$	10	100
	Chi. whole leg	$5.24^{A} \pm 0.15$	10^{5}	$2.70^{A} \pm 0.21$	-	6	60
	M.Chi. whole leg	$5.29^{A} \pm 0.17$	10^{5}	$2.71^{A} \pm 0.2$	-	7	70
B	Minced meat	$6.7^{a} \pm 0.06$	10^{7}	$3.8^{a} \pm 0.2$	-	2	20
	Beef burger	$6.89^{aB} \pm 0.16$	10^{7}	$4.12^{a} \pm 0.09$	$5x10^{2}$	10	100
	Oriental sausage	$6.93^{a} \pm 0.1$	10^{7}	$4.50^{a} \pm 0.16$	$5x10^{2}$	10	100
	Chi. whole leg	$5.90^{aB} \pm 0.23$	10^{5}	$3.39^{aB} \pm 0.2$	-	9	90
	M.Chi. whole leg	$5.96^{aB} \pm 0.16$	10^{5}	$3.56^{aB} \pm 0.22$	-	10	100
C	Minced meat	$6.99^{a} \pm 0.1$	10^{7}	$4.28^{a} \pm 0.38$	-	-	-
	Beef burger	$7.37^{ab} \pm 0.12$	10^{7}	$4.95^{A} \pm 0.86$	$5x10^{2}$	10	100
	Oriental sausage	$7.31^{a} \pm 0.12$	10^{7}	$5.36^{A} \pm 0.16$	$5x10^{2}$	10	100
	Chi. whole leg	$6.67^{ab} \pm 0.13$	10^{5}	$4.51^{ab} \pm 0.19$	-	10	100
	M.Chi. whole leg	$6.74^{ab} \pm 0.15$	10^{5}	$4.53^{ab} \pm 0.19$	-	10	100

S.E* = Standard error of mean,- Valuse with the different letters are significantly differed. ($P<0.05$). Acceptability of Minced meat , Beef Burger and Orienral Sausage Samples according to Codex Alimentarius commission (2002) & Chicken Whole leg and Marinated Chicken Whole leg samples (EOS), (2005).

It is evident from the result recorded in table (1) that the mean of APC and Coliform count (log cfu/g) were (5.38 ± 0.21 and 2.4 ± 0.27), (5.89±0.14 and 3.84±0.14), (6.51±0.16 and 4.04±0.2), (5.24±0.15 and 2.70±0.21) and (5.29± 0.17 and 2.71± 0.2) in (A), (6.7±0.06 and 3.8 ± 0.2) ,(6.93 ± 0.1 and 4.50 ±0.16), (6.89 ± 0.16 and 4.12±0.09), (5.90±0.23 and 3.39 ± 0.2) and (5.96±0.16 and 3.56±0.22) in (B), (6.99±0.1 and 4.28±0.38),(7.37±0.12 and 4.95±0.86), (7.31±0.12 and 5.36±0.16), (6.67±0.13 and 4.51±0.19) and (6.74± 0.15 and 4.53± 0.19) in (C) in minced meat, beef burger, Oriental sausage, chicken whole leg

and marinated chicken whole leg, respectively. The results achieved in table (2) revealed that the mean values of coagulase positive *Staph. aureus* and *E.coli* count in minced meat, beef burger, Oriental sausage, chicken whole leg and marinated chicken whole leg were (1.7±0.19 and 1.8±0.1), (1.83±0.09 and 1.91±0.06), (1.87±0.12 and 1.87±0.04), (1.38±0.16 and 1.63 ± 0.05) and (1.77±0.12 and 1.84±0.06) in (A), (1.9±0.13 and 2.04±0.05), (2.26±0.08 and 2.17±0.05), (2.38±0.09 and 2.21±0.04), (2.06±0.11 and 1.69±0.13) and (2.06±0.11 and 1.63±0.16) in (B), (2.56±0.28 and 2.11±0.12), (2.74±0.11 and 2.29±0.04), (2.84±0.13 and 2.45 ±0.02), (2.46±0.11 and 2.34±0.21), (2.43±0.11 and 2.46±0.20) in (C), respectively. *Salmonella* failed to be detected in all examined meat product samples.

Table 2: Mean values ± SEM and acceptability of Coagulase Positive *Staphylococcus aureus*and *E.coli* count (log CFu/g) in meat product

		S. aureus	P.L	*E.coli*	P.L	Unaccepted Samples	
						NO	%
A	Minced meat	1.7 ± 0.19	10^3	1.8±0.1	-	6	60
	Beef burger	1.83±0.09	10^3	1.91±0.06	-	7	70
	Oriental sausage	1.87±0.12	10^3	1.87±0.04	-	7	70
	Chi. whole leg	1.38±0.16	-	1.63 ± 0.05	10^2	6	60
	M.Chi. whole leg	1.77±0.12	-	1.84 ± 0.06	10^2	8	80
B	Minced meat	1.9±0.13	10^3	2.04±0.05	-	6	60
	Beef burger	2.26±0.08	10^3	2.17±0.05	-	7	70
	Oriental sausage	2.38±0.09	10^3	2.21±0.04	-	8	80
	Chi. whole leg	2.06±0.11	-	1.69^A±0.13	10^2	6	60
	M.Chi. whole leg	2.06±0.11	-	1.63^A± 0.16	10^2	9	90
C	Minced meat	2.56±0.28	10^3	2.11±0.12	-	7	70
	Beef burger	2.74 ±0.11	10^3	2.29 ±0.04	-	8	80
	Oriental sausage	2.84 ±0.13	10^3	2.45 ±0.02	-	10	100
	Chi. whole leg	2.46 ±0.11	-	2.34^a ±0.21	10^2	8	80
	M.Chi. whole leg	2.43 ±0.11	-	2.46^a ± 0.20	10^2	10	100

S.E* = Standard error of mean,- Valuse with the different letters are significantly differed. (P<0.05). Acceptability of Minced meat , Beef Burger and Orienral Sausage Samples according to Codex Alimentarius commission (2002)& Chicken Whole leg and Marinated Chicken Whole leg samples (EOS) , (2005).

4. DISCUSSION

During the various stages of slaughter and processing, all potential edible tissues are subjected to contamination from a variety of sources within and outside the animal (Borch and Arinder, 2002)**.**

Food-borne diseases, caused by agents that enter the body through the intake of contaminated food materials are one of the primary public health concerns (Tan, *et al*. 2013).

Although spices and herbs used for the aesthetic properties contribute to food products, they can often be a major source of microbial contamination (McKee, 1995).

The results achieved in table (1) revealed that the highest count of APC and Coliform in category A and B were (6.51±0.16 and 4.04±0.2) and (6.93±0.1 and 4.50±0.16), while in category C were (7.37± 0.12) of APC in beef burger, (5.36A±0.16) of Coliform in oriental sausage. At the same time highest pathogenic load of *Staphylococcus aureus* were (1.87±0.12), (2.38±0.09), (2.84±0.13) in oriental sausage in A, B and C, respectively. And also, *Escherichia coli* count was higher in beef burger (1.91±0.06) in A, oriental sausage (2.21±0.04) in B and finally, in marinated chicken whole leg (2.46±0.20) in C. The obtained results of APC in minced meat were relatively similar to this result

which recorded by Heredia et al .(2001) (10^5cfu/g); Kammenou, et al.(2003) (6.20 to 6.84 log10 cfu/g); Çetin et al. (2010) ($1.3x10^6$cfu/g) , in beef burger, EI-Mossalami- Eman (2003) ($3.2x10^6$cfu/g), in Oriental sausage, Oluwafemi and Simisaya (2006) (2.06-2.80 x 10^6cfu/g) and Heetun, et al.(2015)) (5.8 log cfu/g) for chicken whole leg .

The obtained results of Coliform (table1) were relatively similar to Mousa, et al. (1993) ($4.9x10^3$cfu/g) for minced meat, EI-Mossalami- Eman (2003) (10^4cfu/g)for beef burger, Hammad et al.(2000) (38% >10^3) for oriental sausage and Abraham et al. (2012) (3.80,3.46and 3.14 log_{10} cfu/g) for chicken meat samples .The Coagulase Positive *S.aureus* from the examined samples were nearly similar to which obtained by Bello et al. (2016)(1.25 x 10^2 to 2.17 x10^2cfu/g) for raw meat, EI-Mossalami- Eman (2003) ($9x10^2$cfu/g) for examined burger samples , Siriken et al. (2006) (10^2cfu/g) for examined sausage samples and AL-Dughaym and Altabari (2010) (>10^2cfu/g) for examined chicken meat samples. Nearly similar results of *E.coli* (table2) in the current study were obtained by Abraham, *et al.*(2012) (1.27 log cfu/g) for examined chicken meat.Higher results were achived by Çetin et al.(2010) (2.8×10^3) for examined minced meat samples. *Salmonella* failed to be detected in the examined meat products. This results were agree with the results which achieved by Fathi and thabet (2001) for minced meat examined samples; Abou Hussein-Reham (2004) for examined beef burger samples; Mousa et al. (2016) for examined oriental sausage samples.

Poor microbiological quality was associated with deficient hygiene or enabled workers (Cruz et al. 2005). The factors associated with outbreaks may be attributed to inadequate temperature control, infected food handlers, contaminated raw ingredients, cross contamination and inadequate heat treatment (Rooney et al. 2004).

Conclusion: the highest contaminated products were processed in category C and oriental sausage followed by marinated chicken whole leg was the most contaminated ones. Greater attention from a public health aspect is needed on the quality and safety of these products by application of strict measures for maintaining of consumer health.

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