

Bacteriological Profile of Chicken Meat Products

Fahim A Shaltout^{1*}, Dina I El Zahaby², Lamiaa M Lotfy³ and Hala F El-Shorah¹

¹Department of Food Hygiene, Faculty of Veterinary Medicine, Benha University, Egypt

²Department of Food Hygiene, Animal Health Research, Shebin El-Kom University, Egypt

³Department of Home Economics, Faculty of Specific Education, Kafer el-Sheikh University, Egypt.

Received July 02, 2018; Accepted October 22, 2018; Published October 30, 2018

ABSTRACT

A total of 90 random samples of semi-cooked chicken Pane, Nuggets and Strips products (30 samples of each) were collected from different supermarkets in different districts at Monofia governorate for determination of their bacteriological aspects. The obtained results indicated that the mean values of total bacterial count, total Enterobacteriaceae and total coliforms counts/g in the examined samples were $4.25 \times 10^6 \pm 1.40 \times 10^6$, $5.47 \times 10^4 \pm 1.98 \times 10^4$ and $8.32 \times 10^3 \pm 3.33 \times 10^3$ for pane, $7.12 \times 10^6 \pm 2.11 \times 10^6$, $6.58 \times 10^4 \pm 1.98 \times 10^4$ and $6.87 \times 10^3 \pm 2.00 \times 10^3$ for Nuggets and $5.96 \times 10^6 \pm 1.49 \times 10^6$, $6.19 \times 10^4 \pm 1.30 \times 10^4$ and $5.49 \times 10^3 \pm 2.00 \times 10^3$ for Strips, respectively. Furthermore, *Staphylococcus aureus*, *E. coli* and *Salmonella* could be detected in examined sample with different percentages. The public health significances of isolated bacteria were discussed.

Keywords: Chicken pane, Chicken nuggets, Chicken strips, *Salmonella*, *E. coli*, *Staphylococcus aureus*

INTRODUCTION

Chicken and chicken products provide animal protein of high biological value for consumers at all ages, where they contain all the essential amino acids required for human growth, higher proportion of unsaturated fatty acids and less in cholesterol value. Moreover, chicken meat is not only highly susceptible to spoilage, but also frequently implicated in the spread of food-borne diseases. 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 [1]. Increased consumer awareness and concern about microbial food borne diseases has resulted in intensified efforts to reduce contamination of chicken meat products, as evidenced by new meat and poultry inspection regulation. Moreover, requiring operation of poultry slaughtering and processing plant under the principle of the hazard analysis critical control point (HACCP) system, the new regulation has established microbiological testing criteria for *E. coli* and *Salmonella*, as methods of evaluation plant performance [2]. Therefore, the present investigation was planned out to throw light on the bacteriological profile of the examined samples of chicken meat products.

MATERIALS AND METHODS

Collection of samples

A total of 90 random samples of chicken meat products pane, nuggets and strips, (30 of each) were collected from

different super markets located in Menofia governorate for bacteriological examination. The weight of each sample was about 50 g and each sample was collected and kept in separated sterile plastic bag and put in an icebox and transferred to laboratory under complete aseptic conditions without undue delay to evaluate their bacteriological quality and evaluate the hygienic health hazard of contaminated with some food borne pathogens.

Bacteriological examination

Total bacterial count (aerobic plate count): Determination of aerobic plate count was carried out according to the method recommended by ICMSF (1996) [3].

Total Enterobacteriaceae count: The total Enterobacteriaceae count was done by plating on violet red bile glucose agar medium at 37°C for 24 h through the

Corresponding author: Fahim A Shaltout, Department of Food Hygiene, Faculty of Veterinary Medicine, Benha University, Egypt, E-mail: fahimshaltout@hotmail.com

Citation: Shaltout FA, El Zahaby DI, Lotfy LM & El-Shorah HF. (2018) Bacteriological Profile of Chicken Meat Products. Food Nutr Current Res, 1(3): 83-90.

Copyright: ©2018 Shaltout FA, El Zahaby DI, Lotfy LM & El-Shorah HF. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

method recommended by ISO (2004) [4].

Total Coliforms count: The total coliform count was done by plating on violet red bile agar medium at 37°C for 24 h through the method recommended by ICMSF (1996) [3].

Isolation and identification of *Staphylococcus aureus*:

Total Staphylococci count: The total Staphylococcus count was done by plating on Baird Parker agar plate at 37°C for 48 h through the method recommended by ICMSF (1996) [3].

Identification of *Staphylococci* spp.:

- Morphological examination recommended by Cruickshank et al. [5].
- Biochemical identification recommended by MacFaddin [6].

Isolation and identification of *E. coli*: Isolation was done according to the methods recommended by ICMSF (1996) [3] and identification was done through the following:

- Morphological identification [5].
- Biochemical identification [7].
- Serological identification [8] by using rapid diagnostic *E. coli* antisera sets (DENKASEIKEN Co., Japan) for diagnostic enteropathogenic types.

Isolation and identification of *Salmonella*:

Identification of *Salmonellae*: Suspected isolates of *Salmonella* organisms were identified according to MacFaddin [6].

Serological identification of *Salmonellae*: Serological identification of *Salmonellae* was carried out according to Kauffman-White scheme [9] for the determination of Somatic (O) and flagellar (H) antigens using *Salmonella* antiserum (DENKA SEIKEN Co., Japan).

Statistical analysis

The obtained results were statistically evaluated by application of Analysis of Variance (ANOVA) test according to Feldman et al. [10].

RESULTS AND DISCUSSION

In recent years there is great awareness of food poisoning and how such is of great public health hazards and this is due to consumption of food especially poultry meat and its products contaminated with various hazards kinds of microorganisms from different sources starting from the chicken carcass itself and throughout the processing plant and their products, in the latest many efforts were made to produce food products free from those microbial hazards and of high quality to be fit for human consumption.

It is evident from the result recorded in **Table 1** that the total APC in the examined samples was varied from 2.00×10^2 to 2.40×10^6 cfu/g in chicken Pane, 1.00×10^4 to 3.00×10^6 cfu/g in chicken Nuggets and 1.60×10^5 to 3.00×10^6 cfu/g in chicken Strips with mean value of $4.25 \times 10^5 \pm 1.40 \times 10^5$ cfu/g for chicken Pane, 7.12×10^5 to 2.11×10^5 cfu/g for chicken Nuggets and 5.96×10^5 to 1.49×10^5 cfu/g for chicken strips.

Table 1. Statistical analytical results of total bacterial counts (CFU/g) (APC) in the examined samples (n=30).

Products	Min.	Max.	Mean $\pm$ S.E.M.	S.D
Chicken Pane	2.00×10^2	2.40×10^6	$4.24 \times 10^6 \pm 1.40 \times 10^6$	7.66×10^6
Chicken nuggets	1.60×10^4	3.00×10^6	$7.12 \times 10^6 \pm 2.11 \times 10^6$	1.15×10^7
Chicken Strips	1.60×10^5	3.00×10^6	$5.96 \times 10^6 \pm 1.49 \times 10^6$	8.17×10^6

In other words, there is a no significant difference of total APC between the examined chicken pane, chicken nuggets and chicken strips ($P>0.05$).

Nearly similar results for chicken products were obtained by Hassan [11] and Mohamed [12]. But this results are higher than which obtained by Shaltout [13], Sengupta et al. [14], Ahmed et al. [15], Ibrahim et al. [16], Marwan [17] and Elsayed [18].

The results in **Table 2** indicated that the total Enterobacteriaceae count in the examined samples was ranged from 6.00×10 to 3.00×10^4 with an average value of $5.47 \times 10^4 \pm 1.80 \times 10^4$ cfu/g for chicken Pane, 8.00×10^2 to 3.00×10^4 with an average value of $6.58 \times 10^4 \pm 1.98 \times 10^4$ cfu/g for chicken Nuggets and 8.00×10^2 to 2.40×10^4 with an average value of $6.19 \times 10^4 \pm 1.30 \times 10^4$ cfu/g for chicken strips.

Table 2. Statistical analytical results of total Enterobacteriace counts (CFU/g) in the examined samples (n=30).

Products	Min.	Max.	Mean $\pm$ S.E.M.	S.D
Chicken Pane	6.00×10^2	3.00×10^4	$5.47 \times 10^4 \pm 1.98 \times 10^4$	9.85×10^4
Chicken nuggets	8.00×10^2	3.00×10^4	$6.58 \times 10^4 \pm 1.98 \times 10^4$	1.98×10^4
Chicken Strips	8.00×10^2	2.40×10^4	$6.19 \times 10^4 \pm 1.30 \times 10^4$	7.12×10^4

In other words, there is a no significant difference of total Enterobacteriace between the examined chicken pane, chicken nuggets and chicken strips ($P>0.05$).

Nearly similar results for chicken products were obtained by Vural et al. [19] and Marwan [17]. But this results are higher

than which obtained by Shaltout [13], Kozaciński et al. [1] and Nawar [20] and lower than which obtained by Osman [21] and Saikia and Joshi [22].

The results in **Table 3** indicated that the total coliform count in the examined samples was ranged from 1.70×10 to 9.00

$\times 10^3$ with an average value of $8.32 \times 10^3 \pm 3.33 \times 10^3$ cfu/g for chicken Pane, 8.00×10 to 3.00×10^3 with an average value of $6.87 \times 10^3 \pm 2.00 \times 10^3$ cfu/g for chicken Nuggets and 8.00×10^2 to 3.00×10^3 with an average value of $5.49 \times 10^3 \pm 2.00 \times 10^3$ cfu/g for chicken strips.

Table 3. Statistical analytical results of coliform counts (CFU/g) in the examined samples (n=30).

Products	Min.	Max.	Mean $\pm$ S.E.M.	S.D
Chicken Pane	1.70×10^2	9.00×10^3	$8.32 \times 10^3 \pm 3.33 \times 10^3$	1.82×10^3
Chicken nuggets	8.00×10^2	3.00×10^3	$6.87 \times 10^3 \pm 2.00 \times 10^3$	1.09×10^3
Chicken Strips	8.00×10^2	3.00×10^3	$5.49 \times 10^3 \pm 2.00 \times 10^3$	1.10×10^3

In other words, there is a no significant difference of total Coliform between the examined chicken pane, chicken nuggets and chicken strips ($P > 0.05$).

The current results were nearly similar to those obtained by Cohen et al. [23] and Nawar [20]. These results are higher than which obtained by Javadi and Safarmashaei [24], Ruban and Fairoze [25], but lower than which obtained by Ibrahim et al. [16], Hassan [11] and Marwan [17].

Results achieved in **Table 4** declared that the Staphylococcus count ranged from 1.20×10 to 2.00×10^3 with mean value $2.99 \times 10^3 \pm 9.82 \times 10^3$ for Pane, 2.00×10 to 3.00×10^3 with mean value $6.41 \times 10^3 \pm 1.9 \times 10^4$ for Nuggets and 8.00×10 to 3.00×10^3 with mean value $1.06 \times 10^3 \pm 2.26 \times 10^3$ for Strips.

Table 4. Statistical analytical results of total Staphylococcus counts (CFU/g) in the examined samples (n=30).

Products	Min.	Max.	Mean $\pm$ S.E.M.	S.D
Chicken Pane	1.20×10^2	2.00×10^3	$2.99 \times 10^3 \pm 9.82 \times 10^3$	5.38×10^3
Chicken nuggets	2.00×10^2	3.00×10^3	$6.41 \times 10^3 \pm 1.90 \times 10^4$	1.08×10^3
Chicken Strips	8.00×10^2	3.00×10^3	$1.06 \times 10^3 \pm 2.26 \times 10^3$	1.24×10^3

In other words, there is a highly significant difference of Total Staphylococcus between the examined samples pane, nuggets and strips ($p \leq 0.01$).

These results are come in agreement with Abbas [26], Ibrahim et al. [27], Saif [28], Mohamed [12] and Elsayed [18]. These results are higher than which obtained by

Sengupta et al. [29], but lower than results which obtained by Marwan [17].

The result obtained in the **Table 5** showed that 42 isolates of Coagulase positive *S. aureus* were isolated from examined chicken meat samples represented as 17 (56.60%) from pane samples, 13 (43.30%) from nuggets samples and 12 (40.00%) from strips samples.

Table 5. Incidence of coagulase positive *S. aureus* in examined samples (n=30).

Sample	No.	Positive	
		No.	%
Pane Chicken	30	17	56.60%
Chicken Nuggets	30	13	43.30%
Chicken Strips	30	12	40.00%
Total	90	42	46.60%

These results came in accordance with those obtained by Mohamed et al. [30] and Ali [31]. These results are lower than which obtained by Buyukcangaz et al. [32], Ahmed [33] and Elsayed [18]. But higher than results which

obtained by Kozacins et al. [34], Abo-Samra [35], Abd El-Fattah [36] and Marwan [17].

The results in **Table 6** revealed that the incidence of *E. coli* was 46.6%, 36.6% and 30% of examined samples of chicken pane, nuggets and strips, respectively. This results is nearly

similar to which obtained by Rashid et al. [37] 40%, Ibrahim et al. [24] 33.33% and Hemeda [38] 44%. This results were lower than which obtained by Saikia and Joshi [22] 98% and

Ruban et al. [39] 85.7%, but higher than Samaha et al. [40] 12% and Hasanin et al. [41] 15%.

Table 6. Incidence of *E. coli* in examined samples (n=30).

Sample	No.	Positive	
		No.	%
Pane	30	14	46.60%
Nuggets	30	11	36.60%
Strips	30	9	30.00%
Total	90	34	37.70%

The results in **Table 7** showed that the incidence of serologically identified *E. coli* in Pane, as Enteropathogenic *E. coli* (*E. coli* O₇₈ (13.3%), *E. coli* O₁:H₇ (3.3%) and *E. coli*

O₂:H₁₁ (6.6%), Enterotoxogenic *E. coli* (*E. coli* O₁₂₈:H₂ (6.6%), Enterheamorrhagic *E. coli* (*E. coli* O₉₁:H₂₁ (6.6%) and *E. coli* O₂₆:H₁₁ (3.3%) and enteroinvasive *E. coli* (*E. coli* O₁₁₄:H₄ (3.3%) and *E. coli* O₁₂₄ (3.3%)).

Table 7. Incidence and serotyping of *E. coli* isolated from positive samples of pane products (n=30).

Sample <i>E. coli</i> serotyping	Pane		Strain Characteristics
	No.	%	
O ₇₈	4	13.30%	EPEC
O ₁₂₈ :H ₂	2	6.60%	ETEC
O ₁₁₄ :H ₄	1	3.30%	EIEC
O ₁ :H ₇	1	3.30%	EPEC
O ₉₁ :H ₂₁	2	6.60%	EHEC
O ₂₆ :H ₁₁	1	3.30%	EHEC
O ₂ :H ₆	2	6.60%	EPEC
O ₁₂₄	1	3.30%	EIEC
Total	14	46.60%	-----

The results in **Table 8** revealed that the incidence of serologically identified *E. coli* in Nuggets, as Enteropathogenic *E. coli* (*E. coli* O₇₈ (6.6%), *E. coli* O₁:H₇ (3.3%) and *E. coli* O₂:H₆ (3.3%), *E. coli* O₅₅:H₇ (3.3%) and

E. coli O₁₄₆:H₂₁ (3.3%) , Enterotoxogenic *E. coli* (*E. coli* O₁₂₈:H₂ (3.3%), Enterheamorrhagic *E. coli* (*E. coli* O₉₁:H₂₁ (6.6%) and *E. coli* O₂₆:H₁₁ (3.3%) and *E. coli* O₁₂₁:H₇ (3.3%)).

Table 8. Incidence and serotyping of *E. coli* isolated from positive samples of nuggets products (n=30).

Sample <i>E. coli</i> serotyping	Nuggets		Strain Characteristics
	No.	%	
O ₇₈	2	6.60%	EPEC
O ₁₂₈ :H ₂	1	3.30%	ETEC
O ₉₁ :H ₂₁	2	6.60%	EHEC
O ₂₆ :H ₁₁	1	3.30%	EHEC
O ₂ :H ₆	1	3.30%	EPEC
O ₁ :H ₇	1	3.30%	EPEC
O ₅₅ :H ₇	1	3.30%	EPEC
O ₁₄₀ :H ₂₁	1	3.30%	EPEC
O ₁₂₁ :H ₇	1	3.30%	EHEC
Total	11	36.60%	-----

The results in **Table 9** showed that the incidence of serologically identified *E. coli* in strips as enteropathogenic *E. coli* (*E. coli* O₇₈ (3.3%), *E. coli* O₁:H₇ (3.3%), *E. coli* O₁₄₆:H₂₁ (3.3%) and *E. coli* O₁₆₃:H₂ (6.6%), Enterotoxogenic *E. coli* (*E. coli* O₁₂₈:H₂ (3.3%), Enterhemorrhagic *E. coli* (*E. coli* O₁₂₁:H₇ (3.3%) and *E. coli* O₉₁:H₂₁ (3.3%)).

Table 9. Incidence and serotyping of *E. coli* isolated from positive samples of strips products (n=30).

Sample <i>E. coli</i> serotyping	Strips		Strain Characteristics
	No.	%	
O ₁₆₃ :H ₂	2	6.60%	EPEC
O ₁₄₆ :H ₂₁	1	3.30%	EPEC
O ₁₂₁ :H ₇	1	3.30%	EHEC
O ₁ :H ₇	2	6.60%	EPEC
O ₇₈	1	3.30%	EPEC
O ₉₁ :H ₂₁	1	3.30%	EHEC
O ₁₂₈ :H ₂	1	3.30%	ETEC
Total	9	30.00%	-----

Tables 10-12 revealed that the incidence of Salmonella in examined samples of chicken pane, chicken nuggets and chicken strips were 20%, 16.60% and 6.60%, respectively. This agrees with those reported by Saikia and Joshi [22] 12.37%, Kozacins et al. [34] 7.4%, Khallaf et al. [42]

12.66% and El-Gayar [43] 16% in pane and 8% in nuggets. This results were lower than those reported by Ruban et al. [39] 65.71%, Bhandari et al. [44] 46.2% and Ibrahim et al. [16] 33.33%, but the results were higher than those reported by Colmegna et al. [45] 4.7% and Hemeda [38] 4%.

Table 10. Incidence of identified Salmonella serotypes isolated from examined samples of pane products (n=30).

Sample Isolated bacteria	Pane			Antigenic Structure	
	No.	%	Group	O	H
<i>S. tsevie</i>	1	3.30%	B	4,5	i:e,n,Z ₁₅
<i>S. kentucky</i>	2	6.60%	C3	8,20	i:Z ₆
<i>S. typhimurium</i>	1	3.30%	B	1,4,5,12	i:1,2
<i>S. aveyeme</i>	1	3.30%	C3	8,20	Z ₃₈ :-
<i>S. enteritidis</i>	1	3.30%	D1	1,9,12	g,m:-
Total	6	20.00%	-----	-----	-----

Table 11. Incidence of identified Salmonella serotypes isolated from examined samples of nuggets products (n=30).

Sample Isolated bacteria	Nuggets			Antigenic Structure	
	No.	%	Group	O	H
<i>S. larochelle</i>	1	3.30%	C1	6,7	e,h:1,2
<i>S. typhimurium</i>	2	6.60%	B	1,4,5,12	i:1,2
<i>S. kentucky</i>	1	3.30%	C3	8,20	i:Z ₆
<i>S. tsevie</i>	1	3.30%	B	4,5	i:e,n,Z ₁₅
Total	5	16.60%			

Table 12. Incidence of identified *Salmonella* serotypes isolated from examined samples of strips products (n=30).

Sample	Nuggets			Antigenic Structure	
<i>Isolated bacteria</i>	No.	%	Group	O	H
<i>S. kentucky</i>	1	3.30%	C3	8,20	i:Z ₆
<i>S. enteritidis</i>	1	3.30%	D1	1,9,12	g,m:-
Total	2	6.60%			

CONCLUSION

Salmonella could be identified serologically as *Salmonella typhimurium* (3.3%) in Pana and (6.6%) in Nuggets, *Salmonella enteritidis* (3.3%) in Pana and Strips, *Salmonella tsevie* (3.3%) in Pana and Nuggets, *Salmonella kentucky* (6.6%) in Pana and (3.3%) in Nuggets and Strips. While, *Salmonella apeyeme* isolated only from Pana with percentage (3.3%) and *Salmonella larochelle* (3.3%) in Nuggets. These results were in agreement with that of Nawar [20] and Ibrahim et al. [16] who found that the isolated *Salmonella* was serologically identified as *S. typhimurium*, *S. enteritidis* and *S. kentucky*. Chicken meat products were highly contaminated with food poisoning bacteria [46,47].

REFERENCES

- Kozaćinski L, Hadžiosmanović M, Zdolec N (2006) Microbiological quality of poultry meat on the Croatian market. *Vet Arch* 76: 305-313.
- Sofos JN, Kochevar SL, Reagan JO, Smith GC (1999) Incidence of *Salmonella* on beef carcasses as related to the United States meat and poultry inspection regulations. *J Food Protect* 62.
- International Commission on Microbiological Specification for Foods (ICMSF) (1996) Microorganisms in food - Their significant and methods of enumeration. 3rd Edn. University of Toronto Press, Toronto, Canada.
- International Organization for Standardization (ISO) (2004) Microbiology of food and animal feeding stuffs - Horizontal methods for detection and enumeration of Enterobacteriaceae. Part 2: Colony count method.
- Cruickshank R, Duguid JP, Marmion BP, Swain RHA (1975) Medical Microbiology. 12th Edn. Churchill Livingstone, Edinburgh, London and New York.
- MacFaddin JF (2000) Biochemical tests for identification medical bacteria. Wary Press Inc., Baltimore, Md. 21202, USA.
- Kreig N, Holt J (1984) Bergey's Manual of Systemic Bacteriology. Vol 1, William and Wilkins, Baltimore, M.D.21202, USA.
- Kok T, Worswich D, Gowans E (1996) Some serological techniques for microbial and viral infections. In Practical Medical Microbiology (Collee J, Fraser A, Marmion B. and Simmons A, eds.), 14th Edn, Edinburgh, Churchill Livingstone, UK.
- Kauffman G (1974) Kauffmann white scheme. *J Acta Path Microbiol Sci* 61: 385.
- Feldman D, Ganon J, Haffman R, Simpson J (2003) The solution for data analysis and presentation graphics. 2nd Edn. Abacus Lancrpts, Inc., Berkeley, USA.
- Hassan O (2015) Microbiological status of poultry carcasses from retail outlets in Alexandria province. M.V.Sc., Thesis, Faculty of Veterinary Medicine, Alexandria University, Egypt.
- Mohamed MSE (2016) Frozen chicken meat in quality governmental hospital. M.V.Sc. Thesis (Meat Hygiene), Faculty of Veterinary Medicine, Benha University, Egypt.
- Shaltout F (2002) Microbiological aspects of semi-cooked chicken meat products. *Benha Vet Med J* 2: 17-19.
- Sengupta R, Das R, Ganguly S, Mukhopadhyay SK (2012) Survey on microbial quality of chicken meat in Kolkata, India. *Int J Res Pure Appl Microbiol* 1: 3233.
- Ahmed MUD, Sarwar A, Najeeb MI, Nawaz M, Anjum AA, et al. (2013) Assessment of microbial load of raw meat at abattoirs and retail outlets. *J Anim Plant Sci* 23: 754-748.
- Ibrahim HM, Amin RA, Ibrahim IA, Yunis OF (2014) Isolation of Enterobacteriaceae from poultry products in El-Behera and Alexandria governorates. *Benha Vet Med J* 27: 109-117.
- Marwan HAI (2016) Sanitary status of meat meals at hospital level in Kaliobia Governorate. M.V.Sc. Thesis (Meat Hygiene), Faculty of Veterinary Medicine, Benha University, Egypt.
- Elsayed AE (2017) Effect of some microbial decontamination on slaughtered chicken. M.V.Sc. Thesis, Faculty of Veterinary Medicine (Meat Hygiene) Benha University, Egypt.

19. Vural A, Erkan ME, Yeşilme S (2006) Microbiological quality of retail chicken carcasses and their products in Turkey. *Medycyna Vet* 62: 1371-1374.
20. Nawar AZ (2007) Correlation between salmonella and sanitation level in poultry processing plants. M.V.Sc. Thesis (Meat Hygiene). Faculty of Veterinary Medicine, Benha University, Egypt.
21. Osman EMS (2001) Quality assurance of locally dressed broiler cuts and their products. Thesis (Meat Hygiene) Ph.D. Veterinary Medicine, Cairo University, Egypt.
22. Saikia P, Joshi SR (2010) Retail market poultry meats of north-east India - A microbiological survey for pathogenic contaminant. *Res J Microbiol* 5: 36-43.
23. Cohen N, Ennaji H, Bouchrif B, Hassar M, Karib H (2007) Comparative study of microbiological quality of raw poultry meat at various seasons and for different slaughtering processes in Casablanca (Morocco). *J Appl Poult Res* 16: 502-508.
24. Javadi A, Safarmashaei S (2011) Microbial profile of marketed broiler meat. *Middle East J Sci Res* 9: 652-656.
25. Ruban SW, Fairuze N (2011) Effect of processing condition on microbiological quality of market poultry meats in Bangalore, Ind *J Anim Vet Adv* 10: 188-191.
26. Abbas OM (2011) Evaluation of the HACCP system in the restaurants of the tourism sector. M.V.Sc. Thesis, (Meat Hygiene), Faculty of Veterinary, Benha University, Egypt.
27. Ibrahim HM, Amin El-Shater MA, Hafez Salwa M (2015) Bacteriological evaluation of freshly slaughtered chicken carcasses. *Vet Med J* 28: 74-82.
28. Saif MZMA (2015) Bacterial status of fresh marketed chicken cuts. M.V.Sc. Thesis, Meat Hygiene, Faculty of Veterinary Medicine, Moshtohor, Benha University, Egypt.
29. Sengupta R, Das R, Ganguly S, Mukhopadhyay SK (2011) Commonly occurring bacterial pathogens affecting the quality of chicken meat. *Int J Chem Biochem Sci* 1: 21-23.
30. Mohamed GM, Ebraheem Lubna M, Thabt Manal H (2010) Electrophoretic analysis and immunological characterization of *Staphylococcus aureus* isolated from chicken meat. *Assuit Vet Med J* 56: 127.
31. Ali EA (2011) Microbial and chemical evaluation of fast foods. M.V.Sc. Thesis, (Meat Hygiene), Faculty of Veterinary Medicine, Benha University, Egypt.
32. Buyukcangaz E, Velasco V, Sherwood JS, Stepan RM, Koslofsky RJ, et al. (2013) Molecular typing of *Staphylococcus aureus* and methicillin-resistant *S. aureus* (MRSA) isolated from animals and retail meat in North Dakota, United States. *Food Borne Pathog Dis* 10: 608-617.
33. Ahmed ASOS (2015) Quality of native and imported meat in the Egyptians markets. M. Sc. Thesis (Food Hygiene and Control) Faculty of Veterinary Medicine, Cairo University, Egypt.
34. Kozačins L, Fleck ZC, Kozačinski ZM, Ilipovič IM, Bratulić M, et al. (2012) Evaluation of shelf life of pre-packed cut poultry meat. *Vet Arch* 82: 47-58.
35. Abo-Samra RG (2013) *Staphylococcus aureus*, *Salmonella* spp. and *Listeria monocytogenes* in locally fresh and frozen chicken meat in Dammita city. *Anim Health Res J* 192: 1-10.
36. Abd El-Fattah S (2014) Enteropathogenic bacteria in broiler carcasses and some poultry products. Ph.D. Thesis, Faculty of Veterinary Medicine, Alex. University, Egypt.
37. Rashid M, Kotwal SKK, Malik MA, Singh M (2013) Prevalence genetic profile of virulence determination and multi drug resistance of *E. coli* isolates from foods of animal origin. *Vet World* 6: 139-142.
38. Hemeda NAI (2017) Incidence of some pathogenic bacteria in poultry products. MVSc. Thesis (Meat Hygiene), Faculty of Veterinary Medicine, Alexandria University, Egypt.
39. Ruban SW, Prabhu KN, Kumer GSN (2012) Prevalence of food borne pathogens in markets samples of chicken meat in Bangalore chain reactions. *Int J Microbiol Res* 1: 106-109.
40. Samaha IA, Ibrahim HAA, Hamada MO (2012) Isolation of some enteropathogens from retailed poultry meat in Alexandria province. *Alex J Vet Sci* 37: 17-22.
41. Hasanin FS, Salem AM, Shorbagy EM, Kholy RL (2014) Traditional and recent techniques for detection of *E. coli* in fresh chicken cuts and giblets. *Benha Vet Med J* 26: 21-29.
42. Khallaf M, Ameer N, Terta M, Larkranbi M, Senouci S, et al. (2014) Prevalence and antibiotic resistance of *Salmonella* isolated from chicken meat marketed in Rabat, Morocco. *Int J Innov Appl Stud* 6: 1123-1128.
43. El-Gayar HA (2017): Microbiological quality of some retail chicken products. MVCs. Thesis (Meat Hygiene), Faculty of Veterinary Medicine, Alexandria University, Egypt.
44. Bhandari N, Nepali DB, Paudyal S (2013) Assessment of bacterial load in broiler chicken meat from the retail shops in Chitwan, Nepal. *Int J Infect Microbiol* 2: 99-104.

45. Colmegna S, Invernizzi A, Mascher AL, Corsale E, Ferrazzi V, et al. (2009) Microbiological characteristics of poultry meats - Results of inspection carried out in the province of Milano, Italy. *Ital J Anim Sci* 8: 765-770.
46. Gill CO, Rahn K, Sloan K, McMullen LM (1997) Assessment of the hygienic performances of hamburger patty production processes. *Int J Food Microbiol* 36: 171-178.
47. Jordan E, Egan J, Dullea C, Ward J, Mcglicuddy K, et al. (2006) Salmonella surveillance in raw and cooked meat and meat products in the Republic of Ireland from 2002 to 2004. *Int J Food Microbiol* 112: 66-70.