Bacterial Status of Fresh Marketed Chicken Meat cuts-up

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A B S T R A C T

This study was conducted to evaluate bacteriological contamination of fresh marketed chicken cuts-up, and their hazards on public health. A grand total of 100 random samples of chicken breast and thigh (50 of each)were collected from different retail shops for bacteriological examination. The mean values of APC, Coliform and *staph. aureus* counts(log cfu/g) were7.83±0.01, 4.68± 0.02and 6.88 ± 0.01 in the examined chicken breast samples, respectively, while they were 7.94±0.03, 4.90±0.01,6.79 ± 0.007 and 6.98 ± 0.01 in the examined chicken thigh samples, respectively. The incidence of isolated *E.coli* was higher in the examined thigh samples (88%) than breast samples (70%). Moreover, the serologically identified *E. coli* were Enteropathogenic *E. coli* (O55 :H7,and O78), Enterotoxogenic *E. coli* (O125:H18, O128:H2 and O127:H6), Enteroheamorrhagic *E. coli*(O26 and O111:H4) and Enteroinvasive *E. coli* (O124). The public health importance of the isolated microorganisms and the recommended points were discussed.

Keywords: chicken meat, APC, *Staph. aureus*, coliform, *E.coli*.

1. INTRODUCTION

Chicken meat is one of the most popular food products worldwide. Several nutritional factors such as high level of protein, low fat content and favorable content of unsaturated fatty acids contribute to the popularity of poultry meat, of which sensory, dietary and economic factors are important. Chicken meat is easy to prepare at home and widely used in restaurants and fast-food establishments. (Mulder, 1999). Poultry carcasses and their parts are frequently contaminated with pathogens, which reach the carcasses from intestinal tract or from fecal material on feed and feathers (Dincer and Baysa, 2004). Chicken meats comprise about two-thirds of the total production in the world. (Ruban et al., 2010). Aerobic bacterial count in poultry carcasses can be routinely used as indicators of improper hygiene during processing and incorrect storage conditions, which can lead to proliferation of pathogens, such as salmonella and toxin

production (Zweifel et al., 2005). Fecal coliform can be recorded in great numbers on freshly slaughtered carcasses. Their presence in meat generally indicates direct and indirect contamination of fecal origin, improper handling and storage (Charlebois et al., 1991).

Staphylococcal food poisoning is one of the most common types of food borne disease results from the ingestion of food containing toxin produced by *S.aureus* (Cliver, 1990). Enterotoxins are responsible for symptoms of staphylococcal food poisoning and may have a role in the pathogenicity of some other staphylococcal diseases. Symptoms include nausea, vomition and less frequently diarrhea. Headache, dizziness and weakness are reported in the majority of cases and may cause double vision and other visual disturbances (Varnam and Evans, 1991). Members of Gram negative bacteria such as *E.coli* which associated with human and animal infections causing suppurative

lesions, neonatal septicemia and meningitis (Collins et al.,1991). Therefore, the aim of this study was to evaluate the bacteriological status of fresh marketed chicken cuts-up (breast and thigh).

2. MATERIALS AND METHODS

2.1. Collection of Samples:

100 random samples of chicken cuts(without skin) were (breast and thigh samples,50 of each) were collected from different poultere's shops at El-Kalyobia governorate to be bacteriologically examined .The collected samples were transferred directly to the laboratory in an ice box under complete aseptic conditions without undue delay and then subjected to the following examinations.

2.2. Preparation of Samples(ISO 2003)

Twenty five grams of the samples under examination were homogenized in aseptic blender jar with 225 ml of 0.1 % sterile buffered peptone water at 2000 rpm for 1-2 minutes to provide a homogenate, from which tenth - fold serial dilutions were prepared. The prepared samples were subjected to the following bacteriological examinations.
Determination of aerobic plate count (APHA, 2001). Determination of coliform count (ISO 2004). Isolation and identification of Escherichia coli (ISO 2001). Isolation and identification of *staph. aureus* (FDA, 2001)

3. Results

It is evident from the results recorded in table (1) that the total APC (log cfu/g) in the examined samples varied from 7.58 to 7. 98 with a mean value of 7.83±0.01 for the examined breast samples and from 7.90 to 7.99 with mean value of 7.94±0.03 for the examined thigh samples.
In other words, there is a highly significant difference of APC between the examined samples (thigh and breast) *(P<0.05).*

According to safe permissible limits stipulated by EOS (2005) NO.(1651/2005) for total APC, it is clear that, the result is not compatible to EOS(not exceed 10^5). It is evident from the results recorded in table (2) that the total coliform count (log cfu/g) for the of examined samples varied from 4.45 to 5.00 with a mean value of 4.68± 0.02 for samples the examined breast samples and from 4.56 to 4.99 with a mean value of 4.90±0.01 for the examined thigh samples. In other words, there is significant difference of total coliform count between the examined samples (thigh and breast) (*P*< 0.05). According to safe permissible limits stipulated by EOS (2005) NO. (1651/2005) for total coliform count it is clear that, the result is not compatible to EOS (not exceed 10^2) (Table2). It is evident from the result recorded in table (3) that the *S. aureus* count(log cfu/g)in the examined breast samples varied from 6.80 to 6.98 with amean value of 6.88 ± 0.01 and from 6.85 to7.14 with a mean value of 6.98 ± 0.01 for the examined thigh samples. In other words, there is significant difference of *Staph .aureus* count between the examined samples (thigh and breast) (*P*< 0.05).
According to safe permissible limits stipulated by EOS (2005) NO. (1651/2005) for the *staph. aureus* count is clear that, the result is not compatible to EOS (free). (Table 3). Results achieved in table (4) indicated that *E.coli* was isolated from 70% and 88% of examined samples of chicken breast and thigh respectively. Moreover, the incidences of serologically identified *E. coli* were Enteropathogenic *E. coli* (24%) (O55:H7 and O78) Enterotoxogenic *E. coli* (78%) (O125:H18, O127: H6 and O128:H2) Enterheamorrhagic *E. coli* (40%) (O26 and O111:H4) and Enteroinvasive *E. coli* (16%) (O124). By comparing results with those obtained by EOS (2005) NO. (1651/2005) the results are not compatible to EOS for chicken carcasses (free *E. coli*) (Table4).

Table (1): Statistical analytical results and acceptability of Aerobic plate counts (APC) (log cfu/g) in the examined samples of chicken breast and thigh (n=50).

Chicken cuts-up samples	+ve Samples		Min.	Max.	Mean ± SEM*	MPL**	Accepted samples		Unaccepted samples	
	No.	%					No.	%	No.	%
Breast	50	100	7.58	7.98	7.83 ± 0.01	5	-	-	50	100
Thigh	50	100	7.90	7.99	7.94±0.03***	5	-	-	50	100

*SEM = Standard error of mean. ** MPL = Maximum permissible limit according to (EOS, 1651/ 2005). *** Significant difference (*P*<0.05).

Table (2): Statistical analytical results and acceptability of total coliform count (log cfu/g) in the examined samples of chicken breast and thigh (n=50).

Chicken cuts-up samples	+ve samples		Min.	Max.	Mean±SEM*	MPL**	Accepted samples		Unaccepted samples	
	No.	%					No.	%	No.	%
Breast	43	86	4.45	5.00	4.86 ± 0.02	2	7	14	43	86
Thigh	47	94	4.56	4.99	4.90±0.01***	2	3	6	47	94

*SEM = Standard error of mean. ** MPL = Maximum permissible limit according to (EOS, 1651/ 2005). *** Significant difference (*P*<0.05).

Table (4) Statistical analytical results and acceptability of *S. aureus* count (log cfu/g) in the examined samples of chicken meat breast and thigh. (n=50).

Chicken cuts-up samples	+ve samples		Min.	Max.	Mean±SEM*	MPL**	Accepted samples		Unaccepted samples	
	No.	%					No.	%	No.	%
Breast	27	54	4.14	4.95	4.66 ± 0.01	free	-	-	27	54
Thigh	33	66	4.23	5.93	4.94±0.01***	free	-	-	33	66

*SEM = Standard error of mean. ** MPL = Maximum permissible limit according to (EOS, 1651/ 2005). *** Significant difference (*P*<0.05).

4. DISSCUSION

Aerobic plate counts are acceptable measure of the general degree of bacterial contamination and the hygienic conditions of processing plants (Cohen *et al.*, 2007). Nearly similar results of APC were obtained by Ebeid (1996) (7.23 log cfu/g) and Hasan-Ola (2015) (7.60 log cfu/g) while lower APC in chicken meat was obtained by Oumokhtar (2000) (4.46 log cfu/g) and Chaiba *et al.* (2007) (5.41 log cfu/g). The higher APC in the examined samples was due to slaughtering and sale of chicken meat

in the same place, which provokes cross contamination of the carcasses. Moreover, the carcasses are kept at ambient temperature, which allow the

Table (5): Incidence of E. coli isolated from the examined samples of chicken breast and thigh

E.coli Strains	Breast		Thigh		Strain characteristics
	No.	%	No.	%	
O26	4	8	6	12	EHEC
O55 : H7	3	6	7	14	EPEC
O78	-	-	2	4	EPEC
O111 : H4	4	8	6	12	EHEC
O124	8	16	-	-	EIEC
O125 : H18	9	18	11	22	ETEC
O127 : H6	6	12	5	10	ETEC
O128 : H2	1	2	7	14	ETEC
Total	35	70	44	88	

EPEC = Enteropathogenic *E. coli*, ETEC = Enterotoxigenic *E. coli*, EIEC = Enteroinvasive *E. coli*, EHEC= Enterohaemorrhagic *E. coli*

Multiplication of mesophilic microorganisms. As well as, the chopping tables manufactured from wood were found to be the same every day without proper cleanliness. Enhancing the chance of cross contamination for uninfected carcass. Detection of coliforms is used as an indicator of water pollution or as a general indicator of sanitary condition in the food-processing environment. The current results of coliform count are nearly similar to those obtained by Vural et al. (2006) (4.92 log cfu/g) and Javadi and Safaramashaei (2011) (4.04 log cfu/g). In addition, higher coliform counts were obtained by Amara (1994) (5.56 log cfu/g**)** and Hegazy (1995) (7.36 log cfu/g) and lower coliform counts were obtained by Chabia (2007) (3.99 log cfu/g) and Huong et al. (2009) (2.84 log cfu/g). High coliform counts indicated poor hygienic quality of meat. The contamination with coliforms may occur during slaughtering, cutting or dressing of carcasses.Soiled hands, shopping blocks or knives used for handling and cutting or contaminated water were considered as sources of coliforms in meat (Yadav et al.*,* 2006). The presence of *Staph. aureus* in foods commonly indicates contamination that may be directly introduced into the food by workers who have skin lesions

containing *S. aureus*, or sneezing or coughing. Lower counts were obtained by Ibraheem- Ghada (1997) (4.72 log cfu/g) and El-Morsi (1998) (4.49 log cfu/g). The presence of *E.coli* in high numbers indicates the presence of organisms originating from fecal pollution. This is due to improper slaughtering techniques, contaminated surfaces and/or handling of the meat by infected food handlers (Nel et al., 2004).

Nearly similar results of *E.coli* were obtained by Hamada (2012) 86% and Hasan-Ola (2015) 80% and higher results were obtained by Huong *et al.* (2009) 100% and lower results were obtained by Lee et al. (2009) 4.6% and Hossam (2012) 8%. Finally, it can be concluded from the present study that chicken meat possess a higher number of microorganisms with significant risks of meat spoilage and contamination. In addition, these results may be attributed to unsanitary condition , cross contamination , fecal pollution , personal hygiene and during handling , packaging , storage , distribution and selling . Therefore, a concerted effort should be made to maintain sanitary condition in processing, preparation and handling. Therefore, to produce chicken meat with high quality to safeguard consumer's health "fit for human consumption ", the following

suggestion and recommendations should be taken into consideration to prevent or even minimize contamination of chicken meat with microorganisms. Periodical examination of workers and hand washing facilities should be present. Periodical sanitation of utensils, chilling rooms and freezing cold stores. Proper hygienic measures should be considered during handling, packing, transportation and storage of poultry carcasses. The carcass of chicken should be refrigerated immediately after slaughter to prevent or retard the growth of microorganisms. -All poultry establishments should develop and implement a system of preventive control designed to improve the safety of their products, known as HACCP (Hazard Analysis and Critical Control Points).

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