MICROBIAL QUALITY OF CHICKEN BROILER CARCASSES

*Nader, Y. Mostafa ;*Ghada , A .K. Kirrella; **Ahmed, M. ELgaml and **Heba, M. M. Kamouh*

*Food Control Dept, Faculty of Veterinary Medicine, Kafrelsheikh University, Egypt

**Animal Health Research Institute, Mansoura branch, Egypt

ABESTRACT

A total of 130 random samples of chicken carcasses including; 60 of frozen chicken carcasses, and 70 of freshly slaughtered chicken carcasses were collected from different private poultry shops, supermarkets and retailing shops in EL Gharbia Governate.

It was found that TAC ranged from 5×10^3 to 2.80×10^6 and 1×10^5 to 1.79×10^8 with a mean value $3.2\times10^5\pm5.5\times10^4$ and $3.41\times10^7\pm 5.42\times10^6$ cfu/g in frozen and freshly slaughtered chicken carcasses, respectively .Also, it was recorded that the mean values of TCC in frozen and freshly slaughtered chicken carcasses $1.5\times10^2\pm1.16\times10$ and $4.07\times10^4\pm5.09\times10^3$ cfu/g respectively. Furthermore, pathogenic E. coli was isolated from frozen and fresh chicken carcasses samples with an incidence of 10% and 5%, respectively. The identified strains of Enteropathogenic E. coli from examined frozen and fresh chicken carcasses were O128:H2, O111:H4, O26:H11, O142, O55:H7 and O119:H4. In addition, total Staphylococcal count was done and it ranged in frozen and freshly slaughtered chicken carcasses from 5×10 to 2.04×10^5 and 2.00×10^3 to 2.08×10^6 with a mean value $1.75\times10^4\pm 5.37\times10^3$ and $2.26\times10^5\pm 4.57\times10^4$ cfu/g. The rate of isolation of Staph.aureus in frozen chicken carcasses and freshly slaughtered chicken carcasses was 15 (9 isolates) and 20% (14 isolates),

respectively Finally, it was found that total mould and yeast count in frozen and freshly slaughtered chicken carcasses ranged from 5×10 to 1.75×10^3 and 3.00×10^2 to 1.5×10^6 with a mean value $3.43 \times 10^2 \pm 5.78 \times 10$ and $1.83 \times 10^5 \pm 3.98 \times 10^4$ cfu/g respectively. also the rate of isolation of salmonella 0,10% from frozen and fresh chicken carcasses samples, respectively .Accordingly from the chicken carcasses possessed significant number of bacteria with significant risk of carcasses spoilage and public healthhazards.

Key words: Microbial quality,broilers carcasses,Aerobic bacterial counts, coliform counts, Staphylococcal counts, *Staph. aureus ,Salmonella,E.coli.*

INTRODUCTION

Poultry meat is more popular as it is easy digestible and accepted by majority of people so its consumption had dramatically increased in recent decades all over the world rather than any meat type *(Sams, 2001).* However, poultry and poultry meat products have been implicated as major sources of Salmonella infection in human *(Amavisit et al., 2001).*

Microbial conditions of poultry meat depend mainly on the initial bacterial load and the microbial species carried on the skin, in the gastro-intestinal tract or in the muscle, which are influenced by farm practices and, most of all, by slaughtering procedures *(Mexis et al., 2012).*

Microorganisms enter the food by raw ingredients, water, environmental cross contamination, inadequate sanitation and poor handling practices during cooking and serving. Certain microbial contamination of food is an indicator of poor sanitary practice in the

preparation and storage of foods. Mishandling in foodservice establishments can contribute significant outbreak of food-borne diseases *(Frazier &Westhoff, 2001)*.

Coliform may be fecal or non fecal in origin. The high count of coliforms on chicken carcasses taken after evisceration might be due to the contamination of the carcasses from the intestinal contents and cross contamination from the eviscerating table. Coliform count is used as an index of the overall hygienic condition prevailing during the processing of food *(Koenacki and Johnson 2001)*.

The standard counting of mesofile bacteria is used as an indication of the hygienic quality of the food. The index of *totalcoliforms* evaluates the hygienic conditions and the index of fecal coliforms is used as an indication of fecal contamination *(Cardoso et al., 2000)*.

Yeast contamination of food is considering a useful indicator to evaluate the food quality. The degree of deterioration is an essential component for microbiological assurance programs *(Marta et al., 2001).*

Staphylococcus aureus may contaminate poultry meat and poultry products during processing and contamination of poultry meat depends, in particular, on the production techniques and methods such as the rearing conditions of the animals, transport conditions of live animals, scalding and plucking procedures and, to a large degree, on the evisceration techniques *(Ellerbroek, 2004)*.

Food borne salmonellosis due to *Salmonella typhimurium* and *Salmonella enteritidis* are transmitted to human by the animal reservoirs of Salmonella infection and through food such as contaminated milk, meat, poultry meat, eggs and their products with infective dose *(Humphrey, 2006)*.

E. coli O157:H7 causes severe illnesses and a low infective dose is required for infection, it is considered one of the most serious food borne pathogens *(Teunis et al.,2004)*.

The aim of the present work lies in:

1. Determination of the required sanitary measures to minimize the possible hazards of consuming poultry meat.

2. Investigation of the prevalence of food poisoning microorganisms in chicken broiler meat as well as discuss the public health importance of the isolated microorganisms.

3. Securing the following information about bacteriological evaluation of frozen and freshly slaughtered chicken carcasses for aerobic bacterial count , coliform count, staphylococcus count , yeast &mold count and isolation and identification of(*Staph aureus*, *Salmonella* and *E.coli*)

MATERIALS AND METHODS

1. Collection of samples:

A total of 130 poultry carcass were randomly collected from different shops and supermarkets at EL Gharbia Governorate (Egypt) aseptically in separate sterile plastic bag, each sample was subjected to bacteriological examination (total bacterial count, coliforms count, total staphylococcus count ,total yeast and mould count , *Staphylococcus aureus* isolation and *Salmonella* isolation, *Ecoli* isolation) .

Frozen chicken meat kept in deep-freezers (temperature -18 ℃), and fresh chicken meat in cooling showcases (temperature +4 ℃). TheSamples were transported to the laboratory immediately after collection in an ice box and tested upon arrival or stored at 2°C for no longer than 4hours.

2. <u>Preparation of samples</u> *(APHA, 1992)*:

Ten grams of each sample were aseptically transferred into a sterile flask containing 90 ml of 0.1% sterile peptone water homogenized for 2 minutes to get a dilution of 10^{-1}. From this dilution, tenth fold serial dilutions up to 10^{-10} were done.

3. <u>Microbiological examination:</u>

3.1.<u>Determination of total aerobic bacterial count</u> *(APHA 2001)*

3.2. <u>Determination of Total coliforms count</u> (ICMSF, 1978)

The suspected colonies were purified and identified as follow:

<u>Morphological examination:</u>

  I. <u>Staining</u> *(Cruickshank, Duguid et al. 1975)*

  II. <u>Motility test</u> *(ICMSF 1996)*

<u>Biochemical identification</u> *(FDA 1998):*

  I. <u>IMVIC pattern</u>

  II. <u>Urea hydrolysis test</u>

  III. <u>Sugar fermentation test</u>

  IV. <u>Triple sugar iron test</u>

<u>Serological identification of isolated culture:</u>

The Escherichia coli strains presumed to be Ecoli O157 were serologically confirmed using IGM antibodies to O157 according to instruction of the manufacture.

3.3. Determination of Staphylococcus *(ISO 6888, (1999):*

The suspected colonies were purified and identified as follow:

Morphological examination:

   I. <u>Staining</u> *(Cruickshank, Duguid et al. 1975)*

  II. <u>Motility test</u> *(ICMSF 1996)*

 III. <u>Biochemical identification:</u>

    A. <u>Catalase activity testb</u> *(MacFaddin,1976)*

    B. <u>Detection of haemolysis</u> *(Baily and Scott, 1978)*

    C. Mannitol *test (Baily and Scott, 1978)*

    D. <u>Coagulase test</u> *(APHA, 2001)*

3.4. Determination of total mould count (ICMSF) (1978)

3.5. Determinationof Salmonella (ISO 6579, (2002)

The suspected colonies were purified and identified as follow:

a) H2S production using Triple sugar iron Agar (TSI).

b) Lysine decarboxylase in Lysine Iron Agar.

c) Urea hydrolysis in urea agar.

d) Indole test

e) MR test

f) VP test

g) Simmons Citrate

RESULTS

Table (1): Microbial profile of the examined broiler carcass samples.

Group	No.	% of pos samples	Mean± S.E
Total aerobic count			
Fresh	70	100%	$3.41\times10^7\pm 5.42\times10^6$
Frozen	60	100%	$3.2\times10^5\pm 5.5\times10^4$
Total coliform count			
Fresh	70	100%	$4.07\times10^4\pm 5.09\times10^3$
Frozen	60	60%	$1.5\times10^2\pm 1.16\times10$
Total staphylococcus count			
Fresh	70	100%	$2.26\times10^5\pm 4.57\times10^4$
Frozen	60	86.67%	$1.75\times10^4\pm 5.37\times10^3$
Total yeast & mold count			
Fresh	70	100%	$1.83\times105 \pm 3.98\times104$
Frozen	60	86.67%	$3.43\times10^2\pm 5.78\times10$

Table (2): Incidence of pathogenic microorganisms in the examined broiler carcass samples.

Bacterial Group	No.	N of pos samples	% of pos samples
Staphylococcus aurus			
Fresh	70	21	30%
Frozen	60	9	15%
salmonella			
Fresh	70	7	10%
Frozen	60	0	0%
Ecoli			
Fresh	70	7	10%
Frozen	60	3	5%

Table (3): Serotyping of Salmonellae isolated from the examined poultry carcasses samples.

No	Identified strains	Group	Positive samples		Antigenic structure	
			No.	%	O	H
1	*Salmonella Enteritidis*	D1	2	1.4	1,9,12	g,m.,
2	*Salmonella Typhimurium*	B	3	2.1	1,4,5,12	i:1,2
3	*Salmonella Kentucky*	C3	1	0.7	8,20	i:z6
4	*Salmonella Muenster*	E1	1	0.7	3,10,15,34	e,h:1,5

Table (4): Serotyping of *E.coli* isolated from the examined poultry carcasses samples.

No	Identified strains	Serodiagnosis	Strain characterization
1	*E.coli*	O128:H2	ETEC
2	*E.coli*	O111:H4	EHEC
3	*E.coli*	O26:H11	EHEC
4	*E.coli*	O142	EPEC
5	*E.coli*	O55:H7	EPEC
6	*E.coli*	O119:H4	EPEC

DISCUSSION

Total aerobic bacterial count:

The total aerobic bacterial count indicates the hygienic practices applied during processing and keeping quality of meat products and 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***).

The results obtained in table (1) showed that 100% of examined fresh and frozen poultry carcass samples were ranged from 5×10^4 to 1.79×10^8 and 5×10^3 to 2.80×10^6 with a mean value of $3.42 \times 10^7 \pm 5.42 \times 10^6$ and $3.2 \times 10^5 \pm 5.5 \times 10^4$, respectively**.**

Nearly similar results were reported by ***Ola (2015)*****.** While lower results were reported by ***Nassar (2013)*****,** ***Abukora (2012)*****,** ***Khlifa et al., (2005)*** and ***Samar (2011)*** while higher results were reported by ***Ibrahim (2013)*** in fresh poultry carcass samples, while in frozen poultry carcass samples nearly similar results were reported by ***Ola (2015)*****.**

Total coliform count:

High coliforms counts indicate 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 (***Yadav et al., 2006***).

The results obtained in table (1) showed that 100% and 60% of fresh and frozen poultry carcass samples were contaminated with coliform and the total Coliform counts were ranged from 3×10^2 to 1.22×10^5 and 4×10 to 2.95×10^2 with mean values of $4.07 \times 10^4 \pm$

5.09×10^3 and $1.5 \times 10^2 \pm 1.16 \times 10$, respectively. Nearly similar results were reported by *Ola (2015)* in both fresh and frozen poultry carcass samples but lower result reported by *Ibrahim (2013)* and *Daoud et al,. (2012)*.

Total staphylococcal count:

The high count of Staphylococci in these products is indicative of a human handling contamination as these organisms are the commensals of human skin and mucosal surfaces and also related to unhygienic practices during different stages of processing and marketing *(Mottin et al., 2010)*.

Results obtained in table (1) revealed that 100% and 86.67% of fresh and frozen poultry carcass samples were contaminated with Staphylococci with a count ranged from 2.00×10^3 to 2.08×10^6 and 5×10 to 2.04×10^5 with a mean value $2.26 \times 10^5 \pm 4.57 \times 10^4$ and $1.75 \times 10^4 \pm 5.37 \times 10^3$, respectively.

Nearly similar results were reported by *Ola (2015)* in both fresh and frozen poultry carcass samples while the lower results were reported by *Ibrahim (2013)* in fresh poultry carcass samples.

Total mold and yeast count:

Yeast contamination of food is considering a useful indicator to evaluate the food quality. The degree of deterioration is an essential component for microbiological assurance programs *(Marta et al., 2001)*.

Results obtained in table(1) revealed that 100% and 86.67% of fresh and frozen poultry carcass samples were contaminated with yeast and mold with a count ranged from 3.00×10^2 to 1.5×10^6 and 5 to 1.75×10^3 with a mean value $1.83 \times 10^5 \pm 3.98 \times 10^4$ and $3.43 \times 10^2 \pm 5.78 \times 10$, respectively.

Lower results were reported by ***Ola (2015)*, *Ibrahim (2013), Abd-Elrahman (2013) and Captia et al, (2001)***, Higher result obtained by ***Nassar(2013)*** while nearly similar results were reported by ***Ola (2015)*** in frozen poultry carcass samples.

Incidence of *S. aureus*:

Staph auras according to colonial characters and 30% and 15% according to biochemical identification, lower results were obtained by ***Cohen et al,. (2007) and Capita et al,. (2001)*** While the higher results were obtained by ***Nassar (2013), Ibrahim (2013)*** and ***Abukora (2012).***

Isolation and identification of Salmonellae:

Table (2) showed that 10 of examined fresh poultry carcass samples according to biochemical identification presumed to contain salmonella organisms.

Nearly similar results were obtained by ***Abukora (2012)*** and ***Kozacinski et al., (2006)*,** Lower results were obtained by ***Mohamed et al., (2012) and Carvalho et al.,(2002)***. Higher results were obtained by ***Ejeta et al., (2004)*** and ***Nassar (2013)***, while *salmonella* could not detected in any samples in frozen poultry meat according to ***Moharum (2005)***, and higher results were obtained by ***Tessari et al. (2008)*.**

The higher rate of incidence of Salmonella could be attributed to lack of proper cold chains, inadequate power supply, and low levels of hygiene in retail outlets ***Bhattacharya and Dash (2007)*.**

Isolation and identification of *E.coli O 157: H7*:

Table (2) showed that10, 5% of the examined fresh and frozen poultry carcass samples according to biochemical identification positive for *Ecoli*.

Higher results obtained by ***Nassar (2013),*** the lower results obtained by ***Abukora (2012),*** while in frozen poultry meat higher results obtained by ***Elnawawi (2012)*** and lower results obtained by ***Tolba (2000) and Biswas (2008)***.

The results recorded that 0% of examined fresh poultry meat, and frozen poultry meat samples for presence of *E.coli O157:H7*.nearly similar results obtained by ***Tolba (2000),*** but higher results obtained by ***Kihal and Barka (2010).***

CONCLUSION

Informations given by the obtained results, allow to conclude that, the majority of chicken meat samples were highly contaminated and exceeded the permissible limits that recommended by the Egyptian authority and this reflect the unhygienic measures and unsuitable environmental condition during processing and handling, thus it is of a great importance to have an established program of Plant employee education and training in proper food handling technique and food protection principles that stress the dangers of poor personal hygiene and unsanitary practices as well as uneffecient storage and low quality of raw materials.

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الجوده الميكروبيه لذبائح دجاج التسمين

نادر يحيي مصطفي * , **غاده عبدالعاطي كامل خيرالله*** , **أحمد محمد الجمل**** ,

هبه مصطفى محمد قموح**

* *كلية الطب البيطري– جامعة كفر الشيخ -قسم الرقابة الصحية على اللحوم*

** *معهد بحوث صحة الحيوان – فرع المنصورة*

اجريت هذه الدراسة علي بعض منتجات اللحوم في محافظه الغربية وذللك لتقييم الجودة البكتريولوجية لهذه المنتجات المتداوله في الاسواق وذلك تم تجميع 130عينه عشوائيه (70 عينه دجاج طازج , 60 عينه دجاج مجمد) من بعض المحلات والسوبر ماركت المختلفة بمحافظه الغربية وقد تم ارسال هذه العينات علي وجه السرعه وتحت الظروف الصحيه الممكنه المشددهالي المعمل ليتم فحصها بكتريولوجيا .

وقد دلت النتائج على أن متوسط العدد الكلي للميكروبات الهوائية في كلا من عينات الدجاج الطازج والمجمد كالتالى (3,41 × 10^7 ± 5,42 ×10^6) و(3,2 × 10^5 ± 5,5 ×10^4) على التوالى. كما أظهرت النتائج أن متوسط العدد الكلي للبكتيريا القولونية في عينات الدجاج الطازج والمجمد كالتالى (4,07 × 10^4 ± 5,09 ×10^3) و (1,5 ×10^2 ± 1,16 ×10) على التوالى .وقد كان متوسط العدد الكلي للميكروب المكور العنقودي في عينات الدجاج الطازج والمجمد كالتالى (2,26 × 10^5 ± 4,57 ×10^4) و (1,75×10^4± 5.37 × 10^3) على التوالى .وبالنسبه للعد الكلى للفطريات والخمائر:وقد كان متوسط العدد الكلي للفطريات والخمائر في عينات الدجاج الطازج والمجمد كالتالى (1,83 ×10^5± 3,89 × 10^4) و (3,43×10^2± 5.78 × 10) على التوالى . وقد تم عزل ميكروب المكور العنقودي الذهبي من عينات الدجاج الطازج والمجمد بنسب 30% و 15 % علي التوالي .كما تم عزل ميكروب السالمونيلا من عينات الدجاج الطازج بنسبه 10 % ولم يتم عزل الميكروب من عينات الدجاج المجمد . وكانت العترات المعزوله هي S. Kentucky, S.Entritidis. S.Typhimurium و S. muenster.ولم يتم عزل الميكروب من كلا من الدجاج الطازج والمجمد.