MICROBIAL QUALITY OF CHICKEN BROILER CARCASSES

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ABSTRACT

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 $5 \times 10^3$ to $2.80 \times 10^6$ and $1 \times 10^5$ to $1.79 \times 10^8$ with a mean value $3.2 \times 10^5 \pm 5.5 \times 10^4$ and $3.41 \times 10^7 \pm 5.42 \times 10^6$ 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 $1.5 \times 10^2 \pm 1.16 \times 10^4$ and $4.07 \times 10^4 \pm 5.09 \times 10^3$ 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 $5 \times 10^5$ to $2.04 \times 10^5$ and $2.00 \times 10^3$ to $2.08 \times 10^6$ with a mean value $1.75 \times 10^4 \pm 5.37 \times 10^3$ and $2.26 \times 10^5 \pm 4.57 \times 10^4$ 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 $5 \times 10^3$ to $1.75 \times 10^5$ and $3.00 \times 10^2$ to $1.5 \times 10^6$ with a mean value $3.43 \times 10^2 \pm 5.78 \times 10^3$ 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 health hazards.

**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 gastrointestinal 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 total coliforms 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 ºC), and fresh chicken meat in cooling showcases (temperature +4 ºC). The Samples were transported to the laboratory immediately after collection in an ice box and tested upon arrival or stored at 2ºC for no longer than 4hours.
2. **Preparation of samples (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. **Microbiological examination:**

3.1. **Determination of total aerobic bacterial count (APHA 2001)**

3.2. **Determination of Total coliforms count (ICMSF, 1978)**

The suspected colonies were purified and identified as follow:

**Morphological examination:**

I. **Staining (Cruickshank, Duguid et al. 1975)**

II. **Motility test (ICMSF 1996)**

**Biochemical identification (FDA 1998):**

I. **IMVIC pattern**

II. **Urea hydrolysis test**

III. **Sugar fermentation test**

IV. **Triple sugar iron test**

**Serological identification of isolated culture:**

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. **Staining** *(Cruickshank, Duguid et al. 1975)*

II. **Motility test** *(ICMSF 1996)*

III. **Biochemical identification:**

A. Catalase activity test *(MacFaddin, 1976)*

B. Detection of haemolysis *(Baily and Scott, 1978)*

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

D. Coagulase test *(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.

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>% of pos samples</th>
<th>Mean ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aerobic count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>100%</td>
<td>3.41×10⁷ ± 5.42×10⁶</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>100%</td>
<td>3.2×10⁶ ± 5.5×10⁴</td>
</tr>
<tr>
<td>Total coliform count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>100%</td>
<td>4.07×10⁴ ± 5.09×10³</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>60%</td>
<td>1.5×10⁵ ± 1.16×10³</td>
</tr>
<tr>
<td>Total staphylococcus count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>100%</td>
<td>2.26×10⁴ ± 4.57×10⁴</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>86.67%</td>
<td>1.75×10⁷ ± 5.37×10³</td>
</tr>
<tr>
<td>Total yeast &amp; mold count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>100%</td>
<td>1.83×10⁵ ± 3.98×10⁴</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>86.67%</td>
<td>3.43×10⁷ ± 5.78×10⁵</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Bacterial Group</th>
<th>No.</th>
<th>N of pos samples</th>
<th>% of pos samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aurus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>21</td>
<td>30%</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>salmonella</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>7</td>
<td>10%</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Ecoli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh</td>
<td>70</td>
<td>7</td>
<td>10%</td>
</tr>
<tr>
<td>Frozen</td>
<td>60</td>
<td>3</td>
<td>5%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>No</th>
<th>Identified strains</th>
<th>Group</th>
<th>Positive samples</th>
<th>Antigenic structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Salmonella Enteritidis</td>
<td>D1</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>Salmonella Typhimurium</td>
<td>B</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>3</td>
<td>Salmonella Kentucky</td>
<td>C3</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>Salmonella Muenster</td>
<td>E1</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>No</th>
<th>Identified strains</th>
<th>Serodagnosis</th>
<th>Strain characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E.coli</td>
<td>O128:H2</td>
<td>ETEC</td>
</tr>
<tr>
<td>2</td>
<td>E.coli</td>
<td>O111:H4</td>
<td>EHEC</td>
</tr>
<tr>
<td>3</td>
<td>E.coli</td>
<td>O26:H11</td>
<td>EHEC</td>
</tr>
<tr>
<td>4</td>
<td>E.coli</td>
<td>O142</td>
<td>EPEC</td>
</tr>
<tr>
<td>5</td>
<td>E.coli</td>
<td>O55:H7</td>
<td>EPEC</td>
</tr>
<tr>
<td>6</td>
<td>E.coli</td>
<td>O119:H4</td>
<td>EPEC</td>
</tr>
</tbody>
</table>
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 $5 \times 10^4$ to $1.79 \times 10^8$ and $5 \times 10^3$ to $2.80 \times 10^6$ 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 $3 \times 10^2$ to $1.22 \times 10^5$ and $4 \times 10^2$ to $2.95 \times 10^2$ with mean values of $4.07 \times 10^4 \pm$
5.09×10³ and 1.5×10² ± 1.16×10, 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 2.00×10³ to 2.08×10⁶ and 5×10 to 2.04×10⁵ with a mean value 2.26×10⁵ ± 4.57×10⁴ and 1.75×10⁴ ± 5.37×10³, 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 3.00×10² to 1.5×10⁶ and 5 to 1.75×10³ with a mean value 1.83×10⁵ ± 3.98×10⁴ and 3.43×10² ± 5.78×10, 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* O157: H7:

Table (2) showed that 10.5% of the examined fresh and frozen poultry carcass samples according to biochemical identification positive for *E. coli*.

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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الميكروب电影节 لذبائح دجاج التسمين

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** معهد بحوث صحة الحي - فرع المنصورة

أجريت هذه الدراسة على بعض منتجات اللحوم في محافظه الغربية وذلك لتقييم الجودة البكتريولوجية لهذه المنتجات المتداولة في الأسواق وذلك تم تجميع 130 عينة عشوائية (70 عينة دجاج طازج، 60 عينة دجاج مجمد) من بعض المحلات والسوبر ماركت المختلفة بمحافظه الغربية وقد تم إرسال هذه العينات علي وجه السرعة وتحت الظروف الصحية الممكنه المشددهالي للمعمل ليتم فحصها بكتريولوجيا.

وقد دلت النتائج على أن متوسط العدد الكلي للميكروبيات الهوانية في كل بنا من عينات الدجاج الطازج والمجمد كانت أعلى (41 ± 3,41 × 10^6) و(3,2 × 10^5 ± 5,5 × 10^4) للتوالي. كما أظهرت النتائج أن متوسط العدد الكلي للبلوكيريا القولونية في عينات الدجاج الطازج والمجمد كانت أعلى (1,5 ± 1,6 × 10^2) و(1,16 ± 1,0 × 10^4) على التوالي. وقد كا أن متوسط العدد الكلي للميكروب المكور العنقودي في عينات الدجاج الطازج والمجمد كانت أعلى (2,26 ± 10^5 ا و (5,37 ± 10^4) على التوالي. وبالنسبة للعدد الكلي للبكتيريا والخمائر: فقد كان متوسط العدد الكلي للبكتيريا والخمائر في عينات الدجاج الطازج والمجمد كانت أعلى (1,83 ± 10^5 ا و (3,43 × 10^4) على التوالي. وقد تم عزل ميكروب المكور العنقودي الذهبي من عينات الدجاج الطازج والمجمد بنسبة 30% و 15% على التوالي. كما تم عزل ميكروب السالمونيلا من عينات الدجاج الطازج بنسبة 10% ولم يتم عزل الميكروب من عينات الدجاج المجمد. وكانت العثورات المعزولة هي S. Typhimurium، S. Enteritidis، S. Kentucky و S. Muenster.