Hygienic quality of chicken meat fillet sold at Sharkia governorate

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Chicken meat is an excellent source of high quality protein, minerals and vitamins in addition to low fat and cholesterol level compared with red meat. A total of hundred chicken meat samples collected from poultry slaughter houses in Zagazig city, Sharkia governorate, Egypt. The samples were subjected to organoleptic and bacteriological examination. The organoleptic characters of all examined chicken fillet samples was normal (100%). The mean count of Aerobic plat count, Psychrotrophic, *Enterobacteriaceae* and Staphylococci ranged from 6.9 to 7.08, 6.78 to 6.9, 5 to 5.08 and 4.9 to 5.08$\log_{10}$cfu/g with mean values of 6.98±0.05, 6.82±0.04, and 5.05±0.26 and 4.98±0.52 $\log_{10}$cfu/g in the examined chicken fillets, respectively.

1. Introduction:

Chicken meat plays an importance role in the solution of the red meat shortage problem in developing countries as it is low price than red meat, low shrinkage during cooking and easily prepared, so it needs great attention to overcome the problems facing the poultry industry.

The presence of pathogenic and spoilage microorganisms in chicken meat remains a significant concern for suppliers, consumers with such micro organsims and public has a health hazards worldwide. The bacterial metabolism is the most important type of reaction responsible for spoilage of chicken meat and thus reducing its quality during storage, its nutritional value and make it unfit for human consumption **(Cohen *et al.*, 2007)**. Mesophilic Aerobic Plate Count (APC) has been successfully used for many years to gauge shelf life, organoleptic acceptability, sanitary conditions and adherence to good manufacturing practices. Initial mesophilic bacterial count gives valuable information regarding the bacteriological quality of raw materials and conditions surrounding food processing, handling and storage **(APHA, 2001)**. Psychrotrophic bacteria able to grow relatively rapid at chilling temperature, room temperature and responsible for many undesirable changes in flavor, odor, texture and color of the refrigerated chicken meat **(APHA, 2001)**. The level of Enterobacteriaceae count in poultry carcasses can be routinely used as indicators of improper hygiene during processing and incorrect storage conditions, which can lead to a proliferation of pathogens **(Zweifel *et al.*, 2005).** *Staphylococcus aureus* has a significance role in the etiology of food poisoning and infections, especially in foods of animal origin and cause pathogenicity for humans and animals. *Staph. aureus* is a common commensal of the skin and mucosal membranes of humans **(Kluytmans and Wertheim, 2005).** Therefore the main objective of this study was to evaluate the organoleptic characters and bacteriological examination of broiler chicken fillet:

2. MATERIALS AND METHODS

2.1.Collection of samples:

A total of hundred random chicken meat samples collected from poultry slaughter house at different sanitation area at Zagazig city , Hahia, El-Aabrahemya Sharkia governorate, Egypt. The collected sample, were identified, packed in sterile polyethylene pages and transferred to the meat hygiene laboratory, faculty of veterinary medicine under perfect aseptic conditions without any delay. All collected samples were subjected to the following examination:

2.2.Organoleptic examination:

Organoleptic examination for chicken meat samples was evaluated for their color, odor, taste and consistency according to the method recommended by **Ogunbanwo and Okanlawon (2006).**

2.3.Bacteriological examinations:

2.3.1.Preparation of samples:

The samples were prepared according to the technique recommended by **(APHA, 2001)** as follows:

Twenty five grams of the examined samples were transferred to a sterile blender, to which 225 ml of 0.1% of sterile peptone water(type M-p3-302, mechanic, precyzina, Poland) were aseptically added to the content of the blender. The contents were homogenized for 2-5 minutes at 2500 rpm and allow to stand for 5 minutes at room temperature. Such homogenate represents the dilution of (10^{-1}). One ml from the original dilution of (10^{-1}) was aseptically transferred to another sterile tube containing 9 ml of 0.1% sterile Peptone water and mixed well to make next dilution (10^{-2}), from which further decimal serial dilutions were prepared up to the required dilution. The prepared dilutions were subjected to the following examinations.

2.3.2.Enumeration and isolation procedure:

2.3.2.1-Determenation of Aerobic plate count (ISO, 2002)

One ml of each previously prepared serial dilution was carefully transferred into separate, duplicate, appropriately marked Petri dishes, and thoroughly mixed with about 15 ml of previously melted and adjusted (45 ± 1°C) standard plate count agar(Oxiod,CM325). After solidification the inoculated plates as well as control one invert and incubate promptly for 24 hours at 37^{O}C. The plates with 30-300 colonies were counted and the total colony count per g. was calculated and recorded.

2.3.2.2-Determination of Total Psychrotrophic count (APHA, 2002)

The same technique as in the aerobic plate count was carried out except that the incubation at 7^{o} C for 10 days.

2.3.2.3.Determination of Enterobacteriaceae count according to ISO21528-2 (2004):

Enumeration of *Enterobacteriaceae* was carried out on violet red bile glucose agar (VRBG) agar. The agar was inoculated by spreading 0.1 ml of the decimal dilution onto (VRBG) agar the surface. Plates were inverted and incubated at 37˚C for 24 hours under aerobic condition. The crystal violet and agar component bile salt largely inhibit the gram positive during neutral red act as an indicator of pH of the agar, and glucose in the formation of acid. *Enterobacteriaceae* recovered, the glucose utilization leads to a drop in pH value, which is translated into a red in the visible colonies, accordingly in evaluating the plates, only red or pink colonies with or without the same precipitate were considered.

2.2.3.4. Determination of Total Staphylococci (FDA 2001):

From the previously prepared dilutions 0.1ml was uniformly spread over a dried surface of duplicate Baired parker agar (Oxoid,CM 275) plates using a sterile bent glass rod. The inoculated plates were incubated in thermostatically controlled incubator at 37ºC for 48 hours. Suspected colonies (black, shinny convex colonies, 1-1.5 mm in diameter with a narrow white margin and surrounded by a wide clear area with a zone of opacity around them) were recorded. Counting was repeated after reincubation at 37 ºC for further 24 hours. *Staphylococcal* count/gram of samples was calculated and recorded as presumptive count as follows

The number of total *Staph.aureus* /g of sample =No. of suspected colonies x dilution x 10

Result and discussion:

Contamination of poultry meat with food borne pathogens remains an important public health issue, because it can lead to illness if there are malpractices in handling, cooking or post-cooking storage of the product **(Mbata, 2005)**. So this study was conducted to assess the hygienic quality of chicken meat that was sold at zagazig city Sharkia governorate and to improve the quality of chicken fillets stored in refrigeration temperature by using some natural oils.

Sensory characteristics as color, odor, taste and consistency have valuable importance to consumers in evaluation of chicken meat quality and thus influence their consumption of meat **(Calkins and hodgen, 2007)**. Meat quality is determined by combination of various factors; however, consumers give a special importance to colour and texture.Meat texture sensation is influenced by presence of many factors including intramuscular fat, water holding capacity and actomyosin complex (**Salakova*et al*., 2009)**.

Results illustrated in **table (1)** and**figure (1)** revealed that the organoleptic characters of all examined chicken fillet samples was normal (100%); the examined samples had normal color (pale pink), firm tender in consistency, acceptedfleshy odor and taste.

Table (1): Organoleptic evaluation of examined chicken fillet (No=50)

	Normal		**Abnormal**	
	No.	**%**	**No.**	**%**
Color	50	100	0	0
Odor	50	100	0	0
Consistency	50	100	0	0
Taste	50	100	0	0

No: Number of examined chicken fillet samples
Normal samples (yellowish white, firm in consistency and accepted odor and taste).

These results agreed with **Atya (2007)** and **Abdou (2017)**who reported that organoleptic examinations of chicken meat samples were acceptable.

Various indicators can be used to evaluate the hygienic quality of chicken meat including aerobic plate count (APC) and total psychrotrophic counts in addition to total *Enterobacteriaceae* which is the main indication on enteric and fecal contamination.

Aerobic plate count is considered an index of quality that gives an idea about the hygienic measures during processing and helps in the determination of the keeping quality of the product **(Aberle*et al*., 2001)**. It is commonly recommended microbiological method to detect all viable microorganisms (colony forming units per gram of the sample) that could grow aerobically.

The results given in **table (2)** illustrated that APC counts were (log_{10}cfu/g) ranged from 6.9 to 7.08 with a mean value of 6.98±0.05. The APC in the examined samples were nearly similar to results obtained by **Mahmoud and Hamouda (2006), Ahmed and Shimamoto (2014)** and **Hassanien *et al*. (2016).** While, these results were higher than 2.30 to 5.41, 4.43 and 4.75, log_{10}cfu/g for the examined chicken meat (**Kozacinski *et al.*, 2006, Abdel-Rahman *et al.*, 2008**and**Shareef *et al.*, 2012).** However, lower than 7.1, 7.7 and 7.83log_{10}cfu/g for the examined chicken meat (**Vural *et al.*, 2006,Jouki *et al.*, 2012**and**Edris *et al.*, 2015).**

Table (2): Mean count of the microbiological examination of chicken fillet samples (No=50) log_{10}CFU/g.

	Aerobic plate count	**Psychrotrophic**	**Enterobacteriacea**	**Staphylococci**
Min	6.90	6.78	5	4.9
Max	7.08	6.90	5.08	5.08
Mean ± SE	6.98±0.05	6.82±0.04	5.05±0.26	4.98±0.52

No: number of examined chicken fillet samples. CFU/g: Colony Forming Unit per gram
Min: Minimum; Max: Maximum; SE: Standard error of mean

These differences may be attributed to the difference in hygienic conditions under which meat were handled, prepared and distributed. Chicken fillet samples had high values of APC as a result of unsanitary measures during preparation through the contaminated utensils, knives, cutting boards and cutting tables.

According to the legal requirement of **EOSQC (2005)**, that set a permissible limit of APC in fresh meat must be not exceed 10^5cfu/g), the examined chicken fillet samples were higher than the **EOSQC (2005)** permissible limit.

Psychrotrophsic bacteria are those organisms that grow well at or below 7°C and have their optimum between 20°C and 30°C. They can be found in soil, surface and and in foods. They provide an estimation of the chicken meat shelf life and they are responsible for spoiling refrigerated foods. **Table (2)** revealed that the Psychrotrophic count ranged from 6.78 to 6.9 $\log_{10}$ cfu/g with a mean value of 6.82±0.04 $\log_{10}$ cfu/g. These results were nearly similar to **Hassanien *et al.* (2016)**.

Results of Psychrotrophic count were higher than2.8, 4.5, 4.23 and 2.8 to 4.32$\log_{10}$ cfu/g in the examined chicken meat samples **(Zeitoun and AL-Eid, 2003, Modi *et al.*, 2005, Chaiba *et al.*, 2007**and **Dan *et al.*, 2008)**, While these results were lower than6.04 $\log_{10}$ cfu/g in the examined chicken meat samples **(Ercolini *et al.*, 2009)**.

Enterobacteriaceae is widely distributed in nature and gastrointestinal tract of mammals, and birds. Stress during transportation of birds and change of diet before slaughter are the main cause of *Enterobacteriaceae* shedding **(Mainali *et al.*, 2009)**. Furthermore, mishandling during of chicken carcass during processing can contaminate meat and surfaces with enteric bacteria through the gut **(Rasschaert *et al.*, 2007)**.

Results illustrated in **table (2)** revealed that the Enterobacteriaceae count ranged from 5 to 5.08 $\log_{10}$cfu/g with a mean value of 5.05±0.26 $\log_{10}$cfu/g. These results were nearly similar to **Vural *et al.*, (2006)** and **Kilonzo-Nthenge *et al.*, (2013)** in the examined chicken samples. While they were higher than 3.04, 0 to 3, 2.28 and 1.34 to 2.15 $\log_{10}$cfu/g in the examined chicken meat samples **(Capita *et al.*, 2002, Zeitoun and AL-Eid , 2003, Kozacinski *et al.*, 2006** and **Del Río *et al.*, 2007)**. But they were lower than **Rindhe *et al.* (2008)** and **Bhandari *et al.* (2013)** who reported Enterobacteriaceae count in chicken meat samples of 6.2 to 6.3 and 10.2 $\log_{10}$cfu/g, respectively.

According to **EOSQC (2005)** which decided that the maximum acceptable limit of the Enterobacteriaceae should not exceed 2 $\log_{10}$cfu/g in the fresh chicken meat; the examined chicken fillet samples were higher than this limit. Bad evisceration process is responsible for a significant increase in the *Enterobacteriaceae* count in the examined chicken fillet samples.

Contamination of chicken meat by Staphylococcal species is attributed to unhygienic measures of food handlers during chicken preparation via direct contact or through respiratory secretions as they carry it in their noses and hands **(Argudin *et al.* 2010).** It is a leading cause of food borne intoxication as it can grow inside food and produce heat stable enterotoxin that results in rapid symptoms of food poisoning after ingestion of food. Results found in **table (2)**

showed that Staphylococci count was ranged from 4.9 to 5.08 with a mean value of 4.98±0.52 log_{10}cfu/g. This result was nearly in accordance with **(Gad, 2004)** and **(Abdelrahman *et al*., 2015).** However higher results were obtained by **Goja et al. (2013**) and **Edris *et al.* (2015)** and who found that staphylococcus count in the examined chicken samples was 7.8and 5.5log_{10}cfu/g, respectively. While **Kozacinski *et al.* (2006), Abdel-Rahman *et al.* (2008), Arul and Saravanan (2011)** and **Shareef *et al.* (2012)** detected lower results of 1.70 to 3.69, 4.1 to 4.7, 1.03 and 1cfu/g, respectively in the examined chicken samples.

The variation on staphylococcus results may be attributed to the differences in personal hygiene during handling, preparation and distribution of meat

According to **EOSQC (2005)** which set the maximum acceptable limit of Staphylococci in fresh meat should not exceed 2 log_{10}cfu/g; the examined samples were higher than this limit.

Staphylococcus aureus is a leading cause of food poisoning worldwide due to the production of heat-stable enterotoxins **(Murray 2005)**. Staphylococcal food poisoning symptoms generally have a rapid onset, appearing around 3 hours after ingestion (range 1–6 hours). Common symptoms include nausea, vomiting, abdominal cramps and diarrhea. Individuals may not demonstrate all the symptoms associated with the illness. In severe cases, headache, muscle cramping and transient changes in blood pressure and pulse rate may occur; recovery is usually between 1–3 days **(FDA, 2012).**

الملخص العربي

الجودة الصحية للحوم الدجاج المباع في محافظة الشرقية

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تعتبر لحوم الدجاج ومنتجاتها مصدرا جيدا للبروتين والحموض الأمينية الأساسية والفيتامينات والمعادن التي تلعب دورا هاما في بناء جسم الإنسان بالإضافة إلى وجود نسب عالية من الحموض الدهنية غير المشبعة وانخفاض مستوى الكوليسترول.

تعد البكتريا الهوائية والبكتريا المحبة للبرودة والبكتريا المعوية وأيضا المكورات العنقودية الذهبية من اكثر الميكروبات التي تؤدي الي فساد لحوم الدواجن المبردة والاصابة بالتسمم الغذائي.

أجريت هذه الدراسة على شرائح الدجاج المبردة التى يتم تسويقها فى محلات بيع لحوم الدواجن فى مدينة الزقازيق بمحافظة الشرقية حيث تم تجميع 100 عينه من شرائح الدجاج ونقلها بسرعة تحت ظروف صحية لفحصها ظاهريا وبكتيريا.

أوضحت النتائج أن جميع العينات التي تم فحصها ظاهريا سليمة بنسبة 100% ومطابقة للمواصفات القياسية من حيث اللون والرائحة والملمس والمذاق.

كان العد الكلى للبكتيرية الهوائية يتراوح بين6,9 الى 7,08(لوغاريتم10/جرام) بمتوسط للبكتيريا الهوائيه هو 6,98 ± 0,05 (لوغاريتم 10/ جرام). كان العد الكلى للبكتيريا المحبة للبرودة يتراوح بين 6,78 الى6,9 (لوغاريتم 10 / جرام) بمتوسطو6,82 ±0,04 (لوغاريتم 10 / جرام). كان العد الكلى للبكتيريا المعوية يتراوح بين 5 الى 5,08 (لوغاريتم 10/

جرام) بمتوسط 5,05±0,26(لوغاريتم 10/ جرام) فى العينات. كان العد الكلى للبكتيريا العنقودية الذهبية يتراوح بين 4,9 الى 5,08 (لوغاريتم 10 /جرام) بمتوسط 4,98±0,52(لوغاريتم 11 / جرام) فى عينات الدجاج المفحوصة.