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# Prevalence of *Escherichia coli* and *Staphylococcus aureus* in meat and chicken meat meals served at governmental hospital

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**ABSTRACT**

This study was conducted on 100 random samples of cooked chicken meat and beef meat meals (50 of each) with 125 gm weight of each sample. The cooked chicken meat samples were represented by cooked breast and thigh (25 samples of each) and 50 samples of cooked meat meals which were collected from a governmental hospital in Kalyoubia Governorate to determine the bacterial content of the beef and chicken meat meals. The results of bacteriological examination for cooked chicken and meat meals were recorded as 1 (4%) *E. coli* from cooked chicken breast samples, where 3 (12%) isolates E.coli from cooked chicken thigh samples, while 2 (4%)isolates from cooked meat .where serologically identified as O111:H4; O114: H21 from cooked chicken breast (one from each type). In addition, 3(50%) were isolated from cooked chicken thigh represented by 2 (33.3%) O26 and one (16.7%) O114:H21. Moreover, 1 (16.7%) O127:H6 E.coli from cooked meat. Also, the study revealed that 6 (6%) isolates of *Staph. aureus* were isolated from examined chicken meat and meat samples represented by 2 (8%) from cooked chicken breast, 3 (12%) from cooked chicken thigh and 1 (2%) from cooked meat

## 1. INTRODUCTION

The hospital food service is primarily intended for a population with altered defenses against infectious processes (immune-compromised, at severe age or in long-term hospitalization) that increase disease risk and severity. (Custovic and Ibrahimagic, 2005).

Staphylococcus aureus is considered the world's third-largest cause of foodborne illness (Normanno *et al.*, 2007) and has two aggravating properties: toxin production and resistance to antimicrobials. This pathogen is considered an excellent predictor of inefficiency in thermal processing, inadequate hygienic conditions during food production / preparation or inadequate refrigeration after food preparation and determined the origin of food poisoning (Alexandra *et al.*, 2011; Sasidharan et al., 2011).

Staphylococcus aureus is a microorganism living in the skin and nasal membranes with considerable pathogenic potential to cause a number of infections acquired in the environment and hospital. The incidence of these infections is growing, and they are becoming more difficult to treat (Oliveira et al., 2018).

Escherichia coli is the most common facultative anaerobic species found in both human and animal gastrointestinal tracts and commonly found in the Enterobacteriaceae family, so the presence of such organisms in foods suggests faecal contamination. (Mohamed et al., 2014)

Pathogenic *E. coli* has been commonly classified into two main categories; diarrheagenic *E. coli* and extraintestinal pathogenic *E. coli.* There are currently six categories of diarrheagenic *E. coli*, including enteropathogenic *E. coli* (EPEC), Enterotoxigenic *E. coli* (ETEC), Enteroinvasive *E. coli* (EIEC), Entero-aggregate *E. coli* (EAEC), *E. coli* (DAEC) and *E. coli* (EHEC) (Xiaodong.,2010).

Therefore, the aim of the present study was to evaluate the bacteriological status of chicken and meat meals at hospital kitchen.

## 2. MATERIAL AND METHODS

*2.1. Collection of samples.*

One hundred of chicken and meat meals samples represented (50 of each) were collected randomly from governmental hospital restaurant. The collected samples were separately kept in sterile plastic bags and preserved in an ice box. All samples were transferred to the laboratory under complete aseptic conditions without undue delay and examined as rapidly as possible.

*2.2. Preparation of samples (ISO, 2017):*

Under complete aseptic condition, twenty-five grams of both examined chicken meat and meat meals sample were transferred to aseptic Stomach bag and 225 ml of 0.1 % sterile peptone water were applied aseptically to the bag content. Each sample was then homogenized, in the stomacher (Biomereuxsa – France – NO. 42489367) at 2000 rpm for 1-2 minutes, to provide a homogenate from which tenth-serial dilutions of fold sequence were planned. This is achieved by adding 1ml of homogeneous to 9 ml of 0.1% sterile peptone water tube and then taking 1 ml of this sterile pipette tube to another sterile test tube containing 0.1% 9 ml

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of sterile peptone water and mixing well to create the next dilution, and so on.

2.3. *Bacteriological examination* was carried out as following:

2.3.1. *Isolation and identification* of *E. coli* following (ISO, 2001):

From the previously prepared serial dilution , 1 ml was put in the center of each plate, then pour TBX media (Trypyone bile x-glucornic) 45 °C, mix carefully in circular manner , let plates solidified then plates were incubated at 44.5 ºC for 24 hrs, suspected colonies showed bluish green with halo zone.

2.3.2. *Enumeration, Isolation and identification* of *staphylococcus aureus(* ISO, 1999)

using baired parker agar medium plates, incubate at 37 ºC for 48 hrs, suspected colonies showed black and shiny colonies with narrow white margins and surrounded by a clear zone extending into the opaque medium

*2.4.Statistical analysis*

Data were analyzed using the Statistical Package for Social science Software (Version 25, SPSS Inc., and Chicago, IL, USA).. The values were expressed as the mean ± standard error of the mean. A significant difference was used at the 0.05 probability level.

## 3. RESULTS

Tables (1 & 2) revealed that six (6%) isolates of *Staph. aureus* were isolated from examined chicken meat and meat samples represented as two (8%) from cooked chicken breast, three (12%) from cooked chicken thigh and one (2%) from cooked meat. Meanwhile, the mean values of *staphylococcal* count (cfu/g) in the examined samples were $8.5 \times 10^2 \pm 0.02 \times 10$, $7.3 \times 10^4 \pm 0.01 \times 10$ and $4.6 \times 10^3 \pm 0.01 \times 10$ from the cooked chicken breast, cooked chicken thigh and cooked meat, respectively.

Table 1 Prevalence of *Staphylococcus aureus* in examined cooked chicken breast and thigh (n=25 for each) and cooked meat (n=50).

| Product | No. of samples | | +ve samples | |
|---|---|---|---|---|
| | | MPL*** | No. | %* |
| Cooked chicken breast | 25 | | 2 | 8* |
| Cooked chicken thigh | 25 | $>10^4$ | 3 | 12* |
| Cooked meat | 50 | | 1 | 2* |
| Total | 100 | | 6 | 6** |

* Percentage in relation to total number of each sample (25 for chicken -50 for meat). ** Percentage in relation to total number of samples (100). ******* MPL Maximum permissible limit according to CFS 2014

Table 2 Statistical analytical results of *Staphylococcus aureus* in examined cooked chicken breast and thigh (n=25 for each) and cooked meat (n=50)

| Product | Count (CFU\g) | | |
|---|---|---|---|
| | Min. | Max. | Mean ± SE |
| Cooked chicken breast | 7.5x10 | $1.7x10^4$ | $8.5x10^{2a} \pm 0.02x10$ |
| Cooked chicken thigh | $8.2x10^2$ | $1.3x10^4$ | $7.3x10^{43} \pm 0.01x10$ |
| Cooked meat | 1.0x10 | $1.5x10^4$ | $4.6x10^{3b} \pm 0.01x10$ |

(a, b) values within a column with different superscript letters were significantly different at ($P \leq 0.05$).

Tables (3 & 4) revealed that, six isolates of *E.coli* were isolated from examined chicken meat and meat samples represented as 3(12%) from cooked chicken thigh with two serotypes EHEC O26 (33.3%) and one EPEC O114: H21 (16.7%), one ETEC (16.7%) from cooked meat with serotype O127 : H6 and two (33.4%) isolates of *E.coli* from cooked chicken breast with one serotype EHEC O111 : H4 (16.7%) and one EPEC O114 : H21 (16.7%). Moreover, 94 samples out of 100 ones were accepted according to CFS2014.

Table 3 Prevalence of *E. coli* in examined cooked chicken breast and thigh (n=25 for each) and cooked meat (n=50).

| Product | No. of samples | MPL*** | +ve samples | | accepted samples | |
|---|---|---|---|---|---|---|
| | | | No. | %* | No. | %* |
| Cooked chicken breast | 25 | Free | 1 | 4* | 24 | 96 |
| Cooked chicken thigh | 25 | Free | 3 | 12* | 22 | 88 |
| Cooked meat | 50 | Free | 2 | 4* | 48 | 96 |
| Total | 100 | | 6 | 6* | 94 | 94 |

* Percentage in relation to total number of each sample (25 for chicken -50 for meat). ** Percentage in relation to total number of samples. *******MPL Maximum permissible limit according to CFS 2014

Table 4 Serotyping of *E. coli* isolated from the cooked chicken breast and thigh) and meat samples (n = 6).

| *E. coli* Strains | Cooked Chicken breast | | Cooked Chicken thigh | | Cooked meat | | Strain characteristics |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | |
| O26 | - | - | 2 | 33.3 | - | - | EHEC |
| O55 : H7 | - | - | - | - | - | - | EPEC |
| O111 : H4 | 1 | 16.7 | - | - | 1 | 16.7 | EHEC |
| O114 : H21 | - | - | 1 | 16.7 | 1 | 16.7 | EPEC |
| O125 : H18 | - | - | - | - | - | - | ETEC |
| O127 : H6 | - | - | - | - | 1 | 16.7 | ETEC |
| Total | 1 | 16.7 | 3 | 50 | 2 | 33.4 | |

EPEC = Enter pathogenic *E. coli.* ETEC = Enter toxigenic *E. coli.* EIEC = Enter invasive *E. coli.* EHEC= Enterohaemorrhagic *E. coli*

## 4. DISUCSSION

Food borne diseases caused by food caused by *Staph. aureus* and *E. coli* and are a major public health concern worldwide. These bacteria are spread predominantly by the ingestion of infected Food and their presence in meat has important public health implications. (Normanno et al., 2007; Sousa, 2008).

Gram negative bacteria, such as *E. coli*, are widely dispersed in the atmosphere by infected food and water (the main sources that spread the bacteria). *E. coli* is widely used as an indicator of surrogacy, its presence in food typically suggests direct and indirect faecal contamination (Clarence et al., 2009).

Table (1) indicated that the majority of examined samples of cooked meat (98%) are acceptable while 2% of the samples were contaminated with the staphylococci, cooked chicken breast (92% acceptability) while 8% contaminated, then cooked chicken thigh (88% acceptability and 12%of samples contaminated).

These results disagreed with those recorded by Abd El-Shafy-Heba (2016) ($0.59x10^2 \pm 0.0x10^2$) and nearly similar results were obtained *by* AbdEl-Aal-Asmaa (2016) ($4.42x10^3 \pm 0.75x10^{4)}$,Ali (2011) ($6.73 \times 10^3$ cfu/g), Abbass (2011) ($8.03x10^3$ cfu/g) and Ibrahim-Hemmat et al. (2014) ($3.01x10^3$ cfu/g) in cooked chicken meat.

The results in Tables (1 & 2) revealed that 6(6%) isolates of *Staph. aureus* were isolated from examined chicken meat and meat samples represented as 2(8%) from cooked chicken breast, 3(12%) from cooked chicken thigh and 1(2%) from cooked meat. Meanwhile, the mean values of staphylococcal count (cfu/g) in the examined samples were $8.5x10^2 \pm 0.02x10$, $7.3x10^4 \pm 0.01x10$ and $4.6x10^3 \pm 0.01x10$

from the cooked chicken breast, cooked chicken thigh and cooked meat, respectively.

It is evident from the results recorded in Table (3) that 6 isolates of *E.coli* were isolated from examined chicken meat and meat samples represented as 1(4%) from cooked chicken breast and 3(12%) from cooked chicken thigh and 2(4%) from cooked meat. These results indicated that cooked chicken thigh is more contaminated one then cooked chicken breast while cooked meat is less contaminated.

Ninety-four samples out of 100 ones were accepted. These results came in accordance with those obtained by El-Taher (2009) (13.3%), Arab (2010) (6.67%), Marzano and Balzaretti (2011) and El-Masry et al. (2015) .The same sero types of *E-coli* were previously isolated from both chicken meat and beef meat by Maarouf and Nassif (2008), Lamada Hanan et al. (2012), Windham et al. (2013) and Abd El – Salam (2014).

Table (4) declared that, serotyping of *E.coli* isolated from the examined chicken and meat meals were 6 isolates of *E. coli* were isolated from cooked meat and chicken samples represented as following 2 (33.4%) from cooked chicken breast with serotype 1 O114 : H21 (16.7%) and 1 of O111: H4 (16.7) and 3(50%) from the examined cooked chicken thigh with 2 serotypes O26(33.3%) and 1 O114 : H21 (16.7%) and 1 isolate of *E.coli* isolated from cooked meat with serotype of O127 : H6 (16.7) and moreover, 94 samples out of 100 ones were accepted according to CFS2014

These results came in accordance with those obtained by Abd El Fath, Rabab (2015) and El Masry- Sherin et al., (2015), while EL-Abbasy (2010) who found more contaminated cooked meat (20%).

The incidence of *E. coli* in the examined samples may be due to poor hygienic standards, mishandling during production, processing and distribution as the attained temperature for cooking was sufficient to kill vegetative bacteria on the surface of meat, beside superficial thin layer and most deep regions (Aycicek *et al*., 2004).

Staphylococcus can be carried on hands, nasal passage or throats. Most food borne illness outbreaks are result of contamination from food handlers and production of heat stable toxins in food. Sanitary food handling and proper cooking and refrigerating should prevent Staphylococcus food borne illness (FSIS, 2003).

## 5. CONCULOSIONS

The present study proved that chicken meat and meat meals constitute public health hazard and the presence of *Staph. aureus* and *E. coli* may be due to the unhygienic preparation of the meals at hospital kitchen and the attained temperature of boiling was insufficient to kill bacteria and to the post-cooking contamination with handling.

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