Microbiological Evaluation of Chicken Carcasses Retailed in Al-Boheira Province with Detection of Some Enteropathogens

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1. INTRODUCTION

Poultry meat is more popular in the consumer market in Egypt as well as throughout the world because of advantages such as easy digestibility and acceptance by the majority of people and it is considered as a good and cheap source of protein (Yashoda et al., 2001). Poultry meat constitutes about 30% of the world's total meat consumption (Daniel et al., 2011).

ABSTRACT

A total of 100 freshly slaughtered chicken carcasses samples were randomly collected from different private retail outlets in Al-Boheira Province during the period extended from March to September 2018 including; thigh and breast (50 samples of each). Samples were subjected to microbiological evaluation via making of aerobic plate count (APC), Enterobacteriaceae count (EC), Coliforms count (CC) as well as molds and yeasts counts. In addition, isolation of some enteropathogens including; Escherichia coli, Salmonella and Shigella was attempted. It was recorded that APC ranged from $5 \times 10^3$ to $6.8 \times 10^5$, with a mean value $2.3 \times 10^5 \pm 2.8 \times 10^5$ cfu/g in samples collected from breast, while in samples of the thigh it ranged from $4.9 \times 10^4$ to $1.8 \times 10^6$, with a mean value $6.9 \times 10^5 \pm 7.1 \times 10^5$ cfu/g. Concerning EC, it was found that EC ranged from $6 \times 10^2$ to $1.8 \times 10^3$, with a mean value $1.3 \times 10^3 \pm 3.8 \times 10^2$ cfu/g in samples of breast, while in the thigh samples, it ranged from $1.8 \times 10^3$ to $2.5 \times 10^3$, with a mean value $2 \times 10^3 \pm 1.7 \times 10^3$ cfu/g. Also, it was recorded that CC of the examined samples ranged from $6 \times 10^2$ to $1.6 \times 10^3$, with a mean value $1.1 \times 10^3 \pm 3.4 \times 10^2$ cfu/g in breast samples, while in thigh samples, it ranged from $1.6 \times 10^3$ to $2.3 \times 10^3$, with a mean value $1.8 \times 10^3 \pm 1.8 \times 10^2$ cfu/g. The trail of isolation of some enteropathogens revealed the isolation of Salmonellae from thigh and breast samples at the rate of 22 and 18%, respectively. E. coli isolated from both types of samples breast and thigh were at percentage of 40% and 48% in breast and thigh, respectively. Furthermore, Shigella spp. was isolated from chicken carcasses breast and thigh samples at percentage of 30% and 42%, respectively. Also, it was found that yeast count ranged from $3.1 \times 10^2$ to $5.4 \times 10^3$, with a mean value $2.2 \times 10^3 \pm 2.1 \times 10^3$ cfu/g in breast samples of fresh chicken carcasses, while in samples from thigh ranged from $3.8 \times 10^2$ to $5.7 \times 10^3$, with a mean value $2.3 \times 10^3 \pm 2.2 \times 10^3$ cfu/g. Also, it was found that mould count ranged from $1.1 \times 10^2$ to $1.3 \times 10^2$, with a mean value $7.3 \times 10^2 \pm 9.5 \times 10^2$ cfu/g in breast samples of fresh chicken carcasses, while in samples from thigh ranged from $1.3 \times 10^2$ to $2.4 \times 10^3$, with a mean value $1 \times 10^3 \pm 9.6 \times 10^2$ cfu/g. According to the recorded results in the current study, it was clear that increased bacterial counts with occurrence of pathogenic bacteria in the examined samples that exceed the Egyptian standards especially thigh samples reflected the poor hygienic conditions that accompanied the traditional slaughtering process reducing the quality of chicken meat sold under such conditions that should alarm the danger bells to prevent selling of freshly slaughtered chicken carcasses and give the chance for chilled and frozen chicken carcass.
Meat obtained from chicken frequently been found implicated in the spread of food-borne illnesses. If hygienic care is not maintained during the various stages of slaughter operations and processing, the potential edible tissues get subjected to contamination from a variety of sources within and outside the animal and also from the environment, equipment and operators. More than 30 genera of micro-organisms including seven pathogens (E. coli, Salmonella), are known to contaminate poultry products. Since poultry meat itself offers an excellent medium for the multiplication of most bacteria, including those that are not inhibited by low temperatures (Adu-Gyamfi et al., 2012)

Contamination of poultry meat with enteropathogens remains an important public health issue, because it can lead to illness if there are malpractices in processing, handling, storage or even cooking causing human loss of productivity and adds significantly to the costs of food production and healthcare. It is also a possible cause of mortality, which is even more of a problem in developing countries, where the health status of many individuals is already compromised (Mead, 2004)

Foodborne illness is a major international health problem (Mensah et al., 2002) Each year, millions of persons become ill from foodborne diseases, though many cases are not reported

Salmonella is one of the most important pathogenic genera implicated in foodborne bacterial outbreaks and diseases. Salmonella infections are worldwide and constitute an important public health problem in many parts of the world. It was reported that Salmonella causes an estimated 1.4 million cases of foodborne illness and more than 500 deaths per year in the US. There are several transmission routes for salmonellosis, but the majority of human infections are derived from the consumption of contaminated foods especially those of animal origin. A variety of food products, especially poultry and other types of meat products, are the most important sources of human Salmonella infection (Cetinkaya et al., 2008)

Escherichia coli is a normal inhabitant of the intestinal tract of humans and worm-blooded animals and meat is a common source of E. coli contamination, which may be acquired during slaughter through fecal contact besides some pathogenic strains are responsible for enteric and diarrheal diseases, and they have been increasingly recognized as the most important causes of food borne diseases and outbreak all over the world (Bettelheim and Goldwater, 2014)

Shigellosis, also called bacillary dysentery, is an infectious disease caused by Shigella bacteria. The species involved are mostly Shigella sonnei (about 70%) and S. flexneri (approximately 25%) while other species are seldomly implicated. Shigella species have the potential to cause large outbreaks because of their low infectious dose (_10 cells). Foods and drinking waters can serve as vehicles of transmission of this pathogen. Each year, there are significant numbers of shigellosis outbreaks resulted from consumption of contaminated foods (Cetinkaya et al., 2008). Shigella have been isolated from chicken samples in Ghana and have been implicated in out breaks of food poisoning.

Therefore, great emphasis is being placed on the microbiological aspects of poultry carcasses and on searching for alternative mechanisms to reduce both natural and cross contamination, thus avoiding major public health problems so it is important to adopt hazard analysis and critical control point principles in production, processing and handling of poultry carcasses to achieve pathogen free products as recommended by the Advisory Committee on the Microbiological Safety of Foods, Government of U.K. (Commission, 2005).

The present work was carried out to evaluate the microbiological quality of chicken carcasses retailed for sale in El-boheira Province beside determine the incidence of some enteropathogens that may contaminate these carcasses.

2. MATERIAL AND METHODS:

2.1. Collection of broiler chicken samples:

A total of 100 freshly slaughtered chicken carcasses samples including; thigh and breast (50 samples of each) were randomly collected from different private retail outlets in El-boheira Province. The samples were transferred aseptically with a minimum of delay to the laboratory in an ice box where they were subjected to a microbiological examination.

2.2. Preparation of samples for bacteriological examination (ICMSF, 1978; Nossair et al., 2015):

Fresh chicken parts (breast and/or thigh) were firstly cauterized by using hot spatula (surface sterilization) then the cauterized parts were removed by using sterilized scalpel and forceps. Then 25 grams of each sample were taken aseptically using sterile forceps and scissors. The removed portion was placed in a sterile homogenizer flask containing 225 ml of peptone water (0.1%). The contents were homogenized at 14000 rpm for 2.5 minutes and allowed to stand for about 6 minutes at room
temperature. After that tenth fold serial dilution were prepared from each sample. The prepared samples were subjected to the following examination.

A loopful from the enrichment broth was streaked onto Salmonella-Shigella (SS) agar plates. The inoculated plates were incubated at 37°C for 24 hours. The suspected colonies of Salmonella (colorless with black center) while Shigella (straw colored colonies) were picked up and stabbed into semi-solid agar tubes for further identification.

2.6.2) Isolation and identification of Enteropathogenic E. coli:

2.6.2.1) Isolation of Enteropathogenic E. coli: (ICMSF, 1996).

2.6.2.1.1) Pre-enrichment culture:

From the previously prepared homogenates, 1 ml was transferred aseptically and inoculated into sterile peptone water and incubated at 37°C for 18 hours.

2.6.2.1.2) Enrichment culture:

From the previously incubated pre-enrichment culture, 1ml was transferred aseptically and inoculated into sterile tubes each contain 6ml of sterile MacConkey’s broth and was incubated at 37°C for 18-24 hours.

2.6.2.1.3) Selective plating:

A loopful from inoculated enrichment broth was streaked onto MacConkey’s agar and incubated at 37°C for 24 hours, then pink colonies were picked up and streaked onto Eosin Methylene Blue (EMB) and incubated at 37°C for 24-48 hours. The typical colonies (green sheen metallic purple center) were picked up for further identification.

2.7) Determination of yeast and mould count

The same technique of pour plate method was applied using potato dextrose agar medium (PDA). The plates were incubated at 28°C for 3 days. All colonies were then counted and the average colonies were determined. The total yeast and mould count CFU/g was calculated.

2.8) Statistical analysis:

Data collected were analysed using independent T. test to assess the significance differences between two different groups (thigh and breast samples) with aid of SPSS® version 16.0.

3. RESULTS AND DISCUSSION

Contamination of poultry meat with enteropathogens 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 chicken meat. In developed countries, food borne illness causes human suffering and loss of productivity, and adds significantly to the costs of food production and health care. It also possible cause of mortality, which is even more of a problem in developing regions, where the health status of many individuals is already compromised.

Table (1): Statistical analytical results of aerobic plate count cfu/g of examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>±SEM</th>
<th>No. of samples above the permissible limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>5×10³</td>
<td>6.8×10⁵</td>
<td>2.3×10⁵b</td>
<td>2.8×10⁵</td>
<td>23</td>
</tr>
<tr>
<td>Thigh</td>
<td>4.9×10⁴</td>
<td>1.8×10⁶</td>
<td>6.9×10⁵a</td>
<td>7.1×10⁵</td>
<td>38</td>
</tr>
</tbody>
</table>

SEM= Standard error of the mean. No.= Numbers of samples examined. N.B: Means with similar letters are not significantly different at P≤0.05. EOSQC No. 1090 (2005): stated that the aerobic bacterial count must not exceed 10⁵ cfu/g.

Table (2): Statistical analytical results of total Enterobacteriaceae count cfu/g of examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>6x10²</td>
<td>1.8x10³b</td>
<td>1.3x10³</td>
<td>3.8x10²</td>
</tr>
<tr>
<td>Thigh</td>
<td>1.8x10³</td>
<td>2.5x10³a</td>
<td>2x10³</td>
<td>1.7x10²</td>
</tr>
</tbody>
</table>

N.B: Means with similar letters are not significantly different at P≤0.05. There are no permissible limits for Enterobacteriaceae recommended by EOSQC No. 1090 (2005).

Table (3): Statistical analytical results of coliforms count cfu/g of examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>6x10²</td>
<td>1.6x10³</td>
<td>1.1x10³b</td>
<td>3.4x10²</td>
</tr>
<tr>
<td>Thigh</td>
<td>1.6x10³</td>
<td>2.3x10³</td>
<td>1.8x10³a</td>
<td>1.8x10²</td>
</tr>
</tbody>
</table>

N.B: Means with similar letters are not significantly different at P≤0.05. EOSQC No. 1090 (2005): stated that the total aerobic coliforms count must not exceed 10² cfu/g.

Table (4): Rate of isolation of Salmonellae isolated from examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Positive samples No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Thigh</td>
<td>11</td>
<td>22</td>
</tr>
</tbody>
</table>

Table (5): Rate of isolation of E. coli isolated from examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Positive samples No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Thigh</td>
<td>24</td>
<td>48</td>
</tr>
</tbody>
</table>

Table (6): Rate of isolation of Shigella spp. from examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of samples</th>
<th>Positive samples</th>
</tr>
</thead>
</table>
Contamination of poultry meat with enteropathogens 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 chicken meat. In developed countries, food borne illness causes human suffering and loss of productivity, and adds significantly to the costs of food production and health care. It also possible cause of mortality, which is even more of a problem in developing regions, where the health status of many individuals is already compromised.

Poultry meat are subjected to the risk of contamination of various pathogens from different sources, primary during preprocessing and processing steps and secondary after processing through packaging, marketing and storage. Such contamination may render these food articles unfit for human consumption or even harmful to consumers.

### 3.1. Aerobic Plate Count (APC):

The recorded data in Table (1) showed that all of the examined samples were contaminated with aerobic bacteria. Also, it was found that APC ranged from $5 \times 10^2$ to $6.8 \times 10^5$, with a mean value $2.5 \times 10^2$ to $2.8 \times 10^3$ cfu/g in breast samples of fresh chicken carcasses, while in samples from thigh APC ranged from $4.9 \times 10^4$ to $1.8 \times 10^6$, with a mean value $6.9 \times 10^2$ to $7.1 \times 10^5$ cfu/g. Also shows that there is a significant difference between the mean values of aerobic bacterial counts cfu/g of breast and thigh samples of freshly slaughtered chicken carcasses. P≤0.05. By comparing these results with Egyptian Organization for Standardization and Quality Control for chicken carcasses EOSQC No. 1090 (2005) it is clear that, the results is not compatible which declare that 46% and 76% of breast and thigh samples of freshly slaughtered chicken carcasses having total aerobic bacterial count above the permissible limit ($10^5$), this due to high source of contamination. The obtained result is lower than Hassan, (2015) who examined 50 freshly slaughtered chicken carcasses samples from retailed outlets in Alexandria province and found that the mean value of APC was $4 \times 10^7$ to $5 \times 10^6$ cfu/g. Moreover, the presence of bacteria on the surface of poultry could result from external contact with fecal matter during growth, catching, transport crates, scald water, picker fingers, evisceration equipment, chill water, worker's hands and/or packing surfaces (Clouser et al., 1995). Scalding process reduced the numbers of microorganisms due to washing effect and destroying of heat sensitive microorganisms. Also, chilling and chlorination of water decreased the bacterial load followed by re-increasing in bacterial count on the final product due to handling of the poultry carcasses (El-Khateib et al., 1998). The recorded result was compatible with Nossair et al., (2015) who examined 50 of chicken carcasses collected from retailing shops in Alexandria Province and found that aerobic plate

### Table (7): Statistical analytical results of yeast count cfu/g of examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>$3.1 \times 10^2$</td>
<td>$5.4 \times 10^3$</td>
<td>$2.2 \times 10^3b$</td>
<td>$2.1 \times 10^3$</td>
</tr>
<tr>
<td>Thigh</td>
<td>$3.8 \times 10^2$</td>
<td>$5.7 \times 10^3$</td>
<td>$2.3 \times 10^3a$</td>
<td>$2.2 \times 10^3$</td>
</tr>
</tbody>
</table>

N.B: Means with similar letters are not significantly different at P≤0.05. EOSQC No. 1090 (2005) stated that chicken carcasses must be free from yeast. All the examined samples exceeded the permissible limit recommended by EOSQC, (2005).

### Table (8): Statistical analytical results of mould count cfu/g of examined chicken carcass samples: (N=50)

<table>
<thead>
<tr>
<th>Source of sample</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>$1.1 \times 10^2$</td>
<td>$1 \times 10^3$</td>
<td>$7.3 \times 10^2b$</td>
<td>$9.5 \times 10^2$</td>
</tr>
<tr>
<td>Thigh</td>
<td>$1.3 \times 10^2$</td>
<td>$2.4 \times 10^3$</td>
<td>$1 \times 10^3a$</td>
<td>$9.6 \times 10^2$</td>
</tr>
</tbody>
</table>

N.B: Means with similar letters are not significantly different at P≤0.05. EOSQC No. 1090 (2005) stated that chicken carcasses must be free from mould. All the examined samples exceeded the permissible limit recommended by EOSQC, (2005).
count ranged from $5 \times 10^6$ to $3 \times 10^9$, with a mean value $4 \times 10^8 \pm 9 \times 10^7$ cfu/g. In conclusion, the high aerobic plate count found in the examined chicken carcasses may be attributed to several sources of contamination so HACCP system must be applied to know the critical points of contamination to avoid contamination during processing.

3.2. Total Enterobacteriaceae Count (TEC):
Data recorded in Table (2), it was found that TEC ranged from $6 \times 10^2$ to $1.8 \times 10^3$, with a mean value $1.3 \times 10^3 \pm 3.8 \times 10^2$ cfu/g in breast samples of fresh chicken carcasses, while in thigh samples TEC ranged from $1.8 \times 10^3$ to $2.5 \times 10^3$, with a mean value of $2 \times 10^3 \pm 1.7 \times 10^3$ cfu/g. Also shows that there is a significant difference between the mean values of total enterobacteriaceae count cfu/g of breast and thigh samples of freshly slaughtered chicken carcasses. *P* < 0.05. The obtained result is lower than the result obtained by Hossam, (2012) who examined bacteriologically 50 fresh broiler carcasses collected from different poultry shops at Dammanhour city and found that the mean value of TEC was $3.2 \times 10^2 \pm 3.4 \times 10^3$ cfu/g. Hassan, (2015) who examined 50 chicken carcasses samples from retailed outlets in Alexandria province and found that the mean value of TEC was $8.5 \times 10^5 \pm 8.9 \times 10^4$ cfu/g. Enterobacteriaceae had an epidemiological importance as some of its members were pathogenic and may cause serious infection and food poisoning to man. Moreover, Enterobacteriaceae count can be taken as an indicator of possible enteric contamination (Pogorelova et al., 1993).

3.3. Coliform Count (TCC):
The result obtained in Table (3) showed that CC ranged from $6 \times 10^2$ to $1.6 \times 10^3$, with a mean value $1.1 \times 10^3 \pm 3.4 \times 10^2$ cfu/g in breast samples of fresh chicken carcasses, while in thigh samples CC ranged from $1.6 \times 10^3$ to $2.3 \times 10^3$, with a mean value $1.8 \times 10^3 \pm 1.8 \times 10^2$ cfu/g. Also shows that there is a significant difference between the mean values of CC cfu/g of breast and thigh samples of freshly slaughtered chicken carcasses. *P* < 0.05. By comparing these results with EOSQC (2005), it is clear that about 60% of breast samples are over than the permissible limit ($1 \times 10^3$) stated by EOSQC (2005) and all the thigh samples having CC above the permissible limit, this due to high source of contamination. These results, especially of breast samples, were nearly similar to that reported by Mousa and El-Hoshy (1993) and Hassan, (2015) including mean value of CC around $1.7 \times 10^3 \pm 1.5 \times 10^2$ cfu/g.

3.4. Isolation of Salmonellae:
The results obtained in table in Table (4) showed that the incidence of Salmonellae isolated from breast and thigh samples was 18% and 22%, respectively. The obtained results of the rate of isolation of Salmonellae from fresh chicken carcasses was higher than that recorded by Donado-Godoy et al. (2012) who found that 27% of the carcasses were Salmonella positive.

3.5. Isolation of E. coli:
The rate of isolation of *E. coli* from examined chicken carcasses samples was attempted and it was recorded that the rate of isolation of *E. coli* in breast and thigh samples was 40% (20 isolates) and 48% (24 isolates), respectively. Table (5). The obtained results of the rate of isolation of *E. coli* from fresh chicken carcasses was higher than that recorded by Zhao *et al.* (2001) who found that 82 (38.7%) of 212 chicken samples yielded *E. coli*.

Samaha *et al.* (2003) who examined 35 random samples of locally produced whole chicken and could isolate *E. coli* at the rate of 22.86% and Hosam, (2012) who could isolate *E. coli* at the rate of 10% from 50 fresh broiler chicken carcasses. Generally the presence of *E. coli* in examined chicken products considered as an indicator for improper handling or unhygienic conditions which agreed with Frazier and Westhoff, (1998) and Hashim, (2003).

3.8. Isolation of Shigella species:
The results obtained in table in Table (6) showed that the incidence of Shigella species isolated from chicken carcasses breast and thigh samples was 30% and 42%, respectively. The obtained results of the rate of isolation of Shigella spp. from fresh chicken carcasses was higher than that recorded by Sackey *et al.* (2001) and Cardoso *et al.* (2006) who found that the incidence of Shigella spp. was 5.9% and 6.9%, respectively.

3.9. Yeast Count:
The recorded data in Table (7) showed that all of the examined samples were contaminated with yeast. Also, it was found that yeast count ranged from $3.1 \times 10^2$ to $5.4 \times 10^3$, with a mean value $2.2 \times 10^2 \pm 2.1 \times 10^2$ cfu/g in breast samples of fresh chicken carcasses, while in samples from thigh ranged from $3.8 \times 10^2$ to $5.7 \times 10^3$, with a mean value $2.3 \times 10^3 \pm 2.2 \times 10^3$ cfu/g. Also Table (7) shows that there is a significant difference between the mean values of yeast counts cfu/g of breast and thigh samples of...
freshly slaughtered chicken carcasses. P≤0.05. By comparing the result with EOSQC No. 1090 (2005) stated that chicken carcasses must be free from yeast it is clear that 100% of the samples were above the permissible limits. This result was in agreement with the results obtained by (Hmd et al., 2017) who examined 50 freshly slaughtered chicken carcasses samples from retailed outlets in Alexandria province and found that the mean value of yeast count was 1.9×10^3 ± 1.3×10^2 cfu/g.

3.10. Mould Count:

The recorded data in Table (8) showed that all of the examined samples were contaminated with mould. Also, it was found that mould count ranged from 1.1×10^2 to 1.3×10^2, with a mean value 7.3×10^2±9.5×10^2 cfu/g in breast samples of fresh chicken carcasses, while in samples from thigh ranged from 1.3×10^2 to 2.4×10^3, with a mean value 1×10^3±9.6×10^2 cfu/g. Also Table (8) shows that there is a significant difference between the mean values of mould counts cfu/g of breast and thigh samples of freshly slaughtered chicken carcasses. P≤0.05. By comparing the result with EOSQC No. 1090 (2005) stated that chicken carcasses must be free from mould it is clear that 100% of the samples were above the permissible limits. This result was in agreement with the results obtained by (Hmd et al., 2017) who examined 50 freshly slaughtered chicken carcasses samples from retailed outlets in Alexandria province and found that the mean value of mould count was 4.8×10^2 ± 9×10 cfu/g.

4. CONCLUSION

According to the recorded results in the current study, it was clear that increased bacterial counts with occurrence of pathogenic bacteria in the examined samples that exceed the Egyptian standards especially thigh samples reflected the poor hygienic conditions that accompanied the traditional slaughtering process reducing the quality of chicken meat sold under such conditions that should alarm the danger bells to prevent selling of freshly slaughtered chicken carcasses and give the chance for chilled and frozen chicken carcasses.

6. REFERENCES


