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# Evaluation Of Hygienic Characteristics Of Broiler Carcasses In Two Slaughterhouses And At The Retails Shops

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***Abstract*— The object of this study is to evaluate the microbiological quality of broiler carcasses at the slaughterhouses after the cooling process and in the retail shops in Tirana district. 96 broiler carcasses were collected from two slaughterhouses and from the retail shops in Tirana. For each operator were collected 48 samples, 24 in the slaughterhouse immediately after the cooling process and 24 carcasses from the same operators at the retail shops in Tirana. All samples were collected between March 2015-February 2016, and were tested for mesophel aerobic bacterial counts, E coli counts, and Staph. aureus counts. There were ISO standard methods used for all the analysis performed. Mesophilic bacterial counts for all the samples varied from $10^2$ cfu/g to $2.1x10^5$ cfu/g. There were 97.92%in norm end 2.08% of the samples above the acceptance limits of the Albanian regulation. E.coli loads for the 96 samples were between <10cfu/g and $1.1 x10^6$ cfu/, with 2.08% of the samples above the acceptance limit for E.coli loads. All the samples were also tested for the St.aureus loads and 34.37% of the samples resulted positive but within the regulation limits.**

***Keywords—broiler; microbiological quality; E.coli; NPA; Staph.Aureus;***

## I. INTRODUCTION

Poultry meat is a major source of food borne diseases. According to the World Health organization food borne diseases count for 502 634 cases a year with 30% of this cases caused by poultry meat. Live animals are host to a large number of different microorganisms residing on their skin, feather or alimentary tract. Contamination is possible at any stage of the production process, feather plucking, evisceration, washing of the carcasses, cooling and freezing. Other contamination might be possible from the environment, equipment, operators etc (Mead, 1989). Hygienic characteristics of the poultry carcasses depend on the rearing conditions, health status of the flock, processing conditions, storage conditions at the slaughterhouse, packaging, transportation, and handling of the products at the retail shops and houses before consumption. An efficacious way of preventing food-borne human diseases is to monitor the microbiological quality of poultry meat and meat products during production, storage and distribution. E According to FRIES (2002), the micro-flora of poultry is transferred from the primary production sites to production lines, and further, by subsequent contamination. Micro flora of crude chicken meat is heterogeneous and originates from slaughtering premises, operators' hands, equipment and outfit, and water and air (ANONYM., 1996). Ensuring safe food supply has been one of the major challenges and concerns for producers, consumers and public health officials in both developing and developed countries. This is because foods excessively contaminated with pathogenic and spoilage micro-organism are undesirable and can cause food borne illnesses. The main capacities for production and processing of poultry meat in Albania are mainly located in the territory of the district of Tirana. These operators are both leading suppliers and distributors of this market area. The study was conducted in the period March 2015-February 2016, in Tirana region. A total of 96 samples were tested, of which 48 samples from operator A and 48 samples from operator B. Samples were taken at the slaughterhouse after the cooling process as well as at the retail markets places supplied from the same operators. Mesophil aerobic count are an indicator of hygienic characteristics of poultry carcasses and E. coli si an indicator of fecal contamination. St. aureus is a common contaminant of poultry meat coming from different origins, with an emphasis of the human strains, which pose the highest risk to the public health (Capita at al, 2002).

## II. MATERIALS AND METHODS

Ninety-six broiler carcasses were collected from two slaughterhouses (24 samples each) and from the retail shops in Tirana (24 samples from each operator). The samples were aseptically collected, and each carcass was placed in a separate, sterile plastic bag. The samples were brought under refrigeration to the laboratory and analyzed within the following 4 h.

### *A. Total Mesophilic aerobic counts*

The samples were subjected to microbiological analysis according to standard procedures ISO (4833:2003). 25 grams of meat from different parts of each whole carcass was removed with the help of a sterile scalpel and minced manually. It was then thoroughly mixed in 225 ml of Buffered peptone water.

Decimal dilutions were poured into a Petri dish. Total mesophil aerobic count test (TAC) was carried out on Standard plate count agar (PCA media) by pour plate method (in duplicate) and plates were incubated for 48 hours at 37°C. The enumeration of Plates with approximately 25-250 colonies were selected for counting of results. Total numbers of colonies were counted after 48 hours from each plate.

### *B. St.Aureus*

25 g of test sample (meat) was weighted and blended in stomacher for 2 minutes and a gram of the sample was weighed out and homogenized in 225mls buffered peptone water. The samples were diluted at dilution rate 1:10 and 0.1 ml from the diluted sample was inoculated into CTNA (coagulase thermo nuclease agar) and incubated for 48 hours in 37°C+1°C. The colonies of St aureus were identified and counted.

## III. RESULTS AND DISCUSION

### *A. Mesophilic Aerobic Counts*

Table1. indicates the results for the mesophilic aerobic counts for operator A at the slaughterhouse and at the retail shops. The total mesophilic aerobic counts resulted within the regulation limit for 47 of the samples and over the regulation limit in 1 case at the retail shop.

It is evident that the total mesophilc aerobic counts tend to increase from the slaughterhouse to the retail shop, this is to be expected because of the storage in the retail shops. Samples collected from the Operator A slaughterhouse resulted 18 satisfactory, 6 acceptable with no samples over the acceptable limits. Samples from the same operator collected at the retail shops resulted 7 satisfactory, 16 acceptable, 1 unacceptable.

TABLE I. TOTAL NUMBER OF AEROBIC (NPM) CFU / G

| Operatori A | | |
|---|---|---|
| Month | slaughterh | Market |
| March 2015 | $6x10^3$ | $1.7x10^4$ |
| | $5x10^3$ | $2.5x10^4$ |
| April | $5.5x10^3$ | $5.9x10^3$ |
| | $4x10^3$ | $2.1x10^5$ |
| May | $6x10^3$ | $3x10^4$ |
| | $10^3$ | $3.5x10^3$ |
| *June* | $2.1x10^3$ | $4.2x10^4$ |
| | $5.5x10^3$ | $2x10^3$ |
| July | $2x10^3$ | $2.3x10^6$ |
| | $10^3$ | $2.4x10^3$ |
| August | $2.5x10^3$ | $5.4x10^5$ |
| | $2.7x10^3$ | $2.5x10^3$ |
| September | $1.7x10^4$ | $5.2x10^2$ |
| | $1.5x10^4$ | $9.1x10^3$ |
| October | $4x10^3$ | $1.8x10^3$ |
| | $1.1x10^3$ | $3x10^3$ |
| November | $1.5x10^3$ | $10^3$ |
| | $1.9x10^3$ | $1.7x10^4$ |
| December | $1.7x10^4$ | $2.7x10^3$ |
| | $1.5x10^4$ | $2.5x10^3$ |
| January 2016 | $10^3$ | $4x10^5$ |
| | $1.3x10^3$ | $9.2x10^2$ |
| February 2016 | $4.8x10^5$ | $9.9x10^2$ |
| | $1.6x10^4$ | $1.1x10^3$ |

Table 2 indicates the total mesophilic aerobic counts for the 48 samples collected from the slaughterhouse of the operator B and the retail shops. There 47 samples within the regulation limits and 1 sample collected at the slaughterhouse resulted unacceptable.

TABLE II. TOTAL NUMBER OF AEROBIC (NPM) CFU / G.

| Operatori B | | |
|---|---|---|
| Month | Slaughterh | Market |
| March 2015 | $10^3$ | $6x10^2$ |
| | $3x10^4$ | $3.2x10^4$ |
| April | $1.7x10^3$ | $3x10^3$ |
| | $2x10^4$ | $4.5x10^4$ |
| May | $8.2x10^2$ | $1.8x10^4$ |
| | $4.4x10^4$ | $2x10^4$ |
| *June* | $3x10^2$ | $5.4x10^4$ |
| | $4.7x10^3$ | $2.3x10^3$ |
| July | $5.66x10^6$ | $1x10^3$ |
| | $2.3x10^3$ | $1.1x10^3$ |
| Augusto | $3.6x10^3$ | $1.1x10^4$ |
| | $5.4x10^3$ | $3.5x10^4$ |
| September | $2.8x10^3$ | $2.4x10^4$ |
| | $1.5x10^4$ | $2.8x10^4$ |
| October | $1.1x10^4$ | $2.3x10^4$ |
| | $1.4x10^4$ | $2.2x10^3$ |
| November | $10^3$ | $2.6x10^3$ |
| | $3.9x10^3$ | $1.5x10^4$ |
| December | $2.5x10^3$ | $1.8x10^4$ |
| | $2.4x10^3$ | $2.2x10^3$ |
| January 2016 | $1.7x10^3$ | $1.6x10^3$ |
| | $5.5x10^5$ | $5.4x10^5$ |
| February 2016 | $1.9x10^3$ | $1.1x10^3$ |
| | $10^3$ | $9.1x10^2$ |

In total there were 2.083% (2/96) of the samples unacceptable according to the total mesophilic aerobic counts. It has to be added that the samples were collected randomly at the slaughterhouse and at the retails shops, meaning that the samples at the retail shops could have been stored for longer than 1 day prior to collection.

### *B. E.coli counts*

Forty eight samples were tested for E.coli counts form Operator A. Twenty four samples were collected at the slaughterhouse and 24 at the retail shops. Table 3 indicates the E coil counts for all the samples tested at the slaughterhouse and at the retail shops. There is to be noticed that the E coli counts have a sharp increase in the retail shops because of the extended time of storage and also the extra contamination derived from the environment handling and storing. There is only on case collected from the retail shops which is over the meat regulation limits and all the other samples are within the regulation limits.

TABLE III. ESCHERICHIA COLI COUNTS

| Operator A | Slaughterhouse *cfu/g* | Market *cfu/g* |
|---|---|---|
| **March** | <10 | <10 |
| | <10 | <10 |
| **April** | <10 | 1.5x10² |
| | <10 | 10³ |
| May | <10 | 10³ |
| | <10 | <10 |
| *June* | 4x10 | <10 |
| | 1.1x10³ | 2.4x10² |
| July | <10 | 1.1x10⁶ |
| | <10 | < 10 |
| Augusto | <10 | 1.1x10³ |
| | 50 | 9x10² |
| September | 20 | <10 |
| | <10 | <10 |
| October | <10 | <10 |
| | <10 | <10 |
| November | 20 | <10 |
| | <10 | 30 |
| December | <10 | <10 |
| | <10 | <10 |
| January 2016 | <10 | 2.2x10² |
| | <10 | 3.6x10² |
| February 2016 | <10 | 9x10² |
| | 2.3x10² | 5.2x10² |

Tabel 4 indicates the E.coli counts for each samples collected at the slaughterhouse of the operator b and at the retail shops. All the samples resulted within the regulation limits for E.coli counts except on sample from the slaughterhouse, which resulted over the regulation limit.

TABLE IV. ESCHERICHIA COLI COUNTS

| Operatori B | Slaughterhouse *cfu/g* | Market *cfu/g* |
|---|---|---|
| **March** | <10 | <10 |
| | <10 | <10 |
| **April** | 10³ | 1.3X10³ |
| | 9.1x10² | 1.2X10³ |
| **May** | <10 | <10 |
| | <10 | <10 |
| **June** | <10 | 1.1X10³ |
| | <10 | <10 |
| **July** | <10 | <10 |
| | <10 | <10 |
| **Augusto** | <10 | <10 |
| | 1.5x10⁶ | <10 |
| **September** | <10 | <10 |
| | <10 | <10 |
| **October** | <10 | <10 |
| | <10 | <10 |
| **November** | <10 | <10 |
| | <10 | <10 |
| **December** | <10 | <10 |
| | <10 | <10 |
| **January 2016** | <10 | 8x10² |
| | 10³ | 10³ |
| **February 2016** | 10² | <10 |
| | <10 | <10 |

Table. 5 and 5.1 indicates the St. aureus counts in all samples tested from the operator A and operator B respectively. The St. aureus counts were within the limits in all the 96 samples. The positivity for St. aureus resulted 33/96 (34.37%)of the total number of analyzed samples. It is to be noticed that there is a higher positivity for the samples collected at the retail shops from both operators. This was expected because the carcasses are not packed individually. with sealed packaging, allowing a higher contamination rate for the samples at the retail shops.

TABLE V. RESULTS OF *ST. AUREUS*

| *Operatori A* | Slaughterhouse *cfu/g* | *Market cfu/g* |
|---|---|---|
| ***March*** | 0 | 0 |
| | 0 | 0 |
| ***April*** | 0 | 16 |
| | 0 | 10² |
| ***May*** | 0 | 0 |
| | 0 | 0 |
| ***June*** | 0 | 20 |
| | 70 | 40 |
| ***July*** | 2x10² | 9x10² |
| | 20 | 0 |
| ***Augusto*** | 10 | 0 |
| | 0 | 0 |
| ***September*** | 0 | 0 |
| | 0 | 0 |
| ***October*** | 0 | 70 |
| | 0 | 20 |
| ***November*** | 0 | 0 |
| | 30 | 20 |
| ***December*** | 57 | 0 |
| | 0 | 30 |
| ***Janary*** | 0 | 1100 |
| | 0 | 150 |
| ***February*** | 0 | 0 |
| | 0 | 50 |

TABLE VI. RESULTS OF *ST. AUREUS*

| *Operatori B* | Slaughterhouse *cfu/g* | *Market cfu/g* |
|---|---|---|
| ***March*** | 0 | 20 |
| | 0 | 0 |
| ***April*** | 0 | 18 |
| | 0 | 16 |
| ***May*** | 0 | 10 |
| | 0 | 0 |
| ***June*** | 0 | 9x10² |
| | 0 | 50 |
| ***July*** | 9x10² | 0 |
| | 50 | 0 |
| ***Augusto*** | 0 | 0 |
| | 0 | 0 |
| ***September*** | 0 | 0 |
| | 0 | 0 |
| ***October*** | 0 | 0 |
| | 0 | 50 |
| ***November*** | 16 | 0 |
| | 20 | 0 |
| ***December*** | 0 | 20 |
| | 0 | 70 |
| ***Janary 2016*** | 20 | 0 |
| | 0 | 40 |
| ***February2016*** | 0 | 0 |
| | 0 | 0 |

## *C.* .CONCLUSION

Aerobic Mesophilic bacterial counts were within the regulation limit in 97,91% of the samples analyzed and 2.083% of the samples resulted unacceptable.

E coli loads were within limits in 94 samples and unacceptable in 2 samples. There is a slight increase of E.coli counts in the samples collected from the retail shops because of longer storage time and missing of individual packaging.

St aureus counts were within the limits in all samples although there is an increase in positivity and bacterial counts in the samples collected form the retail shops.

Referring to the results obtained, it can be concluded that the hygienic conditions of poultry processed and sold in Albania are within the regulation limits except a small number of cases which resulted unacceptable because of high mesophilic bacterial counts and E. coli counts.

It is also to be noticed that the poultry carcasses should be individually packed with sealed packaging materials in order to avoid further contamination during the storage and distribution at the retail shops.

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