Assessment of bacterial contamination in cattle carcasses at Gharbia Abattoirs

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A B S T R A C T

The bacteriological examinations were carried out to evaluate the degree of bacterial contamination in cattle carcasses at abattoirs of Gharbia governorate. A grand total of 100 random swab samples from cattle carcasses were collected in the year at 2018, under complete aseptic conditions just after washing and before stamping from different abattoirs and transferred without undue delay to the Lab. of Animal Health Research Institute, Tanta lab, and subjected to the bacteriological examination. The obtained results indicated that the mean values of Aerobic Plate Count (APC), at the region of fore quarter, hind quarter and abdomen were $1.09x10^9 \pm 0.47x10^9$, $1.61x10^9 \pm 0.74x10^9$ and $1.19x10^9 \pm 0.78x10^9$cfu/g, respectively. While the mean values of Coliform count at the previous regions were$4.78x10^5 \pm 3.82x10^5$, $1.30x10^5 \pm 6.57x10^4$ and $1.42x10^5 \pm 1.27x10^6$cfu/g, respectively, and the mean values of total Staphylococcal count were $2.39x10^7 \pm 8.57x10^6$,$2.76x10^7 \pm 7.50x10^6$ and $3.56x10^7 \pm 1.54x10^7$cfu/g, respectively. All the obtained results showed non-significant difference ($P < 0.05$).

Keywords: *Cattle carcasses, bacteriological examination, aerobic plate count*

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1. INTRODUCTION

Meat considered as an important source of protein, fat, vitamins and minerals, low in carbohydrate content and with sufficient water activity, supports the growth of both spoilage and pathogenic bacteria. A great diversity of microbes inhabit fresh meat generally, but different types may become dominant depending on pH, composition, textures, storage, temperature, and transportation means of raw meat (Adu-Gyamfi *et al*., 2012).The raw meat may harbor many important pathogenic microbes such as *Salmonella spp., E. coli*, and *Staph. aureus,* making the meat a risk for human health, as without the proper handling and control of these pathogens, foodborne illnesses may occur (Nørrung *et al*., 2009). The World Health Organization (WHO) and the Food and Agricultural Organization (FAO) of the United Nations stated that illness due to contaminated food considered the most widespread health problem and an important cause of reduced economic productivity (Käferstein, 2003).The main sources of the microbial contamination were found to be the hide and hair of the slaughtered animals, deriving mainly from the microflora of soil. The transfer of contaminating organisms from the hide to the underling tissues was fond to be replaced with recorded during the stage of skinning by means of knives, through the hands, arms, the workers clothes and accidental puncture of stomach and intestine (Gracey *et al*., 1999). Another important source of contamination arises from unwholesome contacts of meat with excretions from skin, mouth, and nose of the abattoir workers(Omoruyi *et al*., 2011).Aerobic plate count (APC) is the most reliable index of meat quality, sanitary processing and storage life (ICMSF, 1980).*Staphylococcus aureus* is the second most common pathogen associated with outbreaks of food poisoning, its presence in foods is usually indicative for lack of hygiene in food production (Charlier *et al.*, 2009)**,** and can lead to food intoxication (Normanno *et al.*, 2007). Staphylococcal enterotoxins were highly resistant to heat (ICMSF, 1996).There for the present study was aimed to evaluate the degree of bacterial contamination in cattle carcasses through the total APC, Total Coliform count and Total Staphylococcal count.

2. MATERIALS AND METHODS

2.1. Collection of samples

A grand total of 100 random swab samples from cattle carcasses were collected from different abattoirs in Gharbia Governorate under complete

aseptic conditions just after washing and before stamping. The collected swab samples which are moistened in rinsing fluid solution (buffered peptone water 0.1%) and preserved in an insulated ice box under complete aseptic conditions and transferred without undue delay to the Laboratory of Animal Health Research Institute, Tanta lab, and subjected to the bacteriological examination.

2.2. Preparation of sample (APHA, 2001)

Swabs from cattle carcasses surfaces were taken by using sterile cotton swabs moisturized in rinsing fluid solution (buffered peptone water 0.1%), and templates. The sterilized template was placed firmly against the surface of examined area. The sterile cotton swab was drawn from screw capped plastic tube and then rolled over the limited area inside the template in one direction and perpendicular to this direction to represent all the examined area. Finally, the cotton swabs were retained into the screw capped tubes containing 10ml of sterile buffered peptone water (0.1%) and transferred immediately as possible in an ice-box to the laboratory and ten-fold serial dilutions up to 10^7 were prepared.

2.3. Bacteriological examination

2.3.1. Aerobic plate count (ISO, 2013)

One ml from each of the previously prepared serial dilutions was poured into two separate sterile Petri dishes, using pour plate method, to which approximately 15 ml of sterile melted and tempered plate count agar (45^{o}C) were poured. After thorough mixing, the inoculated and control plates were allowed to solidify at room temperature before being incubated in an inverted position at 37 0C for 24 hours. Total aerobic plate count (cfu/g) per gram was calculated on plates containing 30-300 colonies and recorded

2.3.2. Coliform count (ISO, 2006)

All dark red colonies on Violet Red Bile agar plates were enumerated and the average number of coliforms per gm of the sample was recorded

2.3.3. Staphylococcal count (ISO, 2007)

All yellow colonies surrounded by halo zone on Baird parker medium plates were enumerated and total Staphylococci count (cfu/g) were calculated and recorded

3. RESULTS

It is evident from the results recorded in Table (1) that the mean values of APC(/gm) in the examined swab samples of fresh meat of cattle carcasses at the region of fore quarter, hind quarter and abdomen were $1.09x10^9 \pm 0.47x10^9$, $1.61x10^9 \pm 0.74x10^9$ and $1.19x10^9 \pm 0.78x10^9$cfu/g, respectively, with no significant difference ($P < 0.05$) between the sites of examined surface. From the results achieved in Table (2), it is revealed that the mean values of total coliform counts in the examined swab samples of fresh meat of cattle carcasses at the region of fore quarter, hind quarter and abdomen were $4.78x10^5 \pm 3.82x10^5$, $1.30x10^5 \pm 6.57x10^4$ and $1.42x10^5 \pm 1.27x10^6$cfu/g, respectively, with no significant difference ($P < 0.05$) between the sites of examined surface. Furthermore the results achieved in Table (3), revealed that the mean values of total Staphylococcal counts in the examined swab samples of fresh meat of cattle carcasses at the region of fore quarter, hind quarter and abdomen were$2.39x10^7 \pm 8.57x10^6$, $2.76x10^7 \pm 7.50x10^6$ and $3.56x10^7 \pm 1.54x10^7$cfu/g, respectively, with no significant difference ($P < 0.05$) between the sites of examined surface

Table (1) Statistical analytical results of APC (cfu/g) of the examined samples of cattle forequarter, hindquarter and abdomen

Type of Sample	Min.	Max	Mean ± S.E
Fore quarter (n=40)	<10	$1.26x10^{10}$	$1.09x10^9 \pm 0.47x10^{9a}$
Hind quarter (n=40)	<10	$2.50x10^{10}$	$1.61x10^9 \pm 0.74x10^{9a}$
Abdomen (n=20)	<10	$1.16x10^{10}$	$1.19x10^9 \pm 0.78x10^{9a}$

Means within a column followed by same letters showed non-significant difference ($P < 0.05$)

Table (2) Statistical analytical results of coliform count (cfu/g) of the examined samples of cattle forequarter, hindquarter and abdomen

Type of Sample	Min.	Max	Mean ± S.E
Fore quarter (n=40)	<10	$1.53x10^7$	$4.78x10^5 \pm 3.82x10^{5a}$
Hind quarter (n=40)	<10	$2.58x10^6$	$1.30x10^5 \pm 6.57x10^{4a}$
Abdomen (n=20)	<10	$2.54x10^7$	$1.42x10^5 \pm 1.27x10^{6a}$

Means within a column followed by same letters showed non-significant difference (P < 0.05)

Table (3) Statistical analytical results of staphylococci count (cfu/g) of the examined samples of cattle forequarter, hindquarter and abdomen

Type of Sample	Min.	Max	Mean ± S.E
Fore quarter (n=40)	<10	$2.80x10^8$	$2.39x10^7 \pm 8.57x10^{6a}$
Hind quarter (n=40)	<10	$2.20x10^8$	$2.76x10^7 \pm 7.50x10^{6a}$
Abdomen (n=20)	<10	$2.40x10^8$	$3.56x10^7 \pm 1.54x10^{7a}$

Means within a column followed by same letters showed non-significant difference (P < 0.05)

4. DISCUSSION

The bacterial contamination of the carcass occurs mainly during processing and manipulation, such as skinning, evisceration, storage and transportation. The carcass dressing and evisceration processes constitute critical points in the microbial contamination of muscle. Moreover, fecal matter was a major source of contamination could reach the carcass through direct deposition, as well as by indirect contact through contamination with equipment, workers, installations and air (Abdallah et al., 2009). Table (1) the current results were nearly similar to those reported by Mukhopadhyay et al. (2009), above 10^7 , Nafisa et al. (2010), between 10^8 –10^{10} , Tafesse (2014), 1.2 $x10^8$, Bogere and Baluka (2014), $1.64x10^9$ and Nahla-Boshra (2017),$1.4x10^6$.While, higher results were obtained by Ali et al. (2010), 1.58 x $10^{10.}$. Furthermore, lower APC obtained byEl-Dally (1994), 4.7 x 10^3, Rahkio and Korkeala (1996), 4.5 × 10^2, Abdallah et al. (2009), 6.2 × 10^2,Antwi-Agyei and Maalekuu (2014), $2.13x10^5$, Hassan et al. (2016) , 2.26×10^4 and Salem-Amani et al. (2017), 1.5×10^4 . Although the APC of any food articles are not a sure indicative of their safety for consumption, yet it is of supreme importance in judging the hygienic condition under which food has been produced, handled and stored (Levine, 1987). Accordingly, the level of the APC is generally accepted as a criterion for microbial contamination of carcasses and a useful indicator of hygiene (Zweifel and Stephan, 2003). The higher bacterial contamination in fresh meat obtained in this study might be attributed to unhygienic and improper handling of animals during slaughtering, dressing and evisceration, in addition to that there is no doubt that wiping clothes used by slaughter personnel for cleaning up the carcasses could be an important source of contamination of carcasses. Moreover, the wiping clothes used were not sterile and one wiping cloth was used for a number of continuous carcasses (Akafete and Haileleul,2011). Table (2) the obtained results were almost agree with that reported by Mukhopadhyay et al. (2009), 6.9×10^5 , Samaha (2011), 1.1 $x10^4$, Gebeyehu et al. (2013), 53 $x10^5$ and Magdy, (2014), 4.4 $x10^4$. While higher results were obtained by Nnachi and Ukaegbu (2014), 7.8 $x10^{13}$ and Victoria et al. (2014), 2.7 $x10^6$, furthermore, lower coliform count obtained byBogere and Baluka (2014), 5 $x10^2$, Singh et al. (2014), 1.1 $x10^3$, Hassan et al (2016), 5.54 $x10^2$ and Nahla-Boshra (2017), 1.3 $x10^3$. Meat contamination with coliforms indicates poor hygienic conditions of carcass processing(Kornacki, 2011). High contamination level of Coliforms in fresh meat may indicate unsanitary conditions. They are indicators of fecal pollution which begin from skinning and direct contact with knives and workers hands. Also, during evisceration and washing, contamination may come from intestinal contents as well as from water during rinsing and washing of carcasses. Table (3) the achieved results nearly similar to results obtained by Nnachi and Ukaegbu (2014), 7.6 $x10^7$ and Tafesse et al. (2014), 5.5 $x10^6$.While lower result was obtained by Darweesh (2004), 1.6 $x10^4$, Salama (2013), 7.3 $x10^3$, Ismail-Eman (2015), 1.56 $x10^3$, Hassan et al. (2016), 1.28 $x10^3$ and Nahla-Boshra (2017), 6.6 $x10^2$. The total Staphylococci count can be taken as index of sanitary conditions under which meat and its products are manufactured and handled. Staphylococci can be carried on hands, nasal passage or throats. Most food borne illness out breaks is originated as a result of contamination from meat handlers and production of heat stable toxins in meat (Potter, 2001).

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