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Estimation of Bacterial Contamination of One – Humped Camel Carcasses in Elobeid Slaughterhouse

Abd-albari Kowa Hessien Abu Khurais and Siham Elias Suliman

Department of Veterinary Medicine, College of Veterinary Medicine, Sudan University of Science and Technology

Corresponding Author: Prof. Siham Elias Suliman Tel: +249 922 651 757

ABSTRACT

The study was conducted to evaluate the bacteriological contamination in camel carcasses in El-Obeid slaughterhouse, North Kordofan State, A total of 156 swab samples were collected from 32 carcasses for identification of the isolates and bacterial total viable counts (TVCs). The mean total viable count of bacteria after skinning, evisceration and washing operations at shoulder site were $7.52 \pm 0.08, 7.49 \pm 0.9$ and 7.51 ± 0.12 $\log_{10}$CFU/cm^2, in the neck site were $7.49 \pm 0.12, 7.50 \pm 0.18$ and 7.47 ± 0.15 $\log_{10}$ CFU/cm^2 and in brisket site were $7.48 \pm 0.12, 7.54 \pm 0.07$ and 7.48 ± 0.11 respectively with statistically significant difference ($P < 0.05$). In addition, in the rump site, the TVCs in these operations were $7.45 \pm 0.16, 7.45 \pm 0.18$and 7.48 ± 0.07 $\log_{10}$ CFU/cm^2 in three points of operation with statistically significant difference ($P < 0.05$). Also, there were statistically significant difference ($P < 0.05$) in TVCs between knives and worker hands during the three operations. Three species of bacteria were isolated and the highest average prevalence was *Staphylococcus* spp56.22%, *Salmonella* 28.89% and *Escherichia coli* 22.88%. It is concluded that the level of bacterial contamination in camel carcasses at El-Obeid slaughterhouse, North Kordofan State was very high and constituted a real public health hazard as pathogenic and toxicogenic. It is recommended that proper washing of camel carcasses using treated water should be applied during slaughtering processes to reduce the level of contamination with microorganism, increasing the awareness of the workers of the slaughterhouse about the importance of public health in their work.

Keywords: Contamination, Bacteria, One – Humped Camel.

INTRODUCTION:

Meat is considered an important source of proteins, essential amino acids, B complex vitamins and minerals. Due to this rich composition, it offers a highly favorable environment for the growth of pathogenic bacteria. The microbiological contamination of carcasses occurs mainly during processing and manipulation, such as skinning, evisceration, storage and distribution at slaughterhouses and retail establishments (Gill, 1998; Abdalla *et al*., 2009). Although muscles of healthy

animals do not contain microorganisms, meat tissues get contamination during the various stages of slaughter and transportation (Ercolini *et al.*, 2006). Food borne diseases often follow the consumption of contaminated food-stuffs especially from animal products such as meat from infected animals or carcasses contaminated with pathogenic bacteria such as *Salmonella* spp., *Staphylococcus aureus, Listeria monocytogenes, Campylobacter* spp., and *Escherichia coli* O157: H7. The majority of these germs result from contamination occurring at the slaughterhouse. (Jouve, 1990; Rosset, 1996) where conventional veterinary inspection cannot detect the presence of these bacteria on apparently healthy carcasses (Gill, 2000).

The main source of contamination is the slaughtered animals themselves, the staff and the work environment (Bell and Hathaway, 1996). Fecal matter was a major source of contamination and could reached carcasses through direct deposition, as well as by indirect contact through contaminated and clean carcasses, equipment, workers, installations and air (Borch and Arinder, 2002). Cattle slaughter operations, such as bleeding, dressing and evisceration, expose sterile muscle to microbiological contaminants that were present on the skin, the digestive tract and in the environment (Gill and Jones, 1999; Bacon *et al*., 2000). Although, most microbial contaminants of carcasses represent commensal bacteria, some microorganisms such as *Salmonella* spp., *Escherichia coli* 0157:H7, and *Listeria monocytogenes* pose a threat to consumer health (Gustavsson and Borch, 1993; Samelis *et al*., 2001).

Assessment of the hygienic risk in a beef slaughtering process should involve enumeration of organism indicative of fecal contamination, such as *E. coli*, at specific points in the process. The contamination and/or cross contamination of carcasses, during slaughtering operations were demonstrated and the results indicated presence of bacteria of potential public health significance (Biss and Hathaway, 1995; Doyle, 1991), There were significant increases in total bacterial counts at skinning points at washing operations; also, dirty workers hands, clothes and equipment's of the slaughterhouse acted as intermediate sources of contamination of meat (Gill, 1998; Gilmour *et al*., 2004; AbdelSadig, 2006; Abdalla *et al*., 2009). Ali (2007), recorded high contamination level in the flank site and lower contamination level on rump sites during skinning. Cattle and their environment were represented as an important source of pathogenic *E. coli* and contamination of meat and meat products which-are then transmitted to human (Elder *et al*., 2000; Hancock *et al.*, 1998; Rice *et al*., 1996).

In Sudan hygienic measure to control microbial contamination of meat is unsatisfactory applied, there are in slaughterhouse more problems included poor hygienic water which is not heated and no disinfectants used and traditional and conventional methods of meat hygiene do not match the international standard so the contamination of carcass may be occurred.

Objectives of this study were to identify the main points of contamination of camel carcasses during slaughtering operations, determine bacterial number (total viable counts) on camel meat and evaluate microbial contamination in camel raw meat and to isolate and identify bacteria at different check points.

MATERIALS AND METHODS:

A cross-sectional study was conducted for a period of six months, from January to June 2015, at El-Obeid Slaughterhouse in El-Obeid city, the Sudan. Camel carcasses were randomly selected.

A total of 130 swab samples were collected from four separated sites the brisket, shoulder, neck and rump on eight replicated times (32 carcasses of camel), after skinning, evisceration and washing was done, respectively. Carcass sites were sampled by the swab technique; an area of 100 cm^2 was marked with a sterile frame (10 cm x 10 cm) for each site on the carcass. Also, .60 swab samples were taken from each worker hands and the knives that used for different slaughtering operations.

Identification and Isolation of Bacteria:

The identification of isolates were carried out according to Barrow and Feltham (1993); Holt *et al.*, (1994). The total viable counts of isolated bacteria, a $10^{-4}$and 10^{-5} were cultured in duplicates. The plates were incubated at 37°C for 24-48 hours.

Plates with 20-300 colonies were counted, then the average number of colonies was multiplied by the dilution factor to give the number of colony forming units (CFU) per ml and divided by 10 to give the number of colonies forming unit per cm^2, these were done according to Miles and Misera (1938).

The isolation and identification of the bacteria were done as described by Barrow and Feltham (1993) and Carter and Cole (1990). The swab samples were cultured using prepared nutrient agar, nutrient broth, deoxycholate Citrate Agar (DCA), MacConkey agar (MCA), and mannitol salt agar (MSA), eison methyline blue agar (EMB). The broth tubes and agar plates were incubated at 37^oC for 24 hours.

Afterwards, the morphology of colonies on agar media were examined macroscopically, smears were then made from clean slides fixed with heat and subjected to Gram stain and examined under oil immersion and the biochemical tests for species identification were parallel conducted.

Data analysis:

The collected data will be analyzed using SPSS software (Statistical Package for the Social Sciences, version 18.0, SSPS Inc. and Chicago, IL, USA). All bacterial counts were converted to log_{10} cfu /cm^2 for analysis and ANOVA were performed. Statistical significance will be set at a P value of < 0.05.

RESULTS:

The mean total viable count at brisket site was 7.48±0.12, 7.54±0. 07 and 7.48±0.11log cfu/cm^2at the three points of operation with statistically significant difference ($P < 0.05$). In shoulder site, TVCs were 7.52±0.08, 7.49±0.09 and 7.51±0.12 Iog_{10} cfu/cm^2, with none statistically significant difference ($P \geq 0.05$).

TVC in neck site after operational points revealed 7.49±0.12, 7.50±0.18and 7.47±0.15 Iog_{10} cfu/cm^2, respectively, with non statistically significant difference ($P > 0.05$).

In rump site, 7.45±0.16, 7.45±0.18 and 7.48±0. 07 log_{10} cfu /cm^2 without statistically significant difference ($P > 0.05$). TVC in knives after evisceration were 7.48±0.06 Iog_{10} cfu/cm^2, without statistically significant difference ($P > 0.05$).

Also, the TVC of the hands of the workers at post evisceration 7.48±0.06 Iog_{10} cfu/cm^2, without significant

differences (P >0.05) (Table 1).

Table 1: Mean±Sd of Total viable counts (Iog_{10} cfu cm-2) on sites of the carcasses in camels in Elobied slaughterhouse – North Kordofan

Sites	Operational Points			Sign.
	Evisceration	Washing	Chilling	
Rump	7.45±0.16	7.45±0.18	7.48±0. 07	NS
Brisket	7.48±0. .12	7.54±0. 07	7.48±0.11	NS
Neck	7.49±0.12	7.50±0.18	7.47±0.15	NS
Shoulder	7.52±0.08	7.49±0.09	7.51±0.12	NS
Hands	7.45±0.07	-	-	NS
Knives	7.48±0.06	-	-	NS

The study revealed three types of bacteria with their frequency and percentage of contamination of the carcasses as shown in Table 2. The highest relative frequency of isolates was *Staphylococcus aureus*, 98 (48.76%) followed by *E.coli* and *Salmonella* spp .

Table 2: Bacteria isolated from camels carcasses, Hands and Knives in Elobied slaughterhouse – North Kordofan

Sites	*Staphylococcus* spp.	*Salmonella* spp.	*E. coli*	Total
Carcasses	98 (48.76%)	36(17.91%)	36(17.91%)	170(84.57%)
Hands	8(3.98%)	4(1.99%)	4(1.99%)	16(7.97%)
Knives	7(3.48%)	2(0.99%)	6(2.98%)	15(7.46%)
Total	113(56.22%)	42(28.89%)	46(22.88%)	201(100%)

DISCUSSION:

Most of the meat contamination is caused by aerobes. These organisms may gain access to meat from the system of living animal or as a result of slaughter contamination (Lawrie, 1979). Meat contamination is economic importance because it inverse the meat quality. Poor meat hygiene practices in the slaughterhouses before and after slaughter would lead to meat contamination. Thornton, (1968); Gracey and Co11inis (1994) emphasized that meat hygiene should be observed at all stage of meat production till it reaches the consumer as fresh, sound, wholesome and safe meat. The level of the TVC was set and agreed to be a criterion for assessing and evaluating the microbial contamination of carcasses and a useful mean to know the hygienic and safety states of meat (Zweifel and Stephan, 2003). In this study, the TVC ranged from 4.48±0.41 to 5.79±0.39 log10cfu/cm at slaughterhouse. Slaughterhouse had showed TVC above the acceptable value of (2.0 log CFU/cm) set by Decision 2001/471/EC of the EU Commission (Anonymous, 2001). Some of the levels of the TVCs recorded in the present study were similar to what have been concluded by Nouichi and Hamdi (2009) who found the superficial bacterial contamination levels of (4.48±0.63 log cfu/cm2). Also this findings in agreement with El-Hadef *et al.* (2005) who found a mean log TAVCs of (5.34 cfu /cm2) at Constantine slaughterhouse. The results recorded in the present study revealed that the bacterial counts (Table 1) were high in the four sites (neck, shoulder, brisket and rump). These findings in agreement with the findings of Gill and Barker (1998) and Abdalla *et al*. (2009) who reported that meat contaminated by bacteria during skinning operation. The contamination of meat at different parts showed significant statistical difference

in the microbial count (FAO/WHO, 1962; Ransom *et al.*, 2002; Shuaib *et al*., 2015). Also evisceration process has an important role in contamination of the muscles, because the feces are richer with coliform bacteria (El-Hadef *et al*., 2005). Washing of the body reduced the level of organisms with complete wearing of protective clothes as shown in this study (Table 1), whereas in another study of Ali (2007)and Abdalla *et al*. (2009) recorded that post washing might increase the level. In this study the bacterial count from workers' hands after treatment showed significant reduction (Table 2) compared with control and the washing of knives by warm water (82 °C) decreased the level of viable bacteria. These results are similar to the results of Abdalla *et al*. (2009). The presence of bacteria in meat in the slaughterhouse indicated that unhygienic handling of meat. The decontamination processes are important to eliminate the sources of contamination and that by practicing an appropriate training for personnel, application of good hygienic methods adoption of HACCP system (Jeffery *et al.*, 2003).

CONCLUSION AND RECOMMENDATIONS:

The level of bacterial contamination in camel carcasses at Elobeid slaughterhouse in North Kordofan was very high and constituted a real public health hazard as pathogenic and toxicogenic. It is recommended that proper washing of camel carcasses using treated water should be applied during slaughtering processes to reduce the level of contamination with microorganism and increasing the awareness of the workers of the slaughterhouse about the importance of public health in their work will reduce the contamination to acceptable level.

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