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METHOD FOR REDUCING CONTAMINATION OF INDIGENOUS CATTLE CARCASSES DURING SLAUGHTERING

(With 2 Tables)

By

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SUMMARY

The bacteriological study was carried out to evaluate the degree of contamination in indigenous cattle carcasses in slaughterhouse, in Khartoum State, during April 2009 - June 2009. For the total viable counts (TVCs), 768 swab samples were collected from 32 carcasses. Sterilization by hot tap water (82 ˚C) to worker's hands and their knives was applied in all slaughtering operations. The mean total viable count (TVCs) after skinning, evisceration and washing operations at brisket site were 1.4 ± 0.12, 1.5 ± 0.09 and 1.5± 0.06 $\log_{10}$ CFU (colony forming unit) /cm^2, in the shoulder site were, 1.3 ± 0.09, 1.2 ± 0.11 and 1.1 ± 0.05 $\log_{10}$ CFU/cm^2, in the neck site were 1.7 ± 0.05, 1.4 ± 0.06 and 1.6 ± 0.06 $\log_{10}$ CFU/cm^2 whereas in the rump site the TVCs in these operations were 1.4 ± 0.06, 1.1 ± 0.07, and 1.2 ± 0.10 $\log_{10}$ CFU/cm^2., respectively with statistically significant difference ($P<0.05$). Also there were reduction in TVCs of worker's hands and their knives with statistically significant difference ($P<0.05$).

Key words: *Cattle carcasses, microbial contamination, slaughterhouse, total viable count.*

INTRODUCTION

Microbial contamination of animal carcasses during slaughtering is an unavoidable problem in the conversion of live animals to meat for consumption (Dickson and Anderson 1991). Carcass dressing and evisceration processes constitute critical points in the microbial contamination of muscle for which corrective measures need to be implemented (Bacon *et al*., 2000; Cutter *et al*., 2000; Abdalla *et al.*,

2009a; Abdalla *et al*., 2009b). Fecal matter was a major source of contamination and could reach carcasses through direct deposition, as well as by indirect contact through contamination with clean carcasses, equipment, workers, installations and air (Borch and Arinder, 2002; Abdalla *et al*., 2009a; Abdalla *et al*., 2009b). Cattle slaughter operations, such as bleeding, dressing, and evisceration, may expose sterile muscle to microbiological contaminants that are present on the skin, the digestive tract, and in the environment (Gill and Jones, 1999; Bacon *et al*., 2000; Abdalla *et al*., 2009a; Abdalla *et al*., 2009b)**.** It has been demonstrated that the workers and their slaughter instruments could spread contamination into the internal organs of beef cattle. Dickson and Anderson (1992) isolated *Salmonella* spp. and *Escherichia coli* from the hands of workers. The presence of bacteria of potential public health significance was explained by Dolye (1991) and Biss and Hathaway (1995) during slaughtering operations. There were significance increases in total bacterial counts at skinning points than that at washing operations and also dirty worker's hands, clothes and equipments of the slaughterhouse acted as intermediate sources of contamination of meat (Gill, 1998; Gilmour *et al.,* 2004; Abdelsadig, 2006; Abdalla *et al.,* 2009a; Abdalla *et al.,* 2009b). Ali (2007) recorded high contamination level on rump sites during skinning. Cattle and their environment were represented important sources of pathogenic *E. coli* (Hancock *et al*., 1998; Elder *et al*., 2000).

There were many studies and also many countries round the world adapted laws for hygienic practice in slaughterhouse (Hess and lott 1970; Dixon *et al*., 1991; Schutz, 1991). The reduction of pathogens can also be obtained by adopting slaughtering practice such as closing of rectum. Gerats (1990) approved association between slaughter practice and hygienic practice of the workers. The washing of hands and disinfestations with hot water rarely take place, and both hygienic disposition and easy access to hygienic facilities were important for hygienic behavior in slaughterhouse (Gerats *et al*., 1982; Tazelaar 1987; Stolle and Reuter 1989; Abdalla *et al.,* 2009a; Abdalla *et al.,* 2009b). A variety of methods has been developed to reduce the levels of contaminating bacteria on carcasses, although most of the current methods focus on washing and sanitizing procedures (Dickson and Anderson. 1992).

The goal of this study were to evaluate the effectiveness of using washing of hands and knives in reducing microorganisms, on beef carcasses during different steps of slaughtering operations

MATERIALS and METHODS

The study was conducted for a period of three months, from April to June 2009, at Sabloga Slaughterhouse in Khartoum city. The carcasses were selected randomly.

The selected carcasses, workers hands and knives were sampled before (control) and after treatment in which workers hands and knives were sterilized under hot tap water (82 °C) in between various operations of slaughtering according to (Gill *et al*., 1998).

A total of 768 samples were taken from four separate sites namely the brisket, shoulder, neck and rump on eight replicated times (32 carcasses), before control and after treatment, at skinning, evisceration and washing respectively. Carcass sites were sampled by the swab-technique an area of 100 cm^2 was marked with a sterile frame (10 cm × 10 cm) for each site on the carcass. Also 60 swab samples were taken from each worker hands and the knives used for different slaughtering operations. The total viable counts were done according to Barrow and Feltham (1993).

The data were analyzed using SPSS software (Statistical Package for the Social Sciences, version 11.5, SSPS Inc, and Chicago, IL, USA). All bacterial counts were converted to $\log_{10}$ CFU /cm^{-2} for analysis and ANOVA was performed. Statistical significance was set at a P value of <.05.

RESULTS

The mean total viable count (TVCs) post skinning, post evisceration and post washing at brisket site was, 3.31 ± 0.14, 3.71± 0.04 and 3.65± 0.02 log CFU/cm^2 for the control, whereas after treatment was 1.4 ± 0.12, 1.5 ± 0.09 and 1.5 ± 0.06 log CFU/cm^2 with statistically significant difference (P<0.05). In shoulder site, TVCs for control carcasses were 3.03 ± 0.15, 2.73± 0.02 and 2.79±0.10 $\log_{10}$ CFU/cm^2 but in treatment samples were 1.3 ± 0.09, 1.2 ± 0.11 and 1.1 ±0.05 CFU/cm^2 with statistically significant difference (*P*<0.05). TVCs in neck site samples after operational points revealed mean values of 3.65± 0.02, 3.42±0.02 and 3.72±0.02 $\log_{10}$ CFU/cm^2 and after treatment were, 1.7 ± 0.05, 1.4 ±0.06 and 1.6 ±0.06 $\log_{10}$ CFU/cm^2 respectively (*P*<0.05). In rump site, TVC in the three points of operation for control were 3.24±0.02, 2.88±0.02 and 3.18±0.03 $\log_{10}$CFU/cm^2, whereas after treatment 1.4 ± 0.06, 1.1 ±0.07 and 1.2 ±0.10 log10CFU/cm^2 with

statistically significant difference (Table 1). TVC in knives after skinning and evisceration for control samples were 3.40±0.02 and 3.25±0.03 log_{10} CFU/cm^2 whereas after treatment were 1.5 ± 0.07 and 1.4 ±0.09 log_{10} CFU/cm^2 (P<0.05) (Table 2). Also the TVC, of the hands of the workers post skinning, post evisceration and post washing were 3.74±0.02, 3.42±0.02 and 3.71±0.02 log_{10} CFU/cm^2 for control samples but in treated samples were 1.6 ± 0.11, 1.2 ±0.39 and 1.6 ±0.09 log_{10} CFU/cm^2 respectively (P<0.05) (Table 2) .

Table 1: Total viable counts (log_{10} CFU cm^2) at different sites on carcasses, at different operational points before (Control) and after treatment

Sites	Operational points						Significance
	Control			Treatment			
	Post skinning	Post evisceration	Post washing	Post skinning	Post evisceration	Post washing	
Brisket	3.31 ± 0.14	3.71 ± 0.04	3.65 ± 0.02	1.4 ± 0.12	1.5 ± 0.09	1.5 ± 0.06	*
Shoulder	3.03 ± 0.15	2.73 ± 0.02	2.79 ±0.10	1.3 ± 0.09	1.2 ± 0.11	1.1 ±0.05	*
Neck	3.65 ± 0.02	3.42 ±0.02	3.72 ±0.02	1.7 ± 0.05	1.4 ±0.06	1.6 ±0.06	*
Rump	3.24 ± 0.02	2.88 ±0.02	3.18 ±0.03	1.4 ± 0.06	1.1 ±0.07	1.2 ±0.10	*

- = Not detected'; * = Significant at level (P<0.05)

Table 2: Total viable counts (log_{10} CFU cm^2) at knives and hands of the workers at different operational points before (Control) and after treatment

Items	Operational points						Significance
	Control			Treatment			
	Post skinning	Post evisceration	Post washing	Post skinning	Post evisceration	Post washing	
Knives	3.40 ± 0.02	3..25 ±0.03	-	1.5 ± 0.07	1.4 ±0.09	-	*
Hands of the workers	3.74 ± 0.02	3.42 ±0.02	3.71 ±0.02	1.6 ± 0.11	1.2 ±0.39	1.6 ±0.09	*

- = Not detected'; * = Significant at level (P<0.05)

DISCUSSION

In this data, the total bacterial counts results were depended on cotton swabbing method, but (Dorsa 1996; Gill and Jones 2000; Ransom *et al.,* 2002) showed that gauze swabbing and excision methods were the same bacterial enumerations on 100 cm^2 area. Also Ware *et al.* (1999) obtain the same results by using these sampling methods in total aerobic count (TAC), faecal coliforms count (FCC) and *E coli* count (ECC) before chilling.

The present work revealed statistically significant difference ($P<0.05$) before treatment of slaughtering operations, this in accord with the results of Gill (1998) who reported bacterial contamination of meat during butchering and skinning. Also, Ali (2007) revealed that the workers hands and the equipment were the sources of meat contamination.

The high level of bacterial viable counts after post washing of bovine carcasses in this study is in agreement with the study of Ali (2007) who recorded that the highest contamination at the point of washing on different sites of examination of bovine carcasses. Microbiological contamination on these beef carcasses occurred as result of conditions of multi-factorial complexity, which could include environmental condition (Gill *et al*., 1996). It is obvious that the variability in microbial counts (especially after washing) indicate the need for use of prerequisite programmes. The reduction of the microbial contamination in this study (Table 1) is in agreement with Rahkio and Korkeala (1996) who said that the enforcement of hygienic practice such as regular disinfection of working tools and worker hands is important in reducing the microbiological contamination of carcasses (Also Dixon *et al.,* 1991; John *et al.,* 2000) reported that reduction of bacterial contamination during slaughtering after using a degree of sanitation.

In conclusion**,** the elimination of contamination sources by practicing good sanitary measures will reduce the occurrence of microorganisms. Appropriate methods should be applied during slaughtering operations, using adequate water and disinfection. Such control measures should include an extensive education programs for proper hygiene and improvement of managements. Designing slaughtering lines so as to make hygienic working possible is evidently very important.

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