Microbial Contamination of Sheep Carcasses at Modern Slaughterhouse in Khartoum State

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Summary

The microbial contamination of sheep carcasses was investigated in El Kadero Slaughterhouse, Khartoum State, between September 2007 and May 2008. A total of 540 swab samples were collected from 36 carcasses for identification of the isolates and total viable count (TVC) of these organisms. The average TVCs after skinning, evisceration and after washing in the abattoir were 5.5 ± 0.89, 6.0 ± 0.33 and 5.1 ± 0.41 $\log_{10}$ FU/cm^2, respectively. The highest prevalence of *Staphylococcus. aureus*, *Bacillus spp* and *Escherichia coli* (16% each) was noticed during different operations in the abattoir.

Introduction

The normal microflora of sheep was studied by Banwart (1981). These organisms are usually established very early in sheep's life and tend to harbour the types found in their environment. Govinadrajan (1990) and Gill (2004) have reported that wholesome meat which is hygienically produced, is pathogen free, retains its natural state and nutritive value, ensures to maintenance a degree of microbial contamination control and is unconditionally acceptable to the consumer. evisceration processes contamination of sheep carcasses was studied and the increase of microorganisms in the abattoirs compared with their post flaying level was also noticed ((Narsimha *et al.*, 1992; Borse *et al.*, 1998; Gill and Baker, 1998). Gilmour *et al.*, (2004) and Mathany (2006) recorded a significantly increase in total bacterial counts at skinning points than those at washing points. Dirty hands, workers clothes and slaughterhouse equipment may act as intermediate sources of meat contamination. Accordingly, washing and sanitizing agents are effective in reducing bacterial population and the presence of pathogenic bacteria on carcasses (Thornton and Gracey, 1976; Gill, 2004). Mathany (2006) isolated *Stapylococcus. aureus, S. epidermidis, Bacillus spp., E. coli, Klebsiella spp, Samonella spp, S. typhi* and *Proteus spp* from sheep carcasses. The poor hygiene and sanitation prevailing in the abattoirs encourage microbial contamination, survival and growth.

This study was aimed to assess microbial contamination of sheep carcasses in El Kadero Slaughterhouse.

Materials and Methods

Collection of swab samples: A total of 540 swab samples were collected from36 carcasses of sheep from El Kadero Slaughterhouse, Khartoum State during September 2007 May 2008. These samples were taken from five different sites viz brisket, shoulder, flank, neck and rump. In addition, 36 samples were taken from the workers knives, and their hands at post skinning, evisceration and after washing operations.

Sterile swabs (3 x 1 cm) moistened in 0.1% Peptone Water were used. An area was marked by sterile frame (10 x 10 cm) for each collection site of the carcasses. The swab was rubbed on the marked-site for 30 seconds and transferred to a screw-capped bottle containing 10 ml sterile maintenance medium (0.85% NaCl and 0.1% peptone). The bottles were put in ice container and sent to laboratory for bacteriological examination.

Bacteriology: All samples were cultured in Nutrient Broth, and onto Blood and MaConkey's agars, for the growth of microorganisms . Biochemical testes were performed for identification of the isolates (Barrow and Feltham, 1993). The total viable count (TVC) of the isolated microorganisms was carried out according to the method of Miles and Misra (1938).

Statistical analysis: All TVCs bacteria were converted to leg_{10} CFU cm^{-2} for analysis and ANOVA was performed using SPSS for bacteria isolated. Significant differences were determined at the 5% level ($P<0.05$).

Results

The TVCs in all 540 swab samples were 5.5 ± 0.89, 6.0 ± 0.33 and 5.1±0.41, $log_{10}CFU/cm^2$ after skinning, evisceration and washing respectively. There were significant differences between these processes ($P<0.05$). The mean TVCs on knives were 3.0 ±0.59 and 3.1±0.45 log_{10} CFU/cm^2 post skinning and post evisceration respectively, with insignificant difference ($P>0.05$). Moreover, the TVCs of the workers hands at post skinning, post evisceration and post washing were 5.1 ± 0.46, 3.8 ± 0.53 and 4.2 ± 0.73 log_{10} CFU/cm^2 respectively, with significant differences among them ($P<0.05$) (Table 1).

Table 1: Comparison of mean total viable count bacterial (TVC) log_{10} CFU/sq cm ± SD of carcasses, knives and hands of workers post skinning, post evisceration and post washing.

Item	Post skinning	Post evisceration	Post washing	Significance
Carcasses	5.5 ± 0.89	6.0 ± 0.33	5.1 ± 0.41	*
Knives	3.0 ± 0.59	3.1 ± 04	-	NS
workers Hands	5.1 ± 0.46	3.8 ± 0.53	4.2 ± 0. 73	*

- Not detected; * Significant at level (P<0.05); NS Non-significant

Table 2 shows that *S. aureus* was isolated from different sites of the carcasses following skinning, evisceration and washing processes with significant difference in its mean values (P<0.05), while *S. epidermidis*, *Proteus spp.*, *E. coli* and *Salmonella spp.* showed significant differences in their mean values at (P<0.01).

Table 2: Mean values of viable count (log_{10}CFU/sq cm ± SD) of bacteria isolated from carcasses, knives and hands of workers at the slaughterhouse.

Isolates	Post skinning	Post evisceration	Post washing	Significance
Staphylococcus aureus	3.1 ± 0.29	3.2 ± 0.21	3.1 ± 0.25	*
Staphylococcus epidermids	3.2 ± 0.23	3.6 ± 0.33	3.1 ± 0.17	*
Micrococcus spp	3.1 ± 0.20	3.1 ± 0.21	3.0 ± 0.22	NS
Proetus spp.	3.4 ± 0.24	3.1 ± 0.21	3.2 ± 0.21	*
Bacillus cereus	3.0 ± 0.30	3.1 ± 0.25	3.0 ± 0.21	NS
Bacillus spp.	3.3 ± 0.23	3.4 ± 0.21	3.4 ± 0.23	NS
Clostridium spp.	3.1 ± 0.20	3.1 ± 0.21	3.0 ± 0.22	NS
Klebsiella spp.	3.1 ± 0.20	3.2 ± 0.21	3.2 ± 0.23	NS
E. coli	3.4 ± 0.25	3.2 ± 0.21	3.7 ± 0.23	*
Salmonella spp.	3.1 ± 0.30	3.2 ± 0.23	3.5 ± 0.17	*
Salmonella typhi	2.5 ± 0.17	2.3 ± 0.23	2.4 ± 0.21	NS

- Not detected; * Significant at level (P<0.05); NS Non-significant

This study revealed at least eleven species of bacteria with their frequency and percentage of carcasses contamination (Table 3). The highest average prevalence was shown by *S. aureus*, *Bacillus spp.* and *E. coli* (16% each).

Table 3: Percentage prevalence of various organisms isolated from sheep carcass.

Items	Frequency	Percentage
Staphylococcus aureus	8	16
Staphylococcus epidermidis	2	4
Micrococcus spp	5	10
Proteus spp.	4	8
Bacillus cereus	5	10
Bacillus spp.	8	16
Clostridium spp.	1	2
Klebsiella spp	4	8
E. coli	8	16
Salmonella spp.	2	4
Salmonella typhi	3	6
Total	50	100

Discussion

In the present study, there was statistically significant difference ($P<0.01$) between the total bacterial viable count after skinning and that after evisceration is obtained, the difference between post washing, skinning and evisceration of carcasses was highly significant (Table 1). These findings are similar to those of Biss and Hathaway (1995) and Gill *et al.* (2000) who recorded high bacterial TVCs after washing of lamb carcasses in the abattoirs. Moreover, Emey and Scott (1939) have reported that the count of surface bacteria ranges between 1000 and 100000 CFU per cm^2, whereas in this study the count was exceeding that level. However, the present findings are in contrast to those of Borse *et al.* (1998) and Gill and Baker (1998) who observed a highly significant reduction in bacterial count (1.8, 0.31 log units) after washing sheep carcasses.

The high level of contamination following evisceration, reported in this study may be due to occasional rupture of the viscera or when separation of the anal sphincter with rectum from the carcass results in contamination of the carcasses side. The workers usually wash the carcass with a limited quantity of water and the same water is used again for washing knives, hands (Table 1) and even the offal. The knives must be sterilized, hot tap water (82°C) between various operations (Patterson, 1969; Grau, 1986).

The highest average prevalence of the isolated bacteria (Table 3) in this investigation is in accordance with those of the isolates of Vijaya *et al.* (1983), El-Bassiony and Samaha (1991) and Borse *et al.* (1998).

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