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Microbiological Quality of Sheep Meat export in slaughterhouse in Khartoum State

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المستخلص:

أجريت الدراسة الحالية لمعرفة الكائنات الدقيقة الملوثة التي يمكن العثور عليها على جثث الأغنام أثناء الذبح في ولاية الخرطوم. تم جمع 255 عينة مسحة بشكل عشوائي من جثث الأغنام والسكاكين وعامل اليد. تم أخذ العينات بعد خطوات المعالجة التالية: السلخ ، الغسيل ، التبريد ، النقل والحاويات ، والسكاكين وأيدي العمال. تم إجراء عدد إجمالي قابل للحياة (TVC) من البكتيريا الملوثة بالإضافة إلى عزل وتحديد البكتيريا. أظهرت النتائج أنه كان هناك اختلاف كبير في TVC بعد مراحل الغسيل ، الغسيل ($p \leq 0.05$). تم تسجيل أعلى TVCS 3.04 + 0.28 Log10 CFU / cm² في موقع الكتف أثناء النقل. تم تسجيل أدنى TVC s 2.9 + 0.10 Log10 C FU / cm² في necksite في ثلاث نقاط والتي تشمل السلخ. الغسيل والحاوية على التوالي.كانت البكتيريا الملوثة المعزولة هي الإشريكية القولونية والمكورات العنقودية الذهبية. يمكن أن تحدث مستويات عالية من التلوث الجرثومي عن طريق الإخلاء السيئ والإدارات الصحية الرديئة ، لكن المنشآت ووحدات المعالجة الأفضل مع نظافة أفضل تجعل لحم الأغنام مصدر قلق للموردين والمستهلكين ومسؤولي الصحة العامة

الكلمات المفتاحية: الجودة الميكروبيولوجية ، لحم الأغنام ، ولاية الخرطوم

ABSTRACT:

The current study was conducted to investigate the contaminating microorganisms that can be found on sheep carcasses during slaughtering in Khartoum State. 255 swab samples were collected randomly from sheep carcasses, Knives and hand's worker. The samples were taken after following processing steps: skinning, washing, chilling, transportation and container) ,also knives and hands of worker. Total Viable Count (TVC) of contaminating bacteria was done besides isolation and identification of bacteria. The results revealed that there was significant difference in the TVC after skinning, washing stages ($p \leq 0.05$). The highest TVCS 3.04±0.28 Log10 CFU/ cm² was recorded at shoulder site in transportation. The lowest TVC s 2.9+0.10 Log10 C FU/ cm² were recorded at necksite in three points which include skinning. Washing and container respectively.Contaminating bacteria isolated were *Escherichia coli*, *Staphylococcus spp.* High levels of microbial contamination can be carried by bad evisceration and poor hygienic managements, but better facilities and processing units with better hygiene make sheep meat have a concern for suppliers, consumers and public health officials.

Keywords: Microbiological Quality, Sheep Meat, Khartoum State

INTRODUCTION

Meat is major source of protein in human diet which is highly susceptible to microbial contaminations and can cause its spoilage and food borne infections in human, resulting in economic and health losses (Komba et al., 2012).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). A great diversity of microbes inhabit fresh meat generally, but different types may become dominant depending on pH, composition, textures, storage temperature, storage temperature, and transportation means of raw meat (Ercolini et al., 2006; Li et al., 2006; AduGyamfi et al., 2012).

The different stages of the conversion from live animals into meat make the microbial quality of carcasses an unavoidable and undesirable result. During the slaughtering process, main sources of contamination are the slaughtered animals themselves, the staff and the work environment (Bell and Hathaway, 1996). Thecontamintion of equipment, materials, and worker's hands and knives can spread pathogenic to non-contaminated carcasses.

Materials and Methods:

Collection of swab samples:

A total of 225 swab samples were collected fIoml5 carcasses of sheep from El Karari Slaughterhouse. Khartoum. State . The samples were taken from 3 different sites viz neck, shoulder, and back. In addition. 15samples were taken from the workers 'knives, and also .l5 samples from their hands.

The operational points were, skinning, washing, chilling, during transporting and from containers. 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-clipped 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 fin Nutrient Broth and onto Blood and MaConkey's Agars, for the growth of microorganisms. Biochemical tests were performed for Identification of the isolates (Barrow and Feltham, I993). 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 log10 CFU /cm² for analysis and ANOVA was performed using SPSS. Significant differences were determined at the 5% level (P<0. 05).

Results:

The TVCs in all 225 swab samples were recorded as mean±Std. Log10 CFU/ cm². The highest TVCS 3.04±0.28 Log10 CFU/ cm² was recorded at shoulder site in transportation. The lowest TVC s 2.9+0.10 Log10 C FU/ cm² were recorded at neck site in three points which include skinning. Washing and container respectively. There were no significant differences between these processes (P>0.05). The mean TVCs on knives 2.89±0.16 log10 CFU/cm² at skinning with no significant differences among them (P>0.05). Moreover, the TVCS of the workers hands at skinning was 2.74±0.20 log10CFU/cm² , with no significant differences among them (P>0.05) (Table 1).

Table (1)Comparison of the mean Total Viable Count of Bacteria (Log10cfu/cm²) ± Std at Different operational Points of Investigation at some sites of sheep carcasses

Sites	Operational Points					Significane Difference
	Skinning	Washing	Chilling	Transportation	Container	
			Log10cfu/Cm²			
Shoulder	2.93±0.91	2.94±0.08	2.95+0.09	3.04±0.28	2.94±0.08	NS
Neck	2.91±0.10	2.91±0.10	2.93±0.11	2.97±0.07	2.91±0.10	NS
Back	2.92±0.10	2.96±0.04	2.94±0.98	2.98±0.05	2.96±0.04	NS
Workers Hands	2.74±0.20	ND	ND	ND	ND	NS
Knives	2.89±0.16	ND	ND	ND	ND	NS

NS no significant different at ($P < 0.05$), ND not done

Table 2 shows that E. coli was isolated from the different sites of the carcasses in Different operational points. the highest isolated number of it in back site 50 (34.01%) isolates whereas the lowest isolated number of E. coli was at workers hands at skinning 2 (1.36) isolates .+

Table (2). Number and Percentage of Escherichia- coli Isolated from Different Operational Points and Sites on Sheep carcasses

Sites	Operational Points					Total
	Skinning	Washing	Chilling	Transportation	Container	
			Escherichia. coli N(%)			
Shoulder	6(4.08)	8 (5.44)	9(6.12)	10(6.80)	10(6.80)	43(29.25)
Neck	8 (5.44)	10(6.80)	11(7.48)	6(4.08)	9(6.12)	44(29.93)
Back	9(6.12)	11(7.48)	10(6.80)	9(6.12)	11(7.48)	50(34.01)
Workers hands	2 (1.36)	ND	ND	ND	ND	2 (1.36)
Knives	8(5.45)	ND	ND	ND	ND	8(5.45)
Tota1	(33(22.45)	29(19.73)	30(20.41)	25 (17.00)	30(20.41)	147(100)

ND not done

Also Table 3 shows that Staphylococcus aureus was isolated from the different sites of the carcasses in different operational points, the highest isolated number of it in shoulder site 35 isolates (31.5%) whereas the lowest isolated number of Staphylococcus aureus was recorded at workers knives 7 (6.25%) isolates.

Table 3. Number and Percentage of Staphylococcus aureus Isolated from Different Operational Points and Sites on Sheep carcasses

Sites	Operational Points					Total
	Skinning	Washing	Chilling	Transportation	Container	
			Staph. Aureus N (%)			
Shoulder	9 (8.04)	8(7.14)	7(6.25)	6(5.36)	5(4.46)	35(31.25)
Neck	7(6.25)	5(4.46)	4(3.57)	10(8.92)	6(5.36)	32(28.57)
Back	5(4.46)	5(4.46)	5(4.46)	6(5.36)	4(3.57)	25(22.32)
Workers hands	13(11.61)	ND	ND	ND	ND	13(11.61)
Knives	7(6.25)	ND	ND	ND	ND	7(6.25)
Total	4l(36.61)	18(16.07)	16(14.29)	22(19.64)	15(13.39)	112(100)

N D not done

Discussion:

Most of the meat contamination is caused by aerobes. These organisms my gain assess to meat from the digestive system of living animal or as a result of slaughter contamination (Lawrie, 1979). Meat contamination is of economic importance

because it inverse the meat quality. Poor meat hygiene practices in the slaughterhouses before and after slaughter would lead to meat contamination. These finding are also in agreement with Amanie (2000) who isolated *Micrococcus* spp. *Staphylococcus leutus, staphylococcus auricularis* and *Escherichia coli* from meat at stages of processing she also isolated *Bacillus firmus*, *Bacillus pantothenti-eus, Bacillus thuringiensis, bacillus anyaligufaciens, aerococcus spp. Proteus mirabilis, psendomoas psendolcaligenes, shewan-ella putrefaciens, Acinetobacter lowff* and *Acinefobacter calcoaeetus*, which I failed to identify in this study. The present studies revealed that, the gram-negative aerobes are the most frequently isolated bacteria. This observation was disagreed with Khalid (2004), who reported that gram-positive was most frequently isolated from different intervals of time. Ajit et.al. (1990) isolates from muscle included *Escherichia coli*, *proteius, Pseudomonas, Klebsiella* and *Citrobacter.* This agree with my isolate specially *Escherichia coli*, with gram-negative genera. Also the present studies agree with Salih (1971), who reported heavy contamination of fresh meat in Khartoum State with spoilage bacteria genera like *Micrococcus, Streptococci, Bacilli, Psendomonas* and *Aerogenes, Bacilli, Pseudomonas* and *Aerogenes.* Which were isolated, have importance in public health and their isolation from meat is a normal phenomenon. These bacteria may originate from environment and exposure of meat to more handling by the workers. The higher bacterial counts obtained during this work may be due to surface contamination of meat which came from different sources, mainly hides, hoofs, air, water, equipments, intestinal contents and slaughtering floor as reported by (Empey and Scott, (1939)
. *Staphylococcus aureus*, which is a normal flora of the carcasses, indicates contamination from handlers. The organism can pass onto food during harvesting, processing or even storage. It is the major cause of food poisoning known as Staphylococcal food poisoning. The poisoningis caused by the ingestion of an enterotoxin produced, which is characterized by (Diarrhea and Eze et al, 2008).
In this study, the surface region of shoulder site in transportation had the highest rate of contamination compared to all parts of the carcass. They are significantly different ($P<0.05$), this agrees with Fadlalla (2004), who recorded that the highest count appears in the middle of the work, while the lowest count were obtained in the beginning of the work. Also in this study, we reported that the hands of worker had high contamination by Gram-positive bacteria compaired with Gram-negative bacteria. The behavior of worker was an important thing in the contamination was reported; by Elamine (2002) and Jeffery et al (2003) and their result indicated that the sources of meat contamination included the hands and arms of meat handlers, equipment and contact surfaces. This was due to of the processing of the carcass in slaughterhouses, which means that they were a way from contamination by intestinal contents. As we reported that the stages of processing of the carcass in slaughterhouse (skinning, washing, chilling, transportation, and container) had high contamination by Gram-negative bacteria.These findings are similar to those of Biss and Hathaway (1995) and Gill et.al. (2000) who recorded high bacterial type after washing of lamb carcasses in the abattoirs.
The present results recorded a rate of total viable count between 3.04$\pm$0.28 Log10 CFU/ cm² and the lowest TVC s 2.9+0.10 Log10 C FU/ cm² were recorded at neck site in three points which include skinning. Washing and container respectively.
almost similar to the result of Phillips et.al. (2001b) and Zweifel and Stephan (2003) respectively recorded rates of 3.33 log cfu/cm^2 and 3log cfu/cm^2 on sheep carcasses at

slaughter-house. The present studies were less than the result of El-Hadef et.el. (2005), who recorded a rate of 5.42log cfu/cm^2.

In this study, we found prevalence of *E. coli* (34.01%) of sheep carcasses but Abdalla, et al (2009) found (16%). Phillips et al (2001) detected Escherichia coli on 29.2% of sheep carcasses. Sumner et al (2002) found the percentage of 36.2% of *E.coli* in South Australia.

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