

## Surface Contamination of Camel Carcasses

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### ABSTRACT:

The surface contamination of camel carcasses was studied. Areas of 10 cm<sup>2</sup> each from the surface of twenty five camel carcasses were swabbed before skinning, after skinning and after preparation and stamping.

The aerobic plate count, enterobacteriaceae count, *Staph. aureus* count, Coliforms (MPN), Fecal coliforms (MPN), *E. coli* (MPN) were determined as well as isolation and identification of salmonellae.

The mean values of aerobic plate count were 4 x 10<sup>8</sup>, 5x10<sup>3</sup>, 6.2x10<sup>6</sup> CFU/cm<sup>2</sup>. While for enterobacteriaceae count were 6.6x10<sup>5</sup>, 8.2x10<sup>2</sup> and 6.2x10<sup>4</sup> CFU/cm<sup>2</sup>. In case of coliforms (MPN) were 6.3x10<sup>5</sup>, 3.1x10<sup>2</sup> and 5.8x10<sup>4</sup> bacteria/cm<sup>2</sup> on the surface of camel carcasses before skinning, after skinning and after preparation and stamping. While fecal coliforms (MPN) and *E. coli* (MPN)/cm<sup>2</sup> were 2.6x10<sup>3</sup>, 6.3x10 and 8.1x10<sup>2</sup> and 8.3x10, <3 and 2.3x10<sup>2</sup> bacteria/cm<sup>2</sup>, respectively. In case of *Staph. aureus* counts were 7.2x10<sup>5</sup>, 8.2x10<sup>2</sup> and 5.6x10<sup>4</sup> bacteria/cm<sup>2</sup> on the surface of camel carcasses during the three stages.

*Citrobacter freundii*, *Enterobacter aerogenes*, *Enterobacter cloacae*, *Enterobacter sakazaki*, *E. coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*, *Morganella morganii*, *Salmonella enteritidis* and *Salmonella typhimurium* were be isolated from the examined camel carcasses.

Public health significance of bacterial contamination of camel carcasses was discussed and suggestive measures for improvement of the microbial quality of camel carcasses were mentioned.

### INTRODUCTION:

A high standard of hygiene and adequate control measures are particularly important in abattoirs. It has been found that outbreaks of food-borne diseases can be prevented by constant supervision of these establishment and by checking the sanitary condition, of the surface and equipment in constant contact with meat (Yassien, 1992).

The external contamination of meat constitutes a constant problem in most developing countries in the abattoir itself where there are many of potential sources of infection by microorganisms (Lawrie, 1979).

The microbial surface contamination of carcasses has been repeatedly reported to have a significant effect on the meat shelf life. Moreover, contaminants may also include pathogens which can penetrate into the meat (Elmossalami & Wassef, 1971).

It was established that the hide of the animal and water used to wash the carcasses were main sources of both mesophilic and psychrotrophic microorganisms on carcasses (Nottingham et al. 1974 and Samaha & Draz, 1993).

Elmossalami (1988) recorded an aerobic plate count of  $2 \times 10^4$  CFU/cm<sup>2</sup> on shoulder and  $4 \times 10^3$  CFU/cm<sup>2</sup> on thigh of cattle after preparation while enterobacteriaceae count proved to be  $3 \times 10^2$  and  $8 \times 10^2$  CFU/cm<sup>2</sup> on shoulder and thigh, respectively. Coliforms were detected in 45, 85 and 90% of shoulders after skinning, preparation and after preparation and stamping, respectively.

Hamdy (1989) reported that the mean aerobic plate count on the surface of camel carcasses were  $1.5 \times 10^8$ ,  $9.6 \times 10^3$  and  $7.2 \times 10^5$  CFU/cm<sup>2</sup> before skinning, after skinning and after preparation and stamping respectively. While the mean enterobacteriaceae counts were  $1.2 \times 10^5$ ,  $4.8 \times 10^2$  and  $8.8 \times 10^3$  CFU/cm<sup>2</sup> before skinning, after skinning and after preparation and stamping, respectively.

Mira (1989) reported that the mean values of aerobic plate count/cm<sup>2</sup> on the shoulder were  $6 \times 10^4$ ,  $10^6$  and  $2 \times 10^4$  after skinning, evisceration and after 24 hours chilling respectively. The enterobacteriaceae counts were  $2 \times 10^4$ ,  $2 \times 10^5$  and  $2 \times 10^4$  CFU/cm<sup>2</sup> but the coliforms counts were 19, 21 and 26 bacteria/cm<sup>2</sup> on the shoulder after skinning, evisceration and 24 hours chilling, respectively.

Samaha and Draz (1993) examined 75 swabs from the surface of cattle carcasses after evisceration. The mean total bacterial, enterobacteriaceae, coliforms, enterococci and *Staph. aureus* counts were  $5.4 \times 10^3$ ,  $8.9 \times 10^3$ ,  $4.8 \times 10^3$ ,  $2.3 \times 10^3$  and  $8 \times 10^2$  CFU/10 cm<sup>2</sup> of cattle carcasses surfaces inside the slaughter halls at Alexandria city, Egypt.

The present study was undertaken to determine the bacteriological status of camel carcass surfaces at Al-Ahsa abattoir.

## **MATERIALS AND METHODS:**

Seventy five swabs were taken from the surface of fore quarter of camel carcasses at Al-Ahsa abattoir.

The swabs were taken from the surface (shoulder) of twenty five carcasses before skinning, after skinning and after preparation and stamping.

10 cm<sup>2</sup> areas were swabbed using sterile cotton tampon and a metal template. Ringer's solution was used as rinsing and diluent fluid (ICMSF, 1978).

Aerobic plate count was applied using the drop technique recommended by the ICMSF (1978).

Enterobacteriaceae count was applied using violet red bile glucose agar (Gork, 1976).

Identification of enterobacteriaceae was done using API 20 E (Bio Merieux sa 69280 Marcy Etoile, France).

Coliforms most probable number (MPN), Fecal Coliforms (MPN) and *E. coli* (MPN) were applied according to the technique recommended by the ICMSF (1978).

Enumeration of coagulase positive *Staph. aureus* was applied using Baird-Parker medium (Thatcher & Clark, 1978). In addition trials were carried out for detection of Salmonella according to the technique recommended by Flowers et al. (1992).

## **RESULTS AND DISCUSSION:**

From the results given in Table (1) it is evident that the mean aerobic plate counts on the surface of camel carcasses were 4x10<sup>8</sup>, 5x10<sup>3</sup>, 6.2x10<sup>6</sup>/cm<sup>2</sup> before skinning, after skinning and after preparation and stamping respectively. Nearly similar findings were recorded by Hamdy, 1989 while lower values were recorded on cattle carcasses by Elmoosalami, 1988, Mira, 1989 and Samaha and Draz 1993. This may be attributed to the hygienic status adopted inside the slaughter halls. However, total viable

count has always been used as indicator to the hygienic condition inside the slaughter halls. The aerobic plate count is of great significance for judging of the hygienic conditions under which the meat was produced. It gives a good idea about the keeping quality of meat (Miskimin et al. 1976).

Etzel (1973) stated that the keeping quality of meat persisted till the count reached  $3 \times 10^7$  bacteria/cm<sup>2</sup> while Sovandia (1962) found that changes in odour could be noticed when the count reached 107 bacteria/cm<sup>2</sup>.

Concerning the mean value of enterobacteriaceae count on the camel carcasses, they were  $6.6 \times 10^5$ ,  $8.2 \times 10^2$  and  $6.2 \times 10^4$  CFU/cm<sup>2</sup> before skinning, after skinning and after preparation and stamping respectively. Similar finding was reported by Hamdy 1989; while lower results were obtained by Elmoosalami (1988) and Samaha and Draz (1993). The presence of enterobacteriaceae indicates presence of toxigenic bacterial contamination in food which is a public health hazard (ICMSF, 1978).

The results presented in Table (1) indicated that the mean values of *Staph. aureus* count were  $7.2 \times 10^5$ ,  $8.2 \times 10^2$  and  $5.6 \times 10^4$  CFU/cm<sup>2</sup> before skinning, after skinning and after preparation and stamping of carcasses, respectively. Nearly similar findings were obtained by Hafez, (1995) on cattle carcasses, but higher counts than that were obtained by Hamdy (1989) on camel carcasses.

It has been reported by many investigators (Meyer, 1975; Niskanen & Normal, 1979; and Eley, 1992) that when the count of coagulase positive staphylococci reached 10<sup>5</sup> bacteria/g of product, it is sufficient to cause toxicosis to consumer.

The presence of *Staph. aureus* on food articles points to a possible contamination from the skin, mouth, nose of food-handlers. The inadequately cleaned equipment may be a source of contamination (ICMSF, 1978).

From the results displayed in Table (1) it is evident that the mean value of coliforms, fecal coliforms and *E. coli* (MPN) were  $6.3 \times 10^5$ ,  $2.6 \times 10^3$  and

8.3x10<sup>3</sup> bacteria/cm<sup>2</sup> before skinning and 3.1x10<sup>2</sup>, 6.3x10<sup>3</sup> and <3 bacteria/cm<sup>2</sup> after skinning and 5.8x10<sup>4</sup>, 8.1x10<sup>2</sup> and 2.3x10<sup>2</sup> bacteria/cm<sup>2</sup> after preparation and stamping of camel carcasses. Lower finding was reported by Samaha and Draz (1993).

Tables (2) and (3) reveals the types and incidence of enterobacteriaceae isolated from examined samples of camel carcasses surfaces during the three stages which were: *Citrobacter freundii*, *Enterobacter aerogenes*, *Enterobacter cloacae*, *Enterobacter sakazakii*, *E. coli* (O26; K60 (B6), O55; K59 (B5), O111, K58 (B4), O119; K69; (B14) *Serratia liquefaciens*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*, *Morganella morganii*, *Salmonella enteritidis* and *Salmonella typhimurium*. The same organisms were isolated by many authors with different percentages (Hamdy, 1989; Mira, 1989; and Samaha and Draz, 1993).

The public Health importance of enteropathogenic *E.coli* has been emphasized by many authors as it has been implicated in cases of gastroenteritis in man, epidemic diarrhea in infants, sporadic summer diarrhea in children (Krieg and Holt (1984) and Eley (1992). This organism has also been the most frequent cause of cystitis, pyelitis, pyelonephritis, appendicitis and peritonitis (Pyatkin and Krivoshein, 1980).

For the production of fresh meat of good microbiological quality, the recommended international codex of hygienic practice for fresh meat and for ante-and post mortem inspection of slaughter animals (Codex, 1976) should be followed. The most important practice that should be taken in consideration in camels slaughtering in Al-Ahsa abattoir are cleaning of dirty camels before slaughter, skinning camels while being on the rail, separation of carcasses from each other and avoid contact between the external surface of the hide and carcasses. Hygienic measures must be adequate to prevent spread of contamination via hands, knives, saws, equipment and clothing. Aerial contamination must be minimized by avoiding excessive manipulation of hides inside the abattoir.

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**Table 1. Surface contamination of slaughtered camels**

	Aerobic plate count CFU/cm <sup>2</sup>			Enterobacteriaceae count CFU/cm <sup>2</sup>			Coliforms (MPN) Bacteria/cm <sup>2</sup>			Fecal coliforms (MP) Bacteria/cm <sup>2</sup>			E.coli (MPN) Bacteria/cm <sup>2</sup>			Staph aureus count CFU/cm <sup>2</sup>		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
min.	2x10 <sup>5</sup>	<20	6x10 <sup>4</sup>	2x10 <sup>2</sup>	<20	2x10 <sup>2</sup>	9x10	<3	1.5x10 <sup>2</sup>	40	<3	40	<3	<3	<3	6x10 <sup>2</sup>	<10	2x10 <sup>2</sup>
max.	6x10 <sup>9</sup>	6x10 <sup>4</sup>	2x10 <sup>7</sup>	4x10 <sup>6</sup>	6x10 <sup>3</sup>	5x10 <sup>5</sup>	11x10 <sup>5</sup>	5x10 <sup>2</sup>	11x10 <sup>4</sup>	11x10 <sup>3</sup>	2x10 <sup>2</sup>	11x10 <sup>2</sup>	11x10 <sup>2</sup>	<3	11x10 <sup>2</sup>	11x10 <sup>2</sup>	6x10 <sup>6</sup>	2x10 <sup>5</sup>
mean	4x10 <sup>8</sup>	5x10 <sup>3</sup>	6.2x10 <sup>6</sup>	6.6x10 <sup>5</sup>	8.2x10 <sup>2</sup>	6.2x10 <sup>4</sup>	6.3x10 <sup>6</sup>	3.1x10 <sup>2</sup>	5.8x10 <sup>4</sup>	2.6x10 <sup>3</sup>	6.3x10	8.1x10 <sup>2</sup>	8.3x10	<3	2.3x10 <sup>2</sup>	6x10 <sup>3</sup>	8.2x10 <sup>2</sup>	5.6x10 <sup>4</sup>
S.E.±	8.3x10 <sup>7</sup>	2.3x10 <sup>3</sup>	3.1x10 <sup>6</sup>	1.2.3x10 <sup>10</sup>	4.3x10 <sup>2</sup>	3.1x10 <sup>4</sup>	3.1x10 <sup>5</sup>	1.2x10 <sup>2</sup>	2.3x10 <sup>4</sup>	1.2x10 <sup>3</sup>	4.2x10 <sup>3</sup>	5.3x10 <sup>2</sup>	6.1x10	0	1.3x10 <sup>2</sup>	1.2x10 <sup>3</sup>	3.1x10 <sup>2</sup>	1.3x10 <sup>4</sup>

CFU = Colony Forming Units

A = Before skinning

B = After skinning

C = After preparation and stamping



**Tabel (2) : Enterobacteriaceae isolated from the examined samples**

Organisms	A		B		C	
	No.	%	No.	%	No.	%
<i>Citrobacte freundii</i>	3	12	0	0	8	32
<i>Enterobacter aerogenes</i>	2	8	2	8	4	16
<i>Enterobacter cloacae</i>	1	4	0	0	3	12
<i>Enterobacter sakazakii</i>	0	0	0	0	5	20
<i>E. coli</i>	2	8	0	0	5	20
<i>Serratia liquefaciens</i>	6	24	3	12	7	28
<i>Klebsiella pneumoniae</i>	2	8	0	0	4	16
<i>Proteus mirabilis</i>	4	16	0	0	5	20
<i>Proteus vulgaris</i>	3	12	1	4	4	16
<i>Morganella morganii</i>	1	4	0	0	3	12
<i>Salmonella enteritidis</i>	0	0	0	0	2	8
<i>Salmonella typhimurium</i>	0	0	0	0	1	4

**Tabel (3) : Serotypes of isoalted *E. coli***

Serotypes	A		C	
	No.	%	No.	%
O26 : K60 (B6)	1	4	1	4
O55 : K59 (B5)	0	0	2	8
O111 : K58 (B4)	1	4	0	0
O119 : K69 (B14)	0	0	2	8

## التلوث السطحي لذبائح الجمال

عبدالله محمد الدغيم و نبيل ياسين

كلية الطب البيطري والثروة الحيوانية  
جامعة الملك فيصل - الأحساء

الملخص :

تم دراسة الحالة البكتريولوجية لأسطح الجمال وذلك بأخذ ٧٥ مسحة من مساحة ١٠ سم<sup>٢</sup> من أسطح خمسة وعشرون ذبيحة قبل وبعد السلخ وكذلك بعد تجهيز الذبائح وختمها.

أوضحت النتائج على ما يلي :

عدد الميكروبات الهوائية  $10 \times 4$  و  $10 \times 5$  و  $10 \times 6$  و  $10 \times 7$  بكتيريا / سم<sup>٢</sup> بينما كان عدد الميكروبات المعوية  $10 \times 6$  و  $10 \times 8$  و  $10 \times 6$  بكتيريا / سم<sup>٢</sup> كما كان عدد ميكروبات القولون  $10 \times 6$  و  $10 \times 3$  و  $10 \times 5$  بكتيريا / سم<sup>٢</sup>. وبالنسبة لعدد الميكروبات القولون النوع البرازي فكان  $10 \times 2$  و  $10 \times 3$  و  $10 \times 6$  و  $10 \times 8$  و  $10 \times 3$  بكتيريا / سم<sup>٢</sup> وكان  $10 \times 8$  و  $10 \times 3$  بكتيريا / سم<sup>٢</sup> بالنسبة لميكروب الايشيريشيا كولاي. وكان عدد ميكروبات العنقودي الذهبي  $10 \times 7$  و  $10 \times 8$  و  $10 \times 5$  بكتيريا / سم<sup>٢</sup> على أسطح ذبائح الجمال قبل وبعد تجهيز وختم الذبائح على التوالي.

ولقد تم عزل عدد من الميكروبات من جنس الايشيريشيا القولونية ، انتيروباكترونداي وانتيروباكترو ايروجينيز وانتيروباكترو سكازاكي وكلبسيلانيموني والبروتيس فليجارس والبروتيس ميراييليس ومورجانيللا مورجاني وسالمونيلا انترتيدز وسالمونيلا تيفمورم.

وقد تم مناقشة الأهمية الصحية للميكروبات المعزولة والإجراءات المقترحة لتحسين الجودة الميكروبية لذبائح الجمال.