Hygiene of Butchershop in Alexandria

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ABSTRACT

A research study was designed to find out the level of microbes contamination on fresh carcasses after transportation and display at butcher shops. As the poor hygiene and sanitation prevailing in the abattoirs as well as the butcher shops encourage microbial contaminations and growth. The higher microbial load in the butcher shops further enhances the chances of early meat spoilage (**Sudhakar et al. 2007**) Contamination of carcasses occurs during different stages of slaughtering processes. These hygienic levels are determined quantitatively by the number and kind of microbes on the surfaces of carcasses. A total of 200 swabs were used in this work. They were taken from the side surfaces of 100 cow and buffalo carcasses (50 cows and 50 buffaloes) at butchers shops. 100 swabs were taken from surrounding environment 25 swabs of each of (wooden bar contact with meat, wall of butcher shops, knives which used in cutting meat, hands of butchers). By using Standard plate count agar medium (Oxoid), Violet red bile glucose agar medium (Oxoid), Mannitol salt agar medium (Oxoid), MacConkey's broth (Difco) ,Kanamycin aesculinazide agar medium (Difco) and Sabouraud's dextrose agar medium (Difco). The present study indicated that the mean ±SEM counts of total bacteria, Enterobacteriaceae, Coliform, Enterococci, Staphylococci, mould and yeast of examined cow meat were $2.31\times10^6 \pm 3.76\times10^5$cfu/cm^2, $3.30\times10^4 \pm 6.45\times10^3$ cfu/cm^2, $6.00\times10^3 \pm 8.34\times10^2$cfu/cm^2, $2.94\times10^4 \pm 1.39\times10^4$cfu/cm^2, $1.68\times10^4 \pm 3.92\times10^3$cfu/cm^2, $1.22\times10^4 \pm 2.07\times10^3$cfu/cm^2, $2.85\times10^3 \pm 3.99\times10^2$ cfu/cm^2, respectively. and the most contaminated parts with mould and yeast were wooden bar and wall, for total bacteria, Enterobacteriaceae were butcher hand, Knives and for Staphylococcal were butcher hand, wall and knives.

INTRODUCTION

Contamination of carcasses occurs during different stages of slaughtering processes. Contamination depends mainly on the hygienic levels of slaughtering processes and meat handling. These hygienic levels are determined quantitatively by the number and kind of microbes on the surfaces of carcasses. **(Hudson et al., 1987)** studied the bacteriological status at a commercial abattoir before and after two stages of modernization to the beef slaughter line which included changing from cradle dressing to dressing on an overhead rail and the introduction of hot water spray cleaning of carcass. They found small changes in the distribution of bacterial numbers on the sites sampled. **(El-Mossalami, 1988)** studied the microbial quality of beef carcasses in a modern abattoir. The author found that the aerobic plate count after skinning was 7×10^2 and 2×10^4/cm^2 for shoulder and thigh, respectively. Meanwhile, it was 2×10^4 and 2×10^5/cm^2 after preparation of carcasses. The Enterobacteriaceae count directly after skinning was .40/cm^2, while after preparation; it was 2 x 10/cm^2 and 6/cm^2 on the shoulder and thigh, respectively. The other important causes of bacterial contamination were butcher hands, dress and slaughtering equipments. These results were confirmed by the study of **Whyte et al, (2002)** the objectives of this investigation were to

analyze the hygiene of butcher shops in Alexandria.

MATERIAL AND METHODS

1. Samples: A total of 200 swabs were used in this work. The samples were taken from the side surfaces of 100 cow and buffalo carcasses (50 cows and 50 buffaloes) at butcher shops. Swabs were obtained after complete hanging and cutting of the carcasses. Other 100 swabs were taken from surrounding environment 25 swabs of each of (wooden bar contact with meat, wall of butcher shops, knives which used in cutting meat, hands of butchers).

2. Media used: Standard plate count agar medium (Oxoid), Violet red bile glucose agar medium (Oxoid), Mannitol salt agar medium (Oxoid), MacConkey's broth (Difco), Kanamycin aesculin azide agar medium (Difco) and Sabouraud's dextrose agar medium (Difco).

3. Swabbing techniques according to ICMSF (1978)

4. Preparation of serial dilution

5. Bacteriological examination

5.1. Total aerobic bacterial count: using standard pour platting method according to **Cruickshank et al. (1972).**

5.2Total Enterobacteriaceae count: The technique was recommended by **ICMSF (1978).**

5.3 Coliform count (MPN/ cm^2): using MacConkey's broth tubes as recommended by **ICMSF (1978).**

5. 4.Enterococci count: Kanamycin aesculin azide agar medium (Mossel et at, 1978) was used as selective medium. As recommended by **ICMSF (1978).**

5.5. Total Staphylococcal count: Mannitol salt agar was used for enumeration of Staphylococci (ICMSF, 1978).

5. 6.Total mould and yeast count: The total mould and yeast count was done using Sabouraud's dextrose agar medium **(Cruickshank et at, 1972**), supplemented with chloramphenicol and chlortetracycline (100 mg of each) as described by **Koburger (1970).**

6. Statistical analysis: Descriptive statistics as well as analysis methods were performed using the Statistical Analysis System (SAS, 1987). T-test procedure was used to compare within and between butcher shops.

RESULTS

Table (1): Statistical analytical results of total bacterial count (cfu/cm^2) of examined samples.

parameters	No. of examined samples	Positive samples		Minimum	Maximum	Mean±SEM
		No.	%			
Cow	50	50	100%	3.70×10^5	6.20×10^6	$2.31\times10^6 \pm 3.76\times10^5$ a
Buffalo	50	50	100%	2.80×10^5	5.00×10^6	$1.94\times10^6 \pm 3.04\times10^5$ a
Wooden bar	25	25	100%	2.30×10^2	2.60×10^6	$6.81\times10^6 \pm 3.16\times10^6$ b
Butcher hand	25	25	100%	3.20×10^5	8.00×10^5	$3.94\times10^5 \pm 1.04\times10^5$ a
Wall	25	25	100%	1.90×10^5	5.00×10^6	$1.61\times10^6 \pm 1.06\times10^5$ a
knives	25	25	100%	0.80×10^4	5.00×10^6	$1.24\times10^6 \pm 0.40\times10^6$ a

Means with similar letters are not significantly different at (P=0.05)
SEM=standard error of the mean

Table (2): Statistical analytical results of total Enterobacteriaceae count (cfu/cm^2) of examined samples.

parameters	No. of samples	Positive sample		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	50	100%	3.20×10^3	9.80×10^4	$3.30\times10^4 \pm 6.45\times10^3$ a
Buffalo	50	50	100%	2.60×10^3	8.70×10^4	$2.81\times10^4 \pm 5.37\times10^3$ a
Wooden bar	25	25	100%	1.70×10^2	5.20×10^5	$6.31\times10^5 \pm 5.76\times10^5$ a
Butcher hand	25	25	100%	1.40×10^5	1.80×10^6	$5.94\times10^4 \pm 2.04\times10^4$a
Wall	25	25	100%	2.60×10^5	4.20×10^6	$1.21\times10^6 \pm 2.56\times10^5$ b
knives	25	25	100%	1.10×10^2	1.90×10^5	$4.94\times10^4 \pm 2.04\times10^4$a

Table (3): Statistical analytical results of total Coliform count (MPN/cm^2) of examined samples.

parameters	No. of samples	Positive sample		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	40	80%	1.50×10^3	1.40×10^4	$6.00\times10^3 \pm 8.34\times10^2$ a
Buffalo	50	40	80%	1.40×10^3	1.50×10^4	$5.69\times10^3 \pm 7.05\times10^2$ a
Wooden bar	25	25	100%	1.70×10^2	1.20×10^3	$1.31\times10^2 \pm 1.06\times10^2$a
Butcher hand	25	25	100%	8.0×10	1.00×10^3	$4.14\times10^2 \pm 1.04\times10^2$ a
Wall	25	20	80%	5.0×10	9.0×10	9.1×10± 3.6×10 a
knives	25	22	88%	7.0×10	1.20×10^2	6.1×10± 2.6×10 a

Table (4): Statistical analytical results of total Enterococci count (cfu/cm^2) of examined samples.

parameters	No. of samples	Positive sample		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	25	50%	2.00×10^3	5.60×10^4	$2.94\times10^4 \pm 1.39\times10^4$ b
Buffalo	50	25	50%	1.30×10^3	2.60×10^4	$9.37\times10^3 \pm 1.35\times10^3$ab
Wooden bar	25	20	80%	1.70×10	1.20×10^2	3.1×10 ±1.6×10b
Butcher hand	25	15	60%	2.80×10^5	5.00×10^6	$1.94\times10^6 \pm 3.04\times10^5$ a
Wall	25	10	40%	3.70×10^5	6.20×10^6	$2.31\times10^6 \pm 3.76\times10^5$ a
Knives	25	25	100%	1.10×10^2	1.70×10^5	$5.04\times10^4 \pm 2.4\times10^4$b

Table (5): Statistical analytical results of total Staphylococcal count (cfu/cm^2) of examined samples.

parameters	No. of samples	Positive sample		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	35	70%	1.80×10^3	6.80×10^4	$1.68\times10^4 \pm 3.92\times10^3$ b
Buffalo	50	40	80%	1.20×10^3	2.30×10^4	$8.54\times10^3 \pm 1.12\times10^3$ b
Wooden bar	25	10	40%	1.40×10^4	3.20×10^4	$4.31\times10^3 \pm 2.71\times10^3$ a
Butcher hand	25	25	100%	1.70×10^5	4.00×10^6	$1.4\times10^6 \pm 4.04\times10^5$ a
Wall	25	20	80%	3.70×10^5	6.20×10^6	$2.21\times10^6 \pm 3.76\times10^5$ a
Knives	25	22	88%	2.90×10^5	3.00×10^6	$1.74\times10^6 \pm 3.03\times10^5$ a

Table (6): Statistical analytical results of total mould count (cfu/cm^2) of examined samples.

parameters	No. of samples	Positive samples		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	4	8%	1.60×10^3	3.70×10^4	$1.22\times10^4 \pm 2.07\times10^3$ b
Buffalo	50	3	6%	1.10×10^3	8.30×10^4	$1.40\times10^4 \pm 3.97\times10^3$ b
Wooden bar	25	23	92%	3.70×10^5	6.20×10^6	$2.31\times10^6 \pm 3.76\times10^5$ a
Butcher hand	25	2	8%	0.80×10	3.00×10	$2.04\times10 \pm 0.64\times10$c
Wall	25	25	100%	2.50×10^5	5.20×10^6	$1.61\times10^6 \pm 2.56\times10^5$ a
knives	25	5	20%	0.70×10	1.10×10	$0.94\times10 \pm 0.14\times10$ c

DISCUSSION

The surface contamination of carcasses has been reported to have a significant effect on the shelf life of meat. Moreover, Improper handling and improper hygiene might lead to the contamination of fresh meat and this eventually affects the health of the consumers. The initial contamination can be directly correlated with the keeping quality of beef. So food hygienists have been attempting to detect and quantify microorganisms of carcass surfaces and surrounding environment (wall, knives, wooden bar and butcher hand). The hygienic level of slaughtering and meat handling is successfully controlled by determining quantitatively the number and kinds of microbes on the surface of carcasses.

Table (7): Statistical analytical results of total yeast count (cfu/cm^2) of examined samples

parameters	No. of samples	Positive sample		Minimum	Maximum	mean±SEM
		No.	%			
Cow	50	2	4%	1.30×10^3	9.90×10^3	$2.85\times10^3\pm 3.99\times10^2$b
Buffalo	50	3	6%	9.80×10^2	3.50×10^3	$2.14\times10^3\pm 1.43\times10^2$b
Wooden bar	25	24	96%	2.70×10^5	5.20×10^6	$1.31\times10^6\pm 2.76\times10^5$ a
Butcher hand	25	2	8%	0.80×10	2.00×10	1.04×10± 0.74×10 c
Wall	25	25	100%	3.50×10^5	6.10×10^6	$2.21\times10^6\pm 3.66\times10^5$ a
knives	25	3	12%	1.80×10	3.0×10	$1.04\times10^2\pm 2.04\times10$b

5.1. Total bacterial count:

Total bacterial count is described as important parameter for the sanitation and hygienic of meat carcasses. Table (1) showed that the mean value of total bacterial count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were $2.31\times10^6\pm 3.76\times10^5$ a, $1.94\times10^6\pm 3.04\times10^5$ a, $6.81\times10^6\pm 3.16\times10^6$ b, $3.94\times10^5\pm 1.04\times10^5$ a, $1.61\times10^6\pm 1.06\times10^5$ a and $1.24\times10^6\pm 0.40\times10^6$ a respectively. All examined samples were contaminated with TBC.There is a significant difference in TBC.in wooden bar and other examined samples which indicate bad sanitization of butcher shop and equipment so we recommend frequent cleaning of equipment and washing of butcher hand by running water and detergent. The increase of total bacterial counts in butcher shops can be attributed to the different sources of contamination especially washing water **(Weiser et al., 1971).**

Furthermore, Table (1) shows also that there was a significant difference between total bacterial counts in examined meat in butcher shops. The significant difference between the total bacterial counts (cfu/cm^2) of examined meat at butcher shops attributed to bad sanitary conditions. Manual dressing of carcasses lead s to more touching of carcass surfaces with the hands of workers. **Elliot and Michener (1961**) mentioned that, the meat should be regarded as unwholesome when it has a large number of microorganisms, even if they were not known to be pathogens or non-pathogens and they had not altered the meat character. The presence of numerous mesophilic bacteria which grow readily on or near body temperature means that conditions may have existed which would favour the multiplication of putrefactive or pathogenic ones .Also, **Shiffman (1961)** added that fresh meat and meat products of bacterial count up to 10^5/g have not been implicated in food poisoning. Therefore, the microbiological standard for such products should be established at 10^5/g.

5.2. Total Enterobacteriaceae count:

Amongst the microbes, salmonella most frequently present on animal body coat and feces and transferred to carcasses during slaughtering and cause severe damages to human health if consumed, salmonella causes food poisoning in the world(**Yan et al,2003**).The concentration of **Salmonella** from carcass of cattle was increased from 6%to 89%after slaughtering and transportation (**Barham et al.2002**).The levels of meat contamination were 33%higher after 6-7hrs of display at meat shops because the number of microbes increases with the passage of time(**Aftab et al.2011**).Table (2) showed that the mean value of total enterobacteriaceace count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were 3.30×10^4 ± 6.45×10^3 a,2.81×10^4 ± 5.37×10^3 a, 6.31×10^5 ± 5.76×10^5 a,5.94×10^4± 2.04×10^4a, 1.21×10^6 ± 2.56×10^5 b and 4.94×10^4 ± 2.04×10^4a respectively. All examined samples were contaminated with enterobacteriaceae. There is a significant difference in enterobacteriaceae in wall and other examined samples. Which indicate bad sanitization of butcher shop and equipment so we recommend frequent cleaning of equipment and washing of wall by running water and disinfectant. And replace wooden bar by granite to be easily disinfected. Determination of any or all members of the family Enterobacteriaceae as an indicator of food sanitary quality has received the attention of more and more food scientists. The occurrence of Enterobacteriaceae shows microbiological and toxigenic bacteria in meat and lead to public health hazard (**Mira, E.K.1989).**

5.3. Total coliform count:

Although the bacterial count was used in bacteriological examination to reflect the hygienic quality of meat, however, it is evident that the test for Coliform bacilli is considered of much greater value in assessing its quality (**Cruickshank et al., 1975**).Table (3) showed that the mean value of total coliform count (MPN /cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were 6.00×10^3 ± 8.34×10^2 a,5.69×10^3 ± 7.05×10^2 a,1.31×10^2± 1.06×10^2a, 4.14×10^2 ± 1.04×10^2 a, 9.1×10± 3.6×10 a and 6.1×10± 2.6×10 a respectively. The incidence of coliform in examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were80,80,100,100,80 and 88%, respectively. Meat samples and butcher hands which indicate bad storage of the meat so we recommend frequent cleaning of storage refrigerator and washing of butcher hand by running water and detergent.

5.4. Total Enterococci count:

Table(4) showed that the mean value of total enterococci count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were 2.94×10^4 ±1.39 $\times10^4$ b, 9.37×10^3 ± 1.35×10^3ab, 3.1×10 ±1.6×10b, 1.94×10^6 ± 3.04×10^5 a,2.31×10^6 ± 3.76×10^5 a and 5.04×10^4± 2.4×10^4b respectively.

The incidence of coliform in examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were50, 50,80,60,40 and 100%, respectively .The result of examined samples show the highest total Enterococci count (cfu/cm^2) wall, butcher hands and knives which indicate bad sanitization of the butcher shops so we recommend frequent cleaning of wall and equipment by running water and disinfectant and washing of butcher hand by running water and detergent. The presence of Enterococci is known as an index of fecal

Contamination.**Echerichia coli** are commonly used as surrogate indicator, its presence in food generally indicate

direct fecal contamination (**Clarence et al., 2009**). Enterococci can induce undesirable changes in meat and meat products and when found in large numbers may be implicated in cases of food poisoning **(Libby, 1975).**

5.5 Total Staphylococcal count:

Table (5) showed that the mean value of total Staphylococcal count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were $1.68\times10^4 \pm 3.92\times10^3$ b,$8.54\times10^3 \pm 1.12\times10^3$ b,

$4.31\times10^3 \pm 2.71\times10^3$ a, $1.4\times10^6 \pm 4.04\times10^5$ a, $2.21\times10^6 \pm 3.76\times10^5$ a and $1.74\times10^6 \pm 3.03\times10^5$ a respectively.

The incidence of Staphylococcal in examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were70,80,40,100,80 and 88% ,respectively. The result of examined samples show the highest total Staphylococcal count (cfu/cm^2) in wall, butcher hands and knives which indicate bad public health.**S.aureus** have been reported in the nose and throat of food handlers(**Omoregbe and Igbinovia,1992**)and in more than50%of healthy humans (**Bergdoll,1990**). So we recommend frequent cleaning of equipment and washing of butcher hand by running water and detergent. And frequent check up of the butchers.

5.6. Total Mould count:

Table (6) showed that the mean value of total Mould count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were $1.22\times10^4 \pm 2.07\times10^3$ b,$1.40\times10^4 \pm 3.97\times10^3$ b,$2.31\times10^6 \pm 3.76\times10^5$ a, $2.04\times10 \pm 0.64\times10$c,$1.61\times10^6 \pm 2.56\times10^5$ a and $0.94\times10 \pm 0.14\times10$ c respectively . The incidence of mould in examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were8, 6,92,8,100 and 20%, respectively .The result of examined samples show the highest total mould count (cfu/cm^2) wooden bar and wall which indicate bad sanitization of butcher shops and equipment so we recommend replacement of wooden bar by granite and cover the wall by ceramic to be easily cleaning and disinfecting. There is no significant variation between the count of mould before and after dressing and evisceration. The mould count is used as an index of the proper sanitation and high quality product. Moulds can assist in the putrefactive processes and in other cases they may impart amouldy odour and taste of foodstuffs. Also, mould can grow over an extremely wide range of temperature; therefore, one can find mould on particularly all foods at almost any temperature under which foods are held. Besides, mould can assist in the putrefactive processes and may produce toxic substrates namely mycotoxins which are harmful to man and animal (**Frazier and Westhoff**, **1983)**

5.7. Total Yeast count:

Table(7) showed that the mean value of total Mould count (cfu/cm^2) of examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were $2.85\times10^3 \pm 3.99\times10^2$ b,$2.14\times10^3 \pm 1.43\times10^2$ b,$1.31\times10^6 \pm 2.76\times10^5$ a, $1.04\times10 \pm 0.74\times10$c,$2.21\times10^6 \pm 3.66\times10^5$ a and $1.04\times10^2 \pm 2.04\times10$ b respectively . The incidence of mould in examined samples of cow carcass, buffalo carcass, wooden bar, butcher hand, wall and knives were4,6,96,8,100 and 12%, respectively . The result of examined samples show the highest total yeast count (cfu/cm^2) wooden bar and wall which indicate bad sanitization of butcher shop and equipment so we recommend replacement of wooden bar by granite and cover the wall by ceramic to be easily cleaning and disinfecting.

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