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AEROBIC MICROBES ON BOVINE CARCASSES SLAUGHTERED AND DRESSED INSIDE AND OUTSIDE THE ABATTOIR

BY

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ABSTRACT

This study was carried out to investigate the microbial count of carcasses slaughtered inside and outside the abattoir and to investigate the effect of seasonal variation on different microbial categories, also to explore the effect of sampling sites on different microbial count. Our results indicated that aerobic plate count of carcasses slaughtered inside and outside the abattoir from different sites were ranged from 5.803 ± 0.584 to 6.0343±0.0614/cm^2, respectively. the significant difference was found between winter and spring for abdomen and found in winter only between thigh samples. Significant difference between shoulder samples was also found in winter while no significant difference was found among all four seasons for neck. For enterobacteriaceae count, significant difference was found in shoulder region in winter season only. For mould and yeast counts, there were no significant difference among all sites during all seasons. Our study revealed that microbial counts were within the recommended permissible limits. Under the non satisfactory hygienic conditions followed in the Egyptian abattoirs no difference in the bacterial load was found between carcasses slaughtered in the municipal abattoirs and that of home killed animals. Hygienic standards should be strictly followed in Egypt.

INTRODUCTION

The meat, available at retail outlets comes through a long chain of slaughtering and transportation where each step may pose a risk of microbial contamination. The sanitary conditions of abattoirs and its surrounding environment are major factors contributing in bacterial contamination of meat **(Gill *etal.*, 2000).**

The microbiological contamination of carcasses occurs mainly during processing and manipulation, such as skinning, evisceration,storage anddistribution at slaughter houses and retail establishments **(Gill 1998; Abdalla et al.,2009).**

Bacteria which are responsible for food borne diseases contaminate meat directly and indirectly especially from animal excreta at slaughter process (**Emswiller et al. 1976).** They can also be transferred from beef-contact surfaces, utensils and other slaughtering equipments **(Yen, 2003).**

The external contamination of meat constitutes a major problem in most developing countries' abattoirs where they are potential sources of infection as microbial surface contamination of carcasses has been repeatedly reported to have a significant effect on the meat shelf life of beef. Moreover, contaminants may also include pathogens such as *Salmonella*, *Vibrio cholerae*, *Escherichia coli* and *Listeria* sp. which can contaminate the meat thereby causing severe problem for consumers **(Elmosalami, 2003)**.

In most developing countries, their traditional methods of handling, processing and marketing of meat undermine quality whereas poor sanitation leads to considerable loss of product as well as the risk of food-borne disease **(Garcia, 2007).**

Therefore, the present work was intended for evaluating the bacteriological quality of beef, the most common Egyptian favorite native meat, derived from traditional slaughtered cattle in our abattoirs and butchers' shops without any previous slaughter treatment, through fulfilling the following points: (1) determination of both aerobicmesophilic bacteria (APC) and Enterobacteriaceae organisms (2) determination of total mould and yeast counts on the following sites (Neck, Shoulder, Abdomen, Thigh) of cattle carcasses slaughtered inside and outside the abattoir.

MATERIALS AND METHODS

[1] Collection and Preparation of Samples:

A limited area ($20cm^2$) sample over Neck, Shoulder, Abdomen and Thigh of 40cattle carcasses slaughtered and dressed at Mansoura municipal abattoir and another 40 cattle carcasses slaughtered and dressed at butchers' shops. over each surface sample inside a sterilized metal template ($4\times5cm^2$)was rubbed repeatedly and successively by 3 sterilized gauze cotton swabs (having asize of about 3.5×1.5cm and attached to flat wooden stick of

about 10cm length): the first swab was moistened with a 0.1% peptone water (the diluent used), while the other 2 swabs were dry.the swab sticks were broken off below contaminated handled area into a sterile test tube containing 10ml of used diluent to give an original dilution of 1:2 after thorough homogenization of the triple swabs . then prepare tenfold serial dilution by transferring 1ml from original sample to another test tube contain 9ml of the same diluent to be diluted in a sequential manner preparing atenfold serial dilutions up to 10^2 to cover the expected range of samples contamination . each swab sample was then marked and subjected for examination.

[2] Bacteriological Analysis:

(A) Aerobic plate count (ICMSF,1978):

A tenth ml from each prepared serial dilution was transferred and evenly spread over a dry surface of duplicated,previously prepared sterile plate count agar medium **(oxide CM0325B)**.The surface of inoculated plates was allowed to dry for 15 minutes before being placed inverted with control plates in the incubator adjusted at 37°c for 24hrs.the bacterial colonies in the countable plates (having 30-300 colonies) were enumerated and the aerobic plate count per each cm of examined samples was calculated and recorded.

(B) Enterobacteriaceae count (ISO,1993):

Duplicated sets sterile Petri dishes were inoculated with 1ml amounts of the chosen range of prepared dilutions. A quantity of about 15ml of violet red bile glucose agar **(oxoid CM485B)**, melted and cooled to 45°c, was added to each inoculated Petri dish, then mixed well 3 times clock wise and 3 times anti-clockwise . After medium has solidified overlay with 10ml of the same medium to ensure anaerobic conditions which suppress the growth of non-fermentative Gram negative bacteria. It also encourages the fermentation of glucose Which favours the formation of clearly visible purple colonies, surrounded by purple halo. Then allowed to be solidified, then incubated "inverted" at 32°c for 24-48hours.Typical colonies of Enterobacteriaceae (round, purple 1-2mm surrounded by precipitation of bile salts in the medium) were enumerated in the countable plates (having 25-250colonies) and the Enterobacteriaceae count per cm^2 of the examined sample was calculated and recorded.

(3)Mycological Tests

Enumeration every of yeast and mould populations in prepared samples was carried out according to **(King et al,1979)** as follows: one fifth (0.2) ml amount from the previously

prepared original dilution (1:2.5) was delivered and spread onto dried surface each of sterilized duplicate plates of dichloran rose Bengal chloramphenicol agar (DRCA). The inoculated plates as well as the control one were incubated at 25°c for 5-7 days. After the incubation period, the average of each yeast and mould colonies were enumerated over the duplicate plates, and the total yeast count/cm² and the total mould count/cm² of tested surfaces were then calculated and recorded

RESULTS & DISCUSSION

The effect of sampling sites on aerobic plate count in different seasons among all tested samples (n=10) is shown in Table (10). These values were represented with mean ± standard deviation. APC in Abdomen from the carcasses slaughtered inside and outside the Mansoura municipal abattoir were ranged from 6.0343 to 5.954 and 5.947 to 5.850,successively. these results showed that APC in abdominal samples showed no significant difference between summer and Autumn (P> 0.05) significant difference, however, were found during winter and spring (P< 0.05). Additionally, APC in thigh from carcasses slaughtered inside and outside the abattoir ranged from 6.003 to 5.890 and 5.796 to 5.8445, successively.these showed that no significant difference among summer, Autumn and spring, however, the significant difference was found in winter (p<0.05).furthermore, APC in shoulder from carcasses slaughtered inside and outside the abattoir ranged from 5.905 to 6.028 and 5.858 to 6.038, respectively. these values showed no significant difference among summer, Autumn and spring, however, were found in winter(p<0.05).whist, APC in neck samples were ranged from 5.803 to 6.004 and 5.797 to 5.995, successively. these data showed no significant difference among all seasons (P>0.05) .

Corresponding to APC, other researchers emphasized similar values in agreement with our study as **Elmossalami et al. (1988)** who examined APC on thigh of beef carcasses slaughtered in modern abattoir in Cairo as 5.30 cfu/cm^2.Whilst, lower incidence detected by the same author on shoulder region by value of 4.301 cfu/cm^2. In this respect, **Nozha et al. (2006)** who detected APC during hot and cold seasons collected from inside and outside the abattoir in Morroco as 7.3 ±1.1 & 6.5 ±1.4 and 5.2±0.8 & 5.1±1.5, successively. In this respect, **Algabryet al.(2012)** who evaluated APC on cattle carcasses collected from butchers' shops in Alexandria were 6.363 ±5.56 cfu /cm^2.

The effect of sampling sites on enterobacteriaceae counts in different seasons among all samples (n=10) is shown in Table (11). The values represented with the mean ± SD. Enterobacteriaceae in Abdomen from carcasses slaughtered inside and outside the Mansoura municipal abattoir were ranged from 0.707±0.238 to 1.22±0.079 and 0.782±0.126 to 1.127±0.094 successively. Enterobacteriaceae counts showed no significant difference among seasons concerning to abdominal samples . Enterobacteriaceae counts in thigh were ranged from 1.06 to 1.122 and 1.064 to 1.127, successively. these results showed that there were no significant difference among seasons. Additionally, counts in shoulder were ranged from 0.936 to 1.040 and 0.917 to 1.118, respectively. these showed that there were no significant difference among summer, Autumn and spring, however, were found in winter (P>0.05).Whilst, counts in neck were ranged from 0.976 to 1.040 and 1.034 to 1.074, respectively. these values showed that there were no significant difference among seasons .

Concerning to enterobacteriaceae counts, higher incidence detected by **kotula et al. (1975)** who estimated total coliform countson beef carcassesduring spring, summer and fall were 2.7×10^4& 2.3×10 and 3.4 cfu/cm^2, successively. Furthermore, **Hamdy (1989)** who estimated coliform count of camel carcasses in Zagazig on shoulder , thigh , outer thorax and innerthorax as $2.5\pm0.86\times10^4$&$7.7\pm 2.8\times10^3$& $1.6\pm0.68\times10^4$and $1.8\pm 0.6\times10^3$/cm^2, successively.

The effect of sampling sites on mould and yeast counts in different seasons among all tested samples (n=10) is shown in Table (12). Samples were collected from cattle carcasses slaughtered inside and outside the Mansoura municipal abattoir. Mould and yeast counts in Abdomen were ranged from 1.305 to 1.480 and 1.368 to 1.443, successively. Whilst, Mould and yeast counts in thigh were 1.210 to 1.486 to 1.242 to 1.491, respectively. Similarly, total counts in shoulder were ranged from 1.238 to 1.494 and 1.130 to 1.452, respectively. Additionally, total counts in neck were ranged from 1.140 to 1.458 to 1.130 to 1.472, consecutively. These results reveal that there were no significant difference among all seasons. higher incidence level can be estimated by**Hassan (2004)**who evaluated mouldcounts /cm^2 of sheep carcasses slaughtered in the abattoir by 5.67×10^4cfu/cm^2. In this context, **Yassienet al. (1989)** who estimated total mould on shoulder and thigh as1.2×10^2/cm^2 and 0.56×10^2/cm^2, successively.**Abd-Allah (2005)** evaluated the mean level of both mould and yeast contamination on freshly dressed carcasses by 3.15-83.50 cfu/cm^2.

Statistical analysis:

The data obtained in this study were statistically analysed according to methods described by **(SPSS, 2004).**

Table 10 : Effect of sampling sites on aerobic count in different seasons among all tested samples

Site	Season	n	Abattoir	Outside		
APC			Mean ± SD	Mean ± SD	tvalue	pvalue
Abd	Summer	10	6.0343 ± 0.0614	5.947 ± 0.1281	1.94	0.0680
	Autumn	10	5.929 ± 0.1125	5.965 ± 0.0851	-0.81	0.427
	Winter	10	5.972 ± 0.0465	5.859 ± 0.1415	2.41	0.0266
	Spring	10	5.954 ± 0.0714	5.850 ± 0.120	2.36	0.0299
Th	Summer	10	5.906 ± 0.450	5.998 ± 0.141	-0.61	0.547
	Autumn	10	5.890 ± 0.1436	5.982 ± 0.0792	-1.79	0.0910
	Winter	10	6.003 ± 0.0170	5.8445 ± 0.1437	3.48	0.0027
	Spring	10	5.9351 ± 0.1085	5.796 ± 0.236	1.68	0.109
Sh	Summer	10	6.028 ± 0.0673	5.964 ± 0.1070	1.61	0.1249
	Autumn	10	5.966 ± 0.1226	6.038 ± 0.2061	-0.94	0.3577
	Winter	10	5.993 ± 0.0705	5.885 ± 0.118	2.49	0.0228
	Spring	10	5.905 ± 0.0813	5.858 ± 0.1734	0.78	0.443
Nk	Summer	10	5.803 ± 0.584	5.797 ± 0.4914	٠,٠٣	0.978
	Autumn	10	6.004 ± 0.1281	5.995 ± 0.1032	0.17	0.864
	Winter	10	5.992 ± 0.0807	5.981 ± 0.0424	0.38	0.705
	Spring	10	6.0225 ± 0.0330	5.964 ± 0.118	1.48	0.1556

Table 11 : Effect of sampling sites on Enterobacteriacea count in different seasons among all tested samples (n=10).

Site	Season	n	Abattoir	Outside		
Enter.			Mean ± SD	Mean ± SD	tvalue	pvalue
Abd	Summer	10	0.707 ± 0.238	0.834 ± 0.102	-1.54	0.141
	Autumn	10	0.8105 ± 0.137	0.782 ± 0.126	0.47	0.640
	Winter	10	0.838 ± 0.0974	0.8322 ±0.0951	0.14	0.892
	Spring	10	0.856 ± 0.079	0.845± 0.105	0.27	0.792
Th	Summer	10	1.085 ± 0.128	1.127 ±0.094	-0.81	0.426
	Autumn	10	1.066± 0.1597	1.064 ± 0.172	0.02	0.984
	Winter	10	1.095 ± 0.124	1.083 ± 0.105	0.24	0.815
	Spring	10	1.122 ± 0.079	1.118 ± 0.095	0.11	0.913
Sh	Summer	10	0.967 ± 0.167	0.954± 0.112	0.20	0.846
	Autumn	10	0.974 ± 0.135	0.917 ± 0.100	1.08	0.293
	Winter	10	0.936 ±0.131	1.118 ± 0.151	-2.85	0.010
	Spring	10	1.040 ±0.143	1.0618 ± 0.0876	-0.41	0.686
Nk	Summer	10	0.976 ± 0.127	1.046 ± 0.096	-1.38	0.184
	Autumn	10	0.985± 0.0551	1.034 ± 0.101	-1.34	0.197
	Winter	10	1.015± 0.105	1.046 ± 0.065	-0.78	0.446
	Spring	10	1.040 ± 0.080	1.074± 0.133	-0.7	0.494

Table 12: Effect of sampling sites on Mould &Yeast count in different seasons among all tested samples (n=10).

Site	Season	n	Abattoir	Outside		
Mou.			Mean ± SD	Mean ± SD	tvalue	pvalue
Abd	Summer	10	1.305 ± 0.315	1.443 ± 0.376	-0.89	0.383
	Autumn	10	1.390± 0.261	1.368 ± 0.209	0.20	0.842
	Winter	10	1.337 ± 0.298	1.368 ± 0.143	-0.29	0.774
	Spring	10	1.480 ± 0.168	1.372 ± 0.112	1.7	0.106
Th	Summer	10	1.309 ± 0.334	1.491 ± 0.209	-1.46	0.160
	Autumn	10	1.210 ± 0.283	1.242 ± 0.274	-0.26	0.8003
	Winter	10	1.424 ± 0.194	1.348 ± 0.295	0.68	0.505
	Spring	10	1.486 ± 0.177	1.414 ± 0.1200	1.06	0.302
Sh	Summer	10	1.392 ± 0.156	1.402 ± 0.190	-0.13	0.9012
	Autumn	10	1.238 ± 0.260	1.130 ± 0.467	0.64	0.5308
	Winter	10	1.494 ± 0.180	1.452 ± 0.180	0.52	0.607
	Spring	10	1.382 ± 0.193	1.382 ± 0.213	-0.00	0.998
Nk	Summer	10	1.290 ± 0.250	1.244 ± 0.258	0.41	0.688
	Autumn	10	1.140 ± 0.1736	1.130 ± 0.248	0.10	0.921
	Winter	10	1.458 ± 0.203	1.241 ± 0.3008	1.89	0.0749
	Spring	10	1.360 ± 0.247	1.472 ± 0.175	-1.16	0.259

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الملخص العربى

الميكروبي على اسطح الذبائح البقرية المذبوحة والمجهزة داخل وخارج مجزر المنصورة التلوث

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قسم الرقابة الصحية على الأغذية

أجريت هذه الدراسة لبحث الاختلاف فى عدد الميكروبات الموجودة فى الذبائح البقرية المذبوحه والمجهزة داخل المجزر وخارجه ولمعرفه تأثيرالتغيرات الموسميه على المجموعات الميكروبية المختلفة. بالإضافة إلى دراسة تأثيرأماكن أخذ العينات على أعداد تلك الميكروبات. وأشارت نتائج دراستنا أن متوسط أعداد البكتريا الهوائية Aerobic plate count على أسطح ذبائح الحيوانات المذبوحة والمجهزة داخل وخارج المجزر من أماكن مختلفة كانت 0.584± ٥,٨٠٣ و0.0614±6.0343 على التوالي. وقد اتضح وجود اختلاف كبير بين موسمي الشتاء والربيع بالنسبة لعينات البطن ، وبنسبه كبيرة فى فصل الشتاء بالنسبة لعينات الفخذ. بالإضافة إلى وجود اختلاف كبير في أعداد الميكروبات في عينات الكتف في فصل الشتاء ولم يكن هناك فرق كبير بين جميع الفصول الأربعة بالنسبة للعينات التي تم أخذها من الرقبة. اما بالنسبة لعدد البكتريا المعويه Enterobacteriaceae count وجد اختلاف كبير في المنطقة الكتف في فصل الشتاء فقط .اما بالنسبة للفطريات والخميرة لم يكن هناك فرق كبير بين جميع المواقع خلال جميع الفصول. وقد بينت الدراسة، تكشف أن عدد الميكروبات كانت ضمن الحدود المسموح بها تحت الظروف الصحية الغير مرضية المتبعة في المجازر المصرية، لم يوجد هناك فرق في كمية الجراثيم بين الذبائح المذبوحه داخل المجزر وخارجها .الاحتياطات الصحية يجب أن تتبع في مصر.