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HYGIENIC EVALUATION OF BEEF CARCASSES AND BUCHERS SHOPS IN FOUR LOCAL MARKETS IN BASRH CITY\ IRAQ

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SUMMARY

The microbial quality of beef carcasses, sanitary conditions in butchers' shops and possibility of the presence of human pathogens associated with food poisoning outbreaks such as salmonella and staphylococci was investigated in 160 samples of beef carcasses, cutting blocks, knives, workers' hands and air (32 samples for each).

These samples were collected from butchers' shops in four local markets in Basrah city (Al-Jumhuriya , Al- Basrah , Al-Ashar and Khamsa mile). All samples were tested for aerobic plate count, total coliform count, *Staphylococcus aureus* count and an attempt was made for isolating and identifying of *Salmonella spp.* Except samples of air were examined only for aerobic plate count. The collection of samples were done during in January and ended with June 2004.

There were no significant differences in aerobic plate count, total coliform count and *Staphylococcus aureus* of beef carcasses among the different markets (Al-Jumhuriya, Al-Basrah, Al-Ashar and Khamsa mile), similar findings were observed in the cutting blocks and air samples, whereas significant differences were appeared in aerobic plate count and total coliform count of knives sample between Al- Basrah and Al-Ashar markets.

The aerobic plate count of workers' hands of Al-Jumhuriya and Al-Ashar markets showed significant differences, whereas total coliform count showed significant differences between Al-Jumhuriya and Khamsa mile

The percentage of coagulase positive test of *Staphylococcus aureus* which were isolated from the beef carcasses, cutting blocks, knives and workers' hands samples was 100%.

The beef carcasses, cutting blocks knives and workers' hands samples showed negative results in salmonella identification testes.

Key word:

INTRODUCTION

The microbiological condition of carcass meat highly depends on the manner in which meat animals are reared, slaughtered and processes (McEvoy *et al*., 2000). From the moment of slaughter, each processing step subjects the carcasses to opportunities for contamination with microorganisms from the exterior surfaces of the animals. The hide of the animal are known to be a major source of carcass contamination (pathogen and spoilage bacteria) and allowing the surface of the hide to touch the surface of meat during removal can cause transfer of significant numbers of organisms to the meat surface(Greer and Jeremiah, 1980).Likewise hands and equipment that touch the outside of the hide can serve to transfer organisms to the meat (Widders *et al* .,1995).Contents of the gastro-intestinal tract ,it is clear that under normal conditions, the heaviest and potentially the some load of bacteria is in the animals digestive tract (Bell *et al*.,1986). In addition to the hide and the gastro-intestinal tract, respiratory tracts, urine and milk are other important animal sources of contamination.

Meat handling and preparation involves contact with knives, hands and clothing of workers, processing equipment, (e.g. saws, hooks, boning tables, conveyers) and water used to wash carcasses (Thornton and Gracey, 1974; Al-Tai, 1986). Further sources of contamination during chilling may occur while carcasses touching one another or contacting with dirty floors and walls and splashing if cleaning is carried out in a loaded chiller or in the air, especially if the filters are not regularly cleaned (Chandran *et al*., 1986).

From the details mentioned above, there are five points on the hazard analysis from where food safety hazards are reasonably likely to occur. These points includes: pathogen contamination from the hide at skinning, pathogen contamination from the gastrointestinal tract during evisceration, final wash, pathogen proliferation at chilling, and pathogen proliferation at finished product storage (American Meat Science Association, 1999).

There appears to be neither any information regarding the microbial quality of beef carcasses nor the status of sanitary conditions of butchers' shops to be known in this city Therefore, it will be an essential to assess the microbial quality of the beef carcasses and hygienic status of the butchers' shops. Also an attempt was made to investigate the possibility of the presence of human pathogens associated with food poisoning outbreaks such as salmonellae and staphylococci.

MATERIALS AND METHODS

A total of 160 samples of beef carcasses, cutting blocks, knives, workers' hands and air (32 samples of each) were collected from butchers' shops of Basrah city. The period was started in January and ended in June. All samples examined bacteriologically for aerobic plate count, total coliform count, *Staphylococcus aureus* count and an attempt was made for isolation of Salmonella spp.

Sampling of Beef Carcasses: Sampling of beef carcasses was done by using rinse swab method (Hall, and Maurer, 1980). The carcass area used for sampling was 25 cm2 from thigh.

Sampling of Equipment: The equipment samples in the butchers' shops were knives and cutting blocks. The surfaces of these equipments were swabbed by using rinse swab technique similar to those employed in beef carcasses except the sampling area which was 5 cm2.

Sampling of Workers' Hand: workers' hand was swabbed over the fingers using swab technique similar to that employed in sampling of equipment .

Sampling of Air: Samples of air were done by exposure plate method (Gregory, 1961).

Transportation of Samples: The samples were transferred by a vehicle immediately to the laboratory by kept them in a cold insulated box, these samples were then subjected to bacteriological examination immediately on reaching the laboratory.

Bacteriological analysis: Serial dilution was used to prepare duplicate plates for the determination of aerobic plate counts (APCs), coliforms and *Staph . aureus*

APCs were determined by using Nutrient agar (Himeda, India) and plates were incubated at 37C° for 48 h. Then all colonies on plates were counted (American public Health Association. (1978).

Colifrom counts were determined by using MacConkey agar (Himeda, India), typical colonies were identified (Mahmood, et al.,1992).).

For the *Staph. aureus* counts ,Mannitol salt agar(Himeda, India)was used and the plates incubated at٣٧ C° for 24 to 48 h (APHA,1978).All typical colonies on Mannitol salt agar was counted. Selected colonies from the agar surfaces were tested for coagulase activities using rabbit plasma (Gillespie, 1943; Sproer, and Tatini, 1975).

For the enrichment of salmonella a five ml from the original sample was transferred to a 45 ml of tetrathionate broth (Oxoid, U.K) and incubated at 37C° for 24 h. One ml from enrichment culture was transferred to a brilliant green agar (Oxoid, U.K) as selective plating .Presumptive salmonella colonies

selected from each of selective plates were subjected to the biochemical test including: Triple Sugar Iron agar, Urease broth and Sulphide Indole Motility (International Organization for Standardization ,1998). All cultures were incubated at 37ºC for 24 hours.

Statistical Analysis: The data were analyzed by One-way ANOVA test, using statistical package for the social sciences (SPSS, version 9.0). All data were expressed as Mean±Std.Error. Differences between data were compared by least significant deference (Snedecor and Cochran, 1971).

RESULTS AND DISCUSSION

Tables (1,2 and 3) revealed that there was no significant differences in the aerobic plate count , total coliform count and *Staph aureus* of beef carcasses among the different markets (Al-Jumhuriya **,**Al-Basrah, Al-Ashar and Khamsa−mile), similar findings were observed in the cutting blocks and air samples. Whereas a significant differences were appeared in aerobic plate count and total coliform count of knives samples between Al-Basrah and Al-Ashar markets .The aerobic plate count of worker' hands of Al-Jumhuriya and Al-Ashar markets showed significant differences, whereas total coliform count appeared significant differences between Al-Jumhuriya and Khamsa mile.

The absent of significant difference among markets concerning carcasses and cutting blocks in all bacterial studies may be due to the fact that the carcasses in all butchers' shops have been presented in the same manner outside there shops, and most butchers' usually cutting the meat on the surface of tree that has many cracks which harbors microorganisms with high load, but the presence of significant difference concerning knives and workers' hands in aerobic plate count and total colifrom count may be due to the difference in the personal and equipment hygiene.

The beef carcasses, cutting blocks, knives and workers' hand samples showed negative results in Salmonella identification testing. The results were in agreement with the results of (Lotfi *et al* ,1986; Abd El-Aziz ,1988) who got negative results in relation to salmonella identification.

Table (1): Comparison data of aerobic plate count of the examined samples collected at different local markets

Sources of samples	Aerobic plate count				F value
	Al-Jumhuriya	**Al-Basrah**	Al-Ashar	Khamsa mile	
carcasses	45.52[M] 3.20-172[R] ±25.29[S.E]	46.37 3.6-166 ±24.65	55.97 3-164 ±24.45	68.70 5.60-170 ±24.36	0.191[NSD]
cutting blocks	1.15 0.12-5.80 ± 0.68	2.82 0.25-15.80 ±1.87	1.81 0.30-5.60 ±0.63	0.70 0.14-17.80 ±2.12	0.213 [NSD]
knives	0.57 ae 0.03-1.06 ±0.12	0.34 ab 0.03-1.04 ±0.148	0.94 de 0.03-1.40 ±0.145	0.70 ae 0.03-1.14 ±0.15	3.135
workers' hands	0.06 a 0.02-0.143 ±0.01	0.12 ab 0.06-0.32 ±0.02	0.17 b 0.06-0.38 ±0.046	0.13 ab 0.03-0.34 ±0.043	1.517
air	9.36 0.08-0.10 ±0.36	9.80 0.08-0.10 ±0.29	9.91 0.08-0.11 ±0.28	10.07 0.09-0.11 ±0.23	١,٠٥٣ [NSD]

M= means counts, R= range between, S.E= standard error

Results are expressed as mean colony forming units x١٠[٤] per cm[٢].

The difference in letter mean significant difference (P<٠,٠١)

Table (٢): Comparison data of total coliform count of the examined samples collected at different local markets

Sources of samples	Total coliform count				F value
	Al-Jumhuriya	**Al-Basrah**	**Al-Ashar**	**Khamsa mile**	
carcasses	0.86[M] 0.03-1.54[R] ±25.29[S..E]	1.13 0.54-1.54 ±0.12	0.94 0.28-1.54 ±0.15	1.03 0.26-1.54 ±0.18	0.519 [NSD]

cutting blocks	0.95 0.28-1.32 ±0.14	0.87 0.52-1.32 ±0.11	0.84 0.26-1.32 ±0.12	0.82 0.24-1.32 ±0.16	0.18 NSD
knives	0.98 ae 0.50-1.20 ±0.10	0.82 ab 0.50-1.10 ±0.09	0.81 de 0.24-1.32 ±0.13	0.66 ae 0.22-1.6 ±0.17	1.025
workers' hands	0.19 a 0.48-1.10 ±0.08	0.74 ab 0.48-1 ±0.07	0.72 ab 0.22-1.10 ±0.10	0.57 b 0.20-1.10 ±0.12	1.945

M= means counts, R= range between, S.E= standard error

Results are expressed as mean colony forming units x١٠^{٣} per cm^{٢}.

The difference in letter mean significant difference (P<٠,٠١)

Table (٣): Comparison data of *Staph.aureus* count of the examined Samples collected at different local markets

Sources of samples	*Staph.aureus* count				F value
	Al-Jumhuriya	**Al-Basrah**	**Al-Ashar**	**Khamsa mile**	
carcasses	١٣,٢٠^{M} ٤,٢٠–٣٨^{R} ±٤,٠٤$^{S.E}$	١٨,٤٣ ٠,٦٠–٥٠ ±٦,٤٨	١٠,٤١ ٠,٦٠–٣٦ ±٤,٣٤	١٢,٣٨ ٠,٨٠–٣٢ ±٤,٤١	٠,٤٨٨ NSD
cutting blocks	٧٨,٢٥ ٣٠–٢٠٠ ±٢٣,٥٢	١٠٤,٥٠ ٢٠–١٩٠ ±٢٣,٤٦	٢٦٧ ١٨–١٣٨٠ ±١٦١,٠٢	١٩٨,٢٥ ٣٢–٢٦٠ ±٢٨,٢٢	١,٠٥٧ NSD
knives	٠,٧٧ ١ - ١٩ ±٢,٧٧	٦,٥٣ ١,٨٠–١٨ ±٢,٢٤	٩,١٨ ٠,٨٠–٢٠ ±٢,٤٥	٦,٥٨ ١,٢٢–١٨ ±٢,١٥	٠,٣١٨ NSD
workers' hands	٠,٨٩ ٠,٧٠–١,١٠ ±٠,٠٥	٠,٨٧ ٠,٦٠–١,١٠ ±٠,٠٦	٠,٩٩ ٠,٧٦–١,٢٠ ±٠,٠٥	٠,٨١ ٠,٦٠–١,١٨ ±٠,٠٧	١,٦٤٢ NSD

M= means counts, R= range between, S.E= standard error

Results are expressed as mean colony forming units x١٠^{٢} per cm^{٢}

NSD= Non Significant Difference (P<0.01)

REFERENCES

Abd El-Aziz, A.S. (1988). Salmonella in locally produced meat products. M. Sc. Thesis, College of Vet.Med.Cario Univ.

Abdul-Wadood, E. (2002). Study on some hygienic aspect of Basrah Abattoirs. Bas .J. Vet. Res., Vol. 1, No.2.

Al-Tai, M.A.J.(1986). Fish and Meat Technology .Dar Al-kutob for press. Basrah Univ.

American Meat Science Association. (1999). The role of microbiological testing in beef food safety programs. The scientific perspective. Consensus of the 1999 Symposium.

American public Health Association. (1978). Standard Methods for the Examination of Dairy products. 14th ed., Washington , U.S.A.

Bell, M.F.; Marshal, R.T. and Anderson, M.E. (1986). Microbiological and sensory test of beef treated with acetic and formic acid .J. Food Prot.49: 207-210.

Chandran, S.K.; Savell, J.W.; Griffin, D.B. and Vanderzant, C. (1986). Effect of slaughter, dressing, fabrication and storage condition on the microbiological and sensory characteristics of vacum-packaged beefsteak. J. Food Sci.51: 37-39.

Gillespie, E.H. (1943). The routine use of the coagulase test for Staphylococci.Monthly Bulletin Emergency Public Health Laboratory Service, 2-19. (Cited by Cruickshank et al., 1975).

Greer, G. G. and Jeremiah, L.E. (1980). Effect of retail sanitation on the bacterial load and shelf life of beef. J. Food prot. 43:277-287.

Gregory, P.H. (1961). The microbiology of the atmosphere. Interscience Publishers (Division of John Wiley and Sons, Inc.) New York.

Hall, M.A. and Maurer, A. J. (1980). The microbiological aspects of a duck processing plant. Poultry Sci. 59: 1795-99

Lotfi, A.; Nasr.S.;Yaussef,K.;Abdel Rahman ,H.; Hefnawy ,Y.; El-Tinawy, A. and Gobran, R.(1986). Enterobacteriacea in meat products in Upper Egypt. Assiut Vet. Med. J. 17: 77.

Mahmood, K.H.; Mohamed, S.H. and Al-Kashaly, S.S. (1992). The microbial quality of raw ground beef from local markets in Basrah, Iraq. Basrah J. Agric. Sci.5: 7-14.

McEvoy, J. M.; Doherty, A.M.; Finnerty, M.; Sheridan, J.J.; McGuire, L.; Blair, I.S.; McDowell, D.A. and Harrington, D. (2000). The relationship between hide cleanliness and bacterial numbers on beef carcasses at a commercial abattoir. Lett. Appl. Microbiol. 30:390–395.

Snedecor. G.W. and Cochran, W.G. (1971). Statistical Methods. 6th ed., Iawa State University Press. Ames, Iawa, USA.

Sproer, W. H. and Tatini, S. R. (1975). Interpretation of the tube coagulase test for identification of Staphylococcus aureus. Appl. Microbiol. 29:502-505.

Thornton, H. and Gracey, J. F. (1974). Meat Hygiene practices. Textbook of Meat Hygiene. 6th ed. Bailliere Tindall. London.

Widders, P .R.; Coates, K. J.; Warner, S.; Beattic, J. C.; Morgan, I. R. and Hickey, M.W. (1995). Controlling microbial contamination on beef and lamb meat during processing. Aust. Vet. J. 72:208-211.

مجلة البصرة للعلوم الزراعية ، المجلد ١٩ ، العدد ١ ، ٢٠٠٦

تقييم الحالة الصحية للحوم الأبقار و محلات القصابين في أربعة أسواق محلية في مدينة البصرة/عراق

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الخلاصة

تم استقصاء النوعية الميكروبية لذبائح الأبقار و الحالة الصحية لمحلات القصابين واحتماليه وجود الجراثيم المرضية المرتبطة بتفشي حاله التسمم الغذائي في الإنسان مثل السالمونلا والمكورات العنقودية في مائه وستين عينه من ذبائح الأبقار ، ألواح التقطيع، السكاكين، أيدي العاملين والهواء(٣٢ عينه من كل نموذج) .

جمعت هذه العينات من محلات القصابين الواقعة في أربعه أسواق محليه في مدينه ألبصره (الجمهورية ، ألبصره ،العشار و خمسه ميل) ابتداء من شهر كانون الثاني وانتهاء بحزيران ٢٠٠٤. جميع العينات فحصت بواسطة العد الكلي للجراثيم الهوائية ، العد الكلي لبكتريا القولون ،عد المكورات العنقودية الذهبية ومحاولة عزل وتشخيص السالمونلا عدا عينات الهواء التي فحصت بواسطة العد الكلي للجراثيم الهوائية فقط .

أظهرت نتائج الدراسة بأن هنالك زيادة غير معنوية في معدل العد الكلي للجراثيم الهوائية ،عد بكتريا القولون ومعدل عد المكورات العنقودية لنماذج ذبائح الأبقار ، ألواح التقطيع، والهواء التي جمعت من الأسواق(العشار ،البصرة ،الجمهورية وخمسه ميل) بينما كان هناك ارتفاعا معنويا في معدل العد الكلي للجراثيم الهوائية ومعدل عد بكتريا القولون لنماذج السكاكين التي أخذت من

سوق البصرة والعشار. أما فيما يتعلق بمعدل العد الكلي للجراثيم الهوائية لنماذج أيدي العاملين فقد أظهرت فرقا معنويا بين سوق الجمهورية والعشار في حين معدل عد بكتريا القولون الكلي أظهرت فرقا معنويا بين سوق الجمهورية وخمسه ميل.

Table.3. Effect of residues extracts and whole residues of rice on shoot length of wheat and barley.

Test Crop	Rice Residues	Extract conc. ١٪	٢٪	٤٪	mean					
Wheat	Control	١٤,٤	١٣,٨	١٤,١	١٤,١٠					
	Ground straw	١٣,٢	١١,٢	٩,٤	١١,٢٦	٢٢,١	٢٣,٦	٢٥,٥	٢٣,٧٣	
	Ground root	١١,٦	١٠,١	٨,٤	١٠,٠٣					
	Burned straw	١٢,٤	١١,٠	١٠,١	١١,١٦					
	Burned root	١٢,٠	١٠,٦	٩,٦	١٠,٧٣					
	mean*		١٢,٣	١٠,٧٢	٩,٣٧					
Barley	L.S.D. ٥٪	Among kinds of residues= ٢,٣								
		Among concentrations= ٢,١								
		Interaction= ٣,٣								
	Control	١٣,٢	١٢,٥	١٢,٥	١٢,٧٣					
	Ground straw	١١,١	١٠,٠	٨,٥	٩,٨٦					
	Ground root	٩,٩	٨,٢	٦,٨	٨,٣٠					
	Burned straw	٩,٠	٧,٧	٦,٦	٧,٧٦					
	Burned root	٩,٠	٨,٢	٧,٥	٨,٢٣					
	mean*		٩,٧٥	٨,٥٢	٧,٣٥					
	L.S.D ٥٪	Among kinds of residues= ٢,٦								
		Among concentrations= ١,١								
		Interaction= ٢,٤								

*** without control**