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SANITARY STATUS OF MEAT MEALS IN ASSIUT UNIVERSITY HOSPITALS

(With 3 Tables)

By

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الحالة الصحية لوجبات اللحوم في مطاعم مستشفيات أسيوط

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تم جمع مائة عينة من مستشفيات جامعة أسيوط مثلت العينات المأخوذة من اللحوم الطازجة بعد طهيها . وقد تم فحص العينات لتقدير العدد الكلى للميكروبات الهوائية وكذلك لكل من الميكروبات المعوية ، القولونية العصوية ، القولونية البرازية ، السبحية المعوية ، العنقودى الذهبى، الكلوستريديام بيرفرنجنز بالإضافة إلى عزل وتصنيف الميكروبات المرضية . كذلك تم تحديد مصادر التلوث وبالتالى رفع الحالة الصحية في المستشفيات . كما تم مناقشة التوصيات اللازمة لحماية المرضى والأطباء وكل أفراد المستشفيات من مخاطر الصحة العامة .

SUMMARY

One hundred random meat samples were collected under sterile conditions fromgeneral & recent Assiut University hospitals buildings and were examined bacteriologically to estimate aerobic plate, Enterobacteriacea, coliforms, faecal coliform, Enterococci and Cl. perfringens count. Half of the samples were raw while the other half were cooked.

Besides isolation and identification of some pathogenic microorganisms were conducted.

The sanitary improvement and assesment of the sources of contamination were carried out.

Suggestive measures to protect phyisicans, patients as well as all hospital staffs from the risk of public health hazards were discussed.

INTRODUCTION

The need for a high standard of hygiene and adequate control measures is prticulary important in food serving establishments.

The hospital patient food service differs from all other types of mass food preparation and service because the individuals fed are the most sick and the most incapacitated member of the population (KUNDSIN and BODMAN, 1976; BRYAN, 1978 and UNKLESBAY, 1978).

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Quality of meals is a primary objective of hospital food-service system. This involves inspection at the point of service (KARMER, 1971; BOBENG and DAVID, 1977 & 1978).

The hospital meat supply is a potential source of infectious pathogenic micro-orgnisms (PASCH, 1974 and BRYAN, 1978).

The transfer of microorganism via hospital meat supplies can occur in three ways; first pathogenic bacteria can be brought in or on meat itself. Secondly, meat service personel may be carriers of pathogenic organisms that can contaminate meat and then transferred to patient via meat supply. Third, improper cooking, refrigeration or storabe may lead to meat borne illness.

The bacteria found in bacteriological examination of hospital meat may be either specific, pathogenic or a mixed flora of non pathogenic bacteria.

The aim of the present work is to investigate the presence of potential spoilage organisms as well as the isolation of the pathogenic ones in raw and cooked meats in general and recent Assiut University Hospitals service systems. Therefore this work was planned to indicate the following:-

I- Evaluation of the sanitary status of raw and cooked meat.
II- Sanitary improvement and assessment of the sources of contamination.

MATERIAL and METHODS

Part I: Evaluation of the sanitary status of raw and cooked meat:

100 random raw and cooked meat samples (50 of each were collected under sterile conditions from Assiut University Hospitals. Raw meat samples were taken directly prior to cooking while the cooked samples were obtained before serving.

25 gms samples were blended with 225 ml of 1/4 strength Ringers solution in a waring blender at 800 r.p.m. Serial dilutions were made for enumeration of APC according to the recommended methods cited by AOAC (1975). Enterobacteriaceae count was done as described by MERCURI and COX (1979), while the procedures recommeded by ICMSF was followed for the MPN of coliforms. Enterococci count was done as recommended by EFTHYMIOU and JOSEPH (1974). While MPN procedures of BEERNS et al. was follwed for Cl. perfringens count.

The isolation and identification of enteric organisms was done as recorded by ICMSF (1978) as well as staphylococci by COWAN and STEEL (1974).

Part II: Sanitary improvement and assessment of the sources of contamination:

This study was planned to detect :

- Effeciency of cooking on pathogenic and potential pathogenic bacteria as well as other microorganisms affecting keeping quality of meat.

- Detection of the sources of contamination of meat during its handling and distribution (utensils).
- Assessment of the sanitary improvement of both handling and distribution (utensils).

The recommended investigation was carried out as follows :

1- 20 random samples of raw meat were collected just before cooking and subjected to examination under the normal available condition.

2- The 20 previous raw meat samples were cooked and subjected to examination just after cooking and under available condition.

3- Other 20 cooked samples were taken by both sterile utensils and sterile handling.

4- Another 20 cooked samples were taken by sterile handling but under normal available condition.

5- Another 20 cooked samples were taken in sterile utensils but handled at available condition.

Method of examintion :

Enumeration and isolation of different microoganisms cited in part I were done as recorded previously. Results obtained are recorded in Table (3).

RESULTS

Results are achieved in tables (1, 2 & 3).

DISCUSSION

Results given in Table 1 revealed that the mean APC of raw and cooked meat of $1.2x10^7$ and $2.1x10^7$ respectively. Nearly similar results were recorded by EL-DALY, 1983 and EL-HOSSIENY, 1987 while BURTMAXCY, 1976; BUNCH et al., 1977 and DAHL et al., 1978 found lower counts.

The enterobacteriacea count was of mean value of $5.1x10^5$ and $1.3x10^5$ for raw and cooked meat respectively.

Regarding to the mean coliforms count was $4.3x10^5$ and $9.3x10^2$ for raw & cooked meat respectively. The identified isolates were E.coli 33(27.5%), 20(20%) Enterobacter 5(4.17%), 4(4%), Citrobacter 7(5.83%), 1(1%) and Klebsiella 10(8.33%), 12(12%) for raw and cooked meat respectively.

Concerning Staph. aureus count, the mean value was $1.3x10^5$ for raw meat and $2.5x10^4$ for cooked meat. Nearly similar results were recorded by DAHL et al. (1980).

The isolated staphylococci were coagulase positive strains, coagulase negative ones, Staph. epidermidis and Micrococci at 12 (10%), 25(20.03%), 15(12.5%), 2(1.7%) for raw meat while for cooked meat were 6(6%), 24(24%), 18(18%), 9(9%) for cooked meat respectively.

Serological typing of E.coli strains isolates showed that EPEC were detected in raw meat in 30(25%) while in cooked were 17(17%) but the untypable strains were 3(2.5%) and 3(3%) respectively. These findings are higher than those outlined by SHOOTER et al. (1970).

It is worth mentioning that the enteropathogenic serotypes implicated in human cases of gastroenteritis, epidemic diarrhea in infants as well as cases of food poisoning (LOVE et al., 1972 and MOSSEL, 1975).

The identified enteric organisms were shigella sp. 2(1.7%); proteus rettergi 2(1.7%); Proteus mirabilis 1(0.83%), Providencia 3(2.5%) and Serratia sp. 3(2.5) for raw meat, while for cooked meat were 1(1%), 2(2%), 0(0%), 1(1%) and 2(2%) respectively. Salmonellae failed to be recovered from meats either raw or cooked.

Enterococci count have been used as an index of faecal contamination as well as implicated as aetiological agents of fooborne illness. The mean value of enterococci was $8.3x10^4$ and $3x10^4$ for raw and cooked meat respectively.

Cl. perfringens count in raw meat were detected in low counts and this is not mainly due to intestinal faecal pollution but it may be due to contamination with unclean water sources. The failure to isolate such organism from cooked meat being similar to TOUMI et al. (1974). In the current of the present investigation C. perfringens counts were lower than the other microorganisms as reported by DENNIS et al. (1972).

The results given in table (3) detect the sources of contamination and sanitary improvement as the following:

1- Effect of cooking on microbial contamination and improved sanitation of handling and distribution:

The heat treatment is often considered as a method to elminate contamination of raw meat as well as to reduce pathogens (FRAZIER, 1967; MISKIMIN et al., 1976 and CREMER et al., 1985). However, the presence of nonsporeforming microorganisms in cooked meat was indicative of either under-or post-processing contamination (CREMER and CHIPLEY, 1977).

Cooking slightly reduced the APC from $11x10^7$ to $10x10^6$ while counts of enterococci, $_5$ enterobacteriaceae and Staph. aureus were reduced from $47x10^4$, $18x10^2$ and $25x10^5$ to $1x10^2$, $1x10^2$ and zero respectively as shown in Table (3).

Higher counts of APC were observed after cooking than that obtained by ROBERT, 1972; SURKIEWICZ et al., 1973 and NICHOLANCO and MATTHEWS, 1978, this may be due to the possible presence of heat injured cells and/or heat shocked spores (DAHL et al., 1978). The higher count of enterococci in cooked meat were attributed to their heat resistant as well as the originally contaminated not entirly removed by cooking.

The present work proved that cooking process had sufficient effect on destruction of Staph. aureus, while BUNCH et al., 1977, reported the presence of such organism after processing. From the public health point of view Staph. aureus organism

plays no role but their toxins of important in most cases as traced to food intoxication as stated by HOBBS and GILBERT, 1981.

Coliforms and E.coli were reduced by cooking from about high levels to very low ones or completely not recovered. These findings are nearly similar to that have been reported by SHOOTER et al., 1970; NICHOLANCO and MATTHEWS, 1978. Furthermore, Cl.perfringens which was present in raw meat could not be detected after cooking.

The present work proved that sufficient cooking process as well as hygienic handling and using sterile utensils lead more or less to the most reduction of Staph. aureus, coliforms, E.coli and Cl.perfringens.

2- Effect of actual normal handling on microbial contamination of meat meals:

The present experiment revealed that handling of meat in hospital by workers hands resulted in a marked increase in APC and enterococci count which varied from $10x10^6$ and $1x10^2$ to $40x10^6$ and $20x10^2$/g respectively, while the level of enterbacteriaceae was the same before and after handling, wheareas Staph. aureus count was $15x10^2$ inspite of not recovering after cooking as illustrated in Table (3).

EL-DALY, 1983 found that the mean APC, enterobacteriaceae, enterococci and coliforms count per hands were $19.6x10^7$, $34.6x10^6$, $83.91x10^2$ and $30.75x10^4$ respectively.

The role of mishandling of food in transmission of microorganisms to it and consequently foodborne illness were discussed by many authors (HESS and LOTT, 1970, Bryan, 1974; PASCH, 1974; HOBBS and GILBERT, 1981; BRYAN and LYON, 1984 and EL-DALY, 1986).

The occurance of Staph. aureus mainly coagulase positive, Staph. epidermidis and Micrococci on meat taken by hands of workers indicating that human being is the main source of Staphylococci and this agree with (WILLIAMS, 1963; BRYAN, 1972; HILL, 1972 and SELIGMAN and ROSENBLUTH, 1975).

Concerning coliforms and E.coli, a high level of such organisms was observed by mishandling further, shigella, E.coli, citrobacter spp. klebsiella spp. and serratia were isolated.

Many invistigators discussed the role of workers and their hands in the transmission of enterococci and faecal coliforms (SELIGMAN and ROSENBLUTH, 1975), coliforms (EL-DALY, 1986), Staph. aureus (BRYAN and MCKINLEY, 1979), E.coli (RIEMANN and BRYAN, 1979).

In the present experiment neither Cl. perfringens or Salmonella were present in the examined samples after handling and this agreed with the results of BRYAN and MCKINLEY, 1979.

3- Effect of utensils on contamination of meat meal:

From the summarized results given in Table (3) it is evident that the utensils used in hospital raised APC from $10x10^6$ to $16x10^6$, enterococci from $1x10^2$ to $15x10^4$,

enterobacteriaceae from $1x10^2$ to $18x10^2$ and Staph. aureus count from zero to $10x10^2$/g, this indicated that the ustensils play a role in post cooking contamination.

EL-DALY, 1983 revealed that the mean APC, enterobacteriaceae, enterococci and coliforms count per tray were $98.8x10^4$, $77.1x10^4$, $63.99x10^2$ and $90.61x10^4$ respectively. In 1986. The mean MPN of coliforms per tray was $79x10^3$.

These results agreed with that obtained by SHOOTER et al., 1970 who detected 10^3/g. E.coli count due to utensil used, while such organism was completely destroyed by cooking.

Further, Cl. perfringens and Staph. aureus were present in 8% and 9% of equipment without the recovering of Salmonellae (BRYAN and MCKINLEY, 1979).

The isolation of Staph. aureus, micrococci, Staph. epidermidis, E.coli as well as klebsiella from utensils contacted with meat may be attributed to unsatisfactory hygienic measures adopted during cleaning of such utensils.

Salmonellae, Cl. perfringens as well as proteus could not be recovered during this part of present experiment.

The inadequate cleaning of utensils was one of the main factors responsible for foodborne outbreaks in foodservice establishments in U.S during "1973-1976" (BRYAN, 1978).

4- Effect of handling and utensils on contamination of meat meals:

The mishandling of cooked food as well as uncleaned equipment surfaces were the most sources of contamination (BRYAN and LYON, 1984).

From the summarized results Table (3) it is evident that the normal handling and unclean utensils used in the hospital lead to marked increase in APC, enterocci, enterobacteriaceae and Staph. aureus count from $10x10^6$, $1x10^2$, $1x10^2$ and zero to $47x10^6$, $26x10^4$, $20x10^2$ and $10x10^3$ respectively.

The role of mishandling of food and inadequately cleaned utensils in transferring of microorganisms, particulary bacteria were reported by (CHIPLEY and CREMER, 1980; BRYAN, 1981; ROUSHDY et al., 1981 and EL-DALY, 1986.

It is evident from these experiments that normal methods of serving used in hospital play an important role in post cooking contamination. Hygienic handling resulted in a marked reduction of such contamination.

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Table (1): Statstical analytical results of microbiological counts of examined raw and cooked meat samples.

Table (1): Statstical analytical results of microbiological counts of examined raw and cooked meat samples.

	APC count		Enterobacteriaceae count		Coliforms count		Staph.aureus count		Enterococci count		C.perfringens count	
	Raw	Cooked	Raw	Cooked	Raw	Cooked	Raw	Cooked	Raw	Cooked	Raw	Cooked
Minimum	$2x10^5$	$2x10^5$	0	0	/3	/3	/100	/100	0	0	/3	/3
Maximum	$2x10^9$	$2x10^8$	$5x10^6$	$2x10^6$	711000	711000	$3x10^6$	$5x10^5$	$2x10^6$	$7x10^5$	23	/3
Mean	$1.2x10^7$	$2.1x10^7$	$5.1x10^5$	$1.3x10^5$	$4.3x10^4$	$9.3x10^2$	$1.3x10^5$	$2.5x10^4$	$8.3x10^4$	$3x10^4$	0.78	0

Table (2): Frequency of different species of bacteria isolated from raw & cooked meats in the hospital (EPEc).

Isdates	Raw	%	Cooked	%
E. coli typable	30	25	17	17
,, atypable	3	2.5	3	3
Enterobacter	5	4.17	4	4
Citrobacter	7	5.83	1	1
Klebsiella	10	8.33	12	12
Salmonella sp.	0	0	0	0
Shigella sp.	2	1.67	1	1
Proteus rettgeri	2	1.67	2	2
,, micabilis	1	0.83	0	0
Providencia	3	2.5	1	1
Serratia sp.	3	2.5	2	2
Staph. coag. +ve	12	10	6	6
,, ,, -ve	25	20.83	24	24
.. epidermidis	15	12.5	18	18
Micrococci	2	1.67	9	9
	120	100	100	100

Table (3): Show the sanitary improvement and assessment of the sources of contamination.

	APC		Enterococcus count		Enterobacteria cese count		Staph. aureus count	
	Mean	Log	Mean	Log	Mean	Log	Mean	Log
Raw meat (A)	$11x10^7$	8	$47x10^4$	5.7	$18x10^2$	3.3	$25x10^5$	6.4
Cooked meat (B)	$10x10^6$	7	$1x10^2$	2	$1x10^2$	2	0	0
Cooked meat (C)	$40x10^6$	7.6	$20x10^2$	3.3	$1x10^2$	2	$15x10^2$	3.2
Cooked meat (D)	$16x10^6$	7.2	$15x10^4$	5.2	$18x10^2$	3.3	$10x10^2$	3
Cooked meat (E)	$47x10^6$	7.7	$26x10^4$	5.4	$20x10^2$	3.3	$10x10^3$	4

A : Taken directely before cooking.
B : Taken directly after cooking by sterile handling and sterile utensils.
C : Taken by sterile utensils and normal handling.
D : Taken by sterile handling and normal utensils.
E : Taken by normal handling and normal utensils.