CONTENTS

LIST OF ABBREVIATIONS

APC	: Aerobic plate count.
APHA	: American Public Health Association.
AOAC	: Association of Analytical Chemists.
BHI	: Brain heart infusion broth.
CDC	: Center of Disease Control.
CFU	: Cell formign unit.
CIN	: Cefsulodin irgasan novobiocin.
E. coli	: Escherichia coli.
E.M.B	: Eosin methylene blue.
ESD	: Enterococcus selective differential agar.
FAO	: Food and Agricultural Organization.
FDA	: Food and Drug Administration.
FSIS	: Food service and inspection service.
g	; gram
ICMSF	: The International Commission of Microbiological Specification for Foods.
ISO	: International Standard of Organization.
KIA	: Kligler iron agar.
MPN	: Most probable number.
Min.	: Minimum
Max.	: Maximum
NAS	: National Academy of Sciences.
No.	: Number
ppm	: part per million.
PH	: Hydrogen ion concentration
R.V	: Rapaport vassiliadis broth.
S.E	: Standrd error
S.	: Salmonella
Staph. aureus	: Staphylococcus aureus.
S.C	: Selenite cystine broth.
TSI	: Triple sugar iron agar
VRBGA	: Violet red bile glucose agar
WHO	: World Health Organization.
XLD	: Xylose lysine desoxycholate
Y.	: Yersinia.

SUMMARY

To improve the microbiological investigations of meat meals in meat serving establishments (student's hostels), a total of 160 random samples of meat samples and contact surfaces represented 80 each of meat samples and contact surfaces. The first 80 meat samples were represented by 20 samples each of raw, prepared raw, cooked and cooked meat at the end of distribution. While the other 80 samples of contact surfaces represented 20 samples of each of worker's hands, knives, preparing tables and trays. Also there were 70 samples taken before and after cleaning and disinfection represented 5 each of raw, cooked and cooked meat at the end of distribution, hands, knives, preparing tables and trays. The collected samples were dispatched to the laboratory with a minimum of delay where they were examined bacteriologically for enumeration of Aerobic plate, Enterobacteriaceae, coliforms, faecal coliform, Staphylococcus aureus and Enterococci count as well as isolation Yersinia species and some Enterobacteriaceae organisms.

Microbiological examinations of examined samples:

1- Examined meat samples:

The mean values of Aerobic plate count of raw, prepared, cooked and cooked meat at the end of distribution were $1.8x10^5 \pm 5x10^5$, $1.2x10^5 \pm 5x10^5$, $2.2 \times 10^5 \pm 7x10^4$ and $3.3 \times 10^5 \pm 6.7x10^4$, respectively.

Statistical analytical results of Enterobacteriaceae count point out that the mean values of the previously mentioned examined samples were

$23x10^3 \pm 6x10^3$, $3x10^3 \pm 1x10^3$, $1.3 x10^3 \pm 0.4 x10^3$ and $1 x10^4 \pm 0.3 x10^4$, respectively.

The mean values of Coliforms (MPN) of examined meat samples were $19 x10^3 \pm 4 x10^3$, $2 x10^3 \pm 1 x10^3$, 18±7 and $4 x10^2 \pm 2 x10^2$, respectively.

The mean values of faecal Coliform (MPN) of the same examined meat samples were 11±5, 6±2, 2±1 and 2±1, respectively. While the mean counts of Staphylococcus aureus were $6.6 x10^4 \pm 2.9 x10^4$, $1.8 x10^3 \pm 0.5x10^3$, $2.1 x10^2 \pm 0.6 x10^2$ and $2.7 x10^4 \pm 0.7 x10^4$, respectively.

The mean values of Enterococci counts were $2.7 x10^4 \pm 0.7 x10^4$, $1x10^3 \pm 0.6 x10^3$, 17±9 and $4 x10^2 \pm 1x10^2$, respectively.

The obtained results showed that E. coli, Citrobacter freundii, , Enterobacter agglomerans, Enterobacter aerogenes, Edwardsiella tarda, Klebsiella pneumoniae, Proteus mirabilis, Proteus myxofaciens, Proteus vulgaris, Serratia liqueficiens, Serratia rubidaea and Yersinia enterocolitica could be isolated from raw meat samples and ranged from 20 to 60% and the same organisms isolated from cooked meat samples at the end of distribution within the range 20 to 80%. While in cooked meat samples. Enterobacter agglomerans, Klebsiella pneumoniae, Proteus mirabilis and Serratia rubidaea were found in the range 20 to 40%.

2) Examined contact surfaces:

The mean values of Aerobic plate count/unit of hands, knives, preparing tables and trays were $12x10^4 \pm 5.3x10^4$, $6.2x10^4 \pm 3.3x10^4$, $13x10^4 \pm 6.6x10^4$ and $24x10^3 \pm 7x10^3$, respectively. In the same manner, the mean values of Enterobacteriaceae counts per unit were $17x10^3 \pm 5.9x10^3$, $7.7x10^3 \pm 3.9x10^3$, $14x10^3 \pm 5.8x10^3$ and $4.7x10^3 \pm 2.5x10^3$, respectively.

The mean value of Coliforms (MPN) /unit of hands, knives, preparing tables and trays were $1x10^4 \pm 4x10^3$, $8.9x10^2 \pm 2.5x10^2$, $12x10^3 \pm 4x10^3$ and $2.5x10^3 \pm 1.3x10^3$, respectively. The mean values of faecal coliform (MPN) of the previously mentioned examined contact surfaces were $8.5x10^2 \pm 4.5x10^2$, $0.4x10^2 \pm 0.3x10^2$, 7 ± 5 and 4 ± 2, respectively.

For the same contact surfaces, the mean value of Staph. aureus aureus were $5.2x10^2 \pm 2.2x10^2$, $1.1x10^3 \pm 0.3x10^3$, $2.6x10^3 \pm 0.5x10^3$ and $3.5x10^2 \pm 0.5x10^2$, respectively.

The Enterococci mean values of the examined contact surfaces were $8.3x10^2 \pm 3.5\ x10^2$, $9.7x10^2 \pm 3x10^2$, $1.6x10^3 \pm 0.6x10^3$, and $0.6x10^3 \pm 0.4x10^3$, respectively.

From the given results E.coli, Citrobacter freundii, Enterobacter agglomerans, Enterobacter aerogenes, Edwardsiella tarda, Klebsiella pneumoniae, Proteus mirabilis, Proteus myxoficiens, Proteus vulgaris, Serratia liquefaciens, Serratia rubidaea and Yersinia enterocolitica were

isolated form the examined contact surfaces with a varying percentages ranged from 20 to 80%.

3-Effect of cleaning and disinfection:

A-On examined meat samples:

After cleaning and disinfection of worker's hands, knives, preparing tables and trays, microbial load was greatly reduced. The mean values of Aerobic plate count of the examined meat samples of raw, cooked and at the end of distribution before and after cleaning and disinfection were ($4x10^5$, $3.7x10^4$), ($3.8x10^3$, $8.2x10^2$), and ($4x10^5$, $7.8x10^4$) respectively.

For the same examined meat samples the mean counts of Enterobacteriaceae/g were ($3.2x10^4$, $7 x10^3$), ($1.9x10^3$, $2.8x10^2$) and ($7x10^3$, $1.1x10^3$) respectively.

The mean values of coliform (MPN) of raw meat samples was $3.2x10^4$ and $1.9x10^3$ before and after cleaning and disinfection, respectively. It was observed that coliform and faecal coliform reduced totally after cleaning and disinfection in cooked and at the end of distribution meat samples, while faecal coliform mean count of raw meat before and after cleaning and disinfection were $0.3x10^2$ and 4 respectively.

The mean values of Staph.aureus count/g of examined meat samples before and after cleaning and disinfection were ($2x10^4$, $0.8x10^3$), ($2x10^2$, $0.6x10^2$) and ($2.6x10^4$, $9.1x10^3$) respectively.

For the examined samples of raw meat and at the end of distribution, the Enterococci mean values before and after cleaning and disinfection were ($2x10^4$, $2.9x10^3$) and ($0.9x10^3$, $0.8x10^2$), respectively and it was noticed that Enterococci absent in cooked meat samples as the action of cooking temperature and disinfection.

B-<u>On the contact surfaces:</u>

The mean count of Aerobic plate, Enterobacteriaceae, Coliforms, Staph.aureus, and Enterococci /unit of hands, knives, preparing tables and trays before and after cleaning and disinfection were ($41x10^4$, $3.2x10^2$) ($9.8x10^4$, $1.5x10^2$), ($17x10^4$, $2.5x10^3$), ($13x10^3$, 9); ($1.4x10^3$, $0.2x10^2$), ($1x10^4$, 18), ($1.9x10^3$, 0), ($1.5x10^3$, 0); ($0.9x10^3$, 0) ($1.2 x10^3$,20), ($3.6 x10^2$, 0), ($1.3 x10^3$,0); ($1.2x10^2$, 1), ($1.6 x10^2$, 6), ($3.7x10^2$, 0), ($1.1x10^2$, 0); ($2.3x10^2$, 0), ($3x10^3$, 0), ($1.2x10^3$, 0) and ($2.2x10^2$, 0), respectively.

<u>Isolation and identification of Yersinia species:</u>

Yersinia enterocolitica could be isolated form raw, prepared and at the end of distribution meat samples with a percentages 15, 5 and 5% respectively, while Yersinia intermedia and Yersinia kristensenii only found in raw meat samples with 5% for each.

On the examined contact surfaces Yersinia enterocolitica found in the percentages of 10, 5, 10 and 5% in hands, knives, preparing tables and trays respectively.

Yersinia intermedia isolated from hands and preparing tables with 5% of each, while Yersinia kristensenii found only in hands with a percentage 5%. The probable source of contamination as well as suggestive control measures were discussed.