

**FURTHER STUDIES ON HAZARD
ANALYSIS OF ROAST BEEF
PREPARED IN FOOD SERVICE
ESTABLISHMENTS**

*THESIS PRESENTED
BY*

Engy Fawzi Ahmed El-Bahi

*To
Department of Food Hygiene
Faculty of Veterinary Medicine
Alexandria University*

*For
The Degree of Ph.D. Vet.Sci.*

*In
Meat Hygiene*

2009

SUPERVISOR COMMITTEE

Prof. Dr. Mohamed Mohamed Mousa
Professor of Meat Hygiene
Faculty of Veterinary Medicine
Alexandria University

Prof. Dr. Hoda Abd El-Ghani Awad
Chief researcher Food Hygiene Dept.
Animal Health Research Institute
Dokki

ACKNOWLEDGEMENT

First of all, my deepest thanks to our merciful God, Who gives me power and chance to fulfill this work,

My deepest gratitude and heartily thanks to Prof. Dr. Mohamed M. Mousa, professor of Meat Hygiene, Faculty of Veterinary Medicine, Alexandria University for his simulating supervision, valuable and continuous share, interest and encouragement.

Special thanks to Dr. Hoda Abd El-Ghani Awad, chief researcher of Food Hygiene Unit, Animal Health Research Institute, Dokki in for her help and cooperation during the fulfillment of her study.

My appreciation goes to all members of the department of Food Hygiene, Faculty of Veterinary Medicine, Alexandria University for their unfailing help and the facilities they provided during the study.

List of abbreviations

APHA	American Public Health Association.
Cit.	Citrobacter.
E.coli	Escherichia coli.
Ent.	Enterobacter.
FAO	Food and Agriculture Organization.
Hrs.	Hours.
ICMSF	International Commission on Micro-Specification for Food.
Klb.	Klebsiella.
NAS	National Academy of Science.
Sal.	Salmonella.
Spp.	Species.
Staph.	Staphylococcus.
WHO	World Health Organization.
Y.	Yersinia.

List of tables

Table (1): Biotype scheme for <i>Y.enterocolitica</i> .	74
Table (2): Statistical analysis of total mesophylic, total <i>Enterobacteriaceae</i> and total Staphylococcal counts of examined roast beef samples.	75
Table (3): Frequency distribution of examined roast beef samples based on their total mesophilic bacterial count (cfu/g).	76
Table (4): Frequency distribution of examined roast beef samples based on their total Enterobacteriaceae count.	77
Table (5): Frequency distribution of examined roast beef samples based on their total Staphylococcal count.	78
Table (6): Incidence of identified <i>Staphylococcus aureus</i> isolated from roast beef samples.	79
Table (7): Incidence of isolated <i>Yersinia</i> species isolated from roast beef samples.	80
Table (8): Incidence of identified isolates of <i>Y.enterocolitica</i> isolated from examined roast beef samples.	81
Table (9): Incidence of <i>E.Coli</i> and some identified enteric bacteria isolated from examined roast beef samples.	82
Table (10):Serotyping of <i>E.coli</i> isolated from the examined samples of roast beef (n=100).	83
Table (11):Statistical analysis results of experimental inoculated meat with <i>Staph.aureus</i> and treated with different concentrations of acid and heat.	84
Table (12):Statistical analysis results of experimental inoculated meat with <i>Y.enterocolitica</i> and treated with different concentrations of acid and heat.	85

List of figures

Figure (1): Frequency distribution of examined roast beef samples based on their total mesophylic bacterial count.	76
Figure (2): Frequency distribution of examined roast beef samples based on their total <i>Enterobacteriaceae</i> count.	77
Figure (3): Frequency distribution of examined roast beef samples based on their total Staphylococcal count.	78
Figure (4): incidence of identified <i>Yersinia</i> spp. isolated from roast beef samples.	80
Figure (5): Incidence of <i>E.Coli</i> and some identified enteric bacteria isolated from examined roast beef samples.	83

*Material
and
Methods*

Results

Summary

Discussion

Introduction

*Review of
literature*

*Conclusion
and
recommendations*

CONTENTS

1- Introduction	1
2- Review of literature	4
2.1. Microbial quality of meat	4
2.2. Food-borne microbial hazards	16
2.3. Bactericidal effect of acetic acid and lactic acid on enteropathogens	42
3- Material and methods	62
3.1. Collection of samples	62
3.2. Preparation of samples	62
3.3. Bacterial examination of roast beef samples	62
3.3.1. Laboratory technique	62
A. Enumeration procedures	62
A.I. Total mesophilic count	63
A.II. Total <i>Enterobacteriaceae</i> count	63
A.III. Total Staphylococcal count	63
3.3.2. Detection of <i>Staphylococcus aureus</i>	63
A. Identification of <i>Staph.aureus</i>	63
A.IMorphological identification	63
A.II. Biochemical identification	64
3.3.3. Isolation and identification of <i>Salmonellae</i>	65
3.3.3.1. Identification of <i>Salmonellae</i>	65
I. Morphological identification	65
II. Biochemical identification	66
3.3.4. Detection of <i>Yersinia enterocolitica</i>	67
A -Isolation of <i>Y.enterocolitica</i>	67

B. identification of <i>Y.enterocolitica</i>	68
3.3.5. Detection of <i>E.coli</i>	69
A-Isolation of <i>E.coli</i>	69
B-Identification of <i>E.coli</i>	70
B.I. morphological identification	70
B.II. Biochemical identification	70
4- Results	75
5- Discussion	91
6- Conclusion and recommendations	100
7- Summary	103
8- References	105
Arabic summary	