# 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

### SUPERVISIOR 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

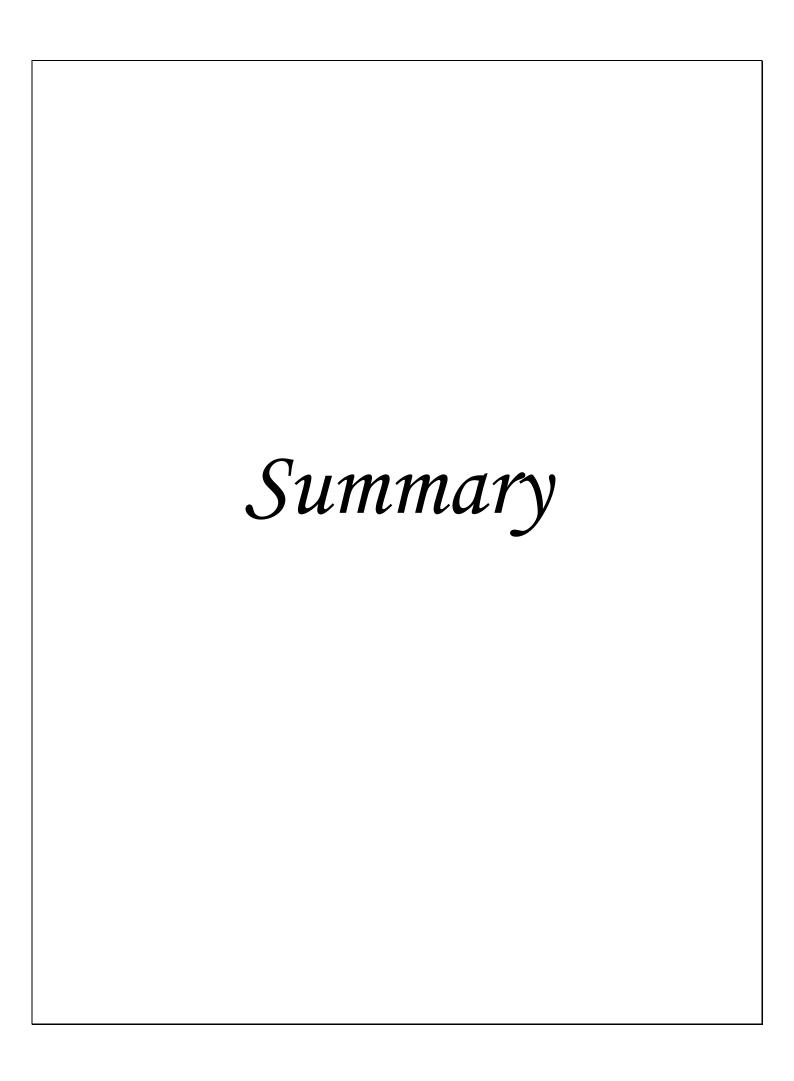
Table (1): Biotype scheme for <i>Y.enterocolitica</i> .	74
Table (2): Statistical analysis of total mesophylic, total <i>Enterobacteriaceae</i>	
and total Staphylococal counts of examined roast beef samples.	75
Table (3): Frequency distribution of examined roast beef samples	
based on their total mesophilic 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 Yersinia 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	
Staph.aureus and treated with different concentrations of acid	
and heat.	84
Table (12):Statistical analysis results of experimental inoculated meat with	
Y.enterocolitica and treated with different concentrations of	
acid and heat.	85

# <u>List of figures</u>

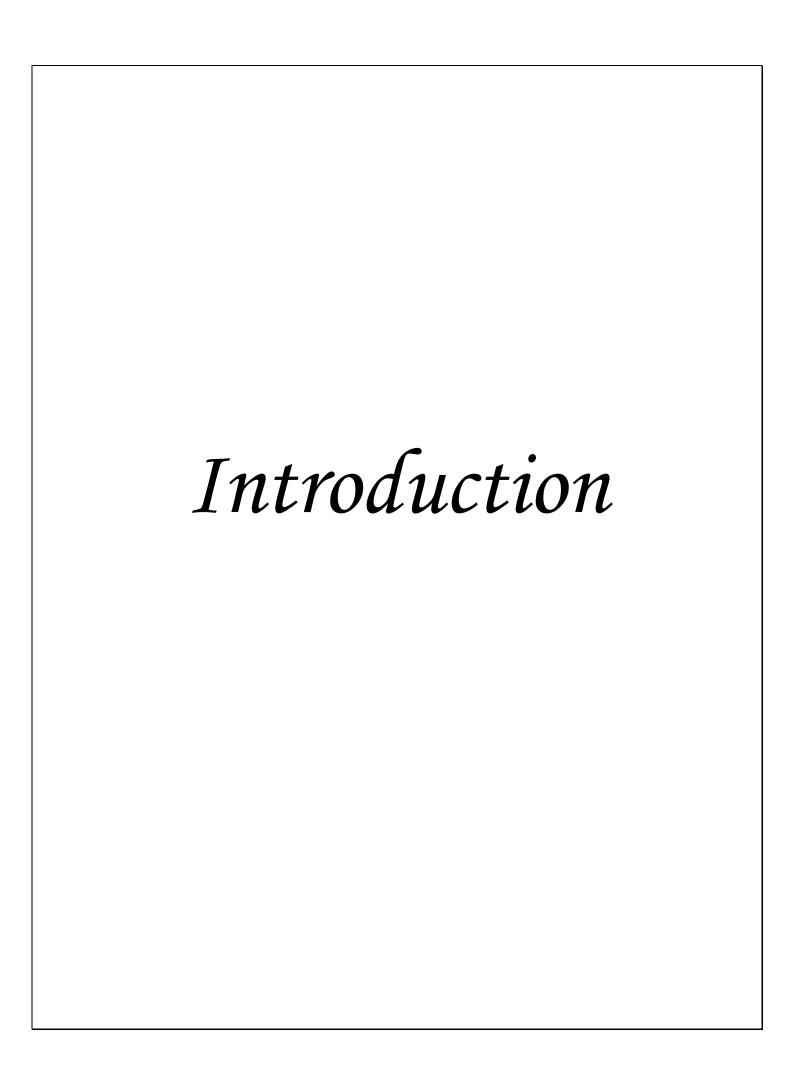
Figure (1):	Frequency distribution of examined roast beef samples	
	based on their total mesophylic bacterial count.	76
Figure (2):	Frequency distribution of examined roast beef samples	
	based on their total Enterobacteriaceae count.	77
Figure (3):	Frequency distribution of examined roast beef samples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

# Material and and Methods











# 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	42
enteropathogens	
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 Enterobacteriaceae count	63
A.III. Total Staphylococcal count	63
3.3.2. Detection of Staphylococcus aureus	63
A. Identification of Staph.aureus	63
A.IMorphological identification	63
A.II. Biochemical identification	64
3.3.3. Isolation and identification of Salmonellae	65
3.3.3.1. Identification of Salmonellae	65
I. Morphological identification	65
II. Biochemical identification	66
3.3.4. Detection of Yersinia enterocolitica	67
A -Isolation of Y.enterocolitica	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	