MICROBIOLOGICAL QUALITY OF BROILER CHICKEN CARCASSES PROCESSED IN SERDANG WET MARKETS

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Veterinary Science

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DEDICATED TO

MY LATE MOTHER BASMATI BHUSAL,
MY LATE GRAND MOTHER NANDI BHUSAL,
MY FAMILY MEMBERS,
MY WIFE BINITA
AND
MY SON PRABAL AND PRAJWAL

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Veterinary Science

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Chairman: Professor Dato' Sheikh-Omar Abdul Rahman

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Foodborne diseases associated with the consumption of poultry meat and its processed products are of public health significance worldwide. In Malaysia, modern large scale processing plants exist together with several small scale poultry slaughter units in wet markets with minimum technological interventions. Previous studies revealed a high prevalence of indicator organisms and pathogens in chicken carcasses freshly slaughtered and those in the retail markets. Thus, this study was undertaken to determine the microbiological quality of poultry carcasses processed in wet markets and evaluate the reduction of microbial contamination using chlorinated water and iced water.

Three wet market poultry slaughter stalls (Stall A, B and C) at Taman Sri Serdang about one kilometer from University Putra Malaysia (UPM) were studied. A total of 1051 swab samples (cloacal swabs taken from cloaca and

carcass swabs taken from breast and thigh skin surfaces of the broiler chicken) were collected from five different sampling sites, i.e:(a) prior to slaughter (b) prior to scalding (c) post-defeathering (d) post-evisceration and (e) post-rinsing in three different visits in each stall. The Standard Plate count (SPC), Coliform Plate count (CPC) *and Escherichia coli* count *(E. coli* count*)* and the prevalence of *Salmonella, Campylobacter* and vancomycin resistant enterococcus (VRE) were determined by standard bacteriological methods.

The overall SPC, CPC *and E. coli* counts were found to be high at all the stages in all three stalls. The counts decreased at post-defeathering, but increased again at post-evisceration and decreased at post-rinsing. The CPC *and E. coli* counts were significantly higher ($P \leq 0.05$) in stall C compared to stall A and B. The highest count in stall C could be due to the differences in processing practice such as bleeding of carcasses in a tank filled with water, use of contaminated water from evisceration tank to clean the feathers attached in defeathering machine and evisceration of carcasses in a tank filled with contaminated water. At post-rinsing, the SPC, CPC and *E. coli* counts were up to 18 (log1.25), 2,800 (log3.46) and 27,000 (log 4.43) times higher respectively than that of Malaysian microbiological guidelines and the microbiological guidelines recommended for meat and poultry by international agencies.

Similar trends were observed on the prevalence of pathogens studied. A high prevalence of *Salmonella* (57%), VRE (40%) and *Campylobacter* (7%) in the

post-rinsing carcasses compared to other processing sites revealed that faecal contamination and cross-contamination of the pathogens had occurred during processing.

The use of chlorinated water and iced water was found to have significantly reduced ($P \leq 0.05$) the microbiological count in the carcasses. The SPC, CPC and *E. coli* counts were reduced up to 224 (log 2.35), 37(log1.57) and 26 (log1.41) times in chlorinated water and 32 (log1.51), 14 (log1.15) and 8 (log 0.90) times in iced water, respectively.

The high prevalence of pathogens and indicator organisms in the carcasses revealed that chickens in wet markets were processed in poor hygienic environment. A more serious attention should be given by the concerned authorities and agencies to upgrade processing procedures ensuring supply of wholesome poultry meat for consumer's protection. The use of chlorinated and iced water to decontaminate the poultry carcasses should be enforced in all wet market poultry processing stalls in the country.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains Veterinar.

KUALITI MIKROBIOLOGI PADA KARKAS AYAM PEDAGING YANG DIPROSES DI PASAR-PASAR BASAH SERDANG

Oleh

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February 2004

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Penyakit 'bawaan makanan' berkaitan dengan penggunaan daging ayam dan produknya adalah penting bagi kesihatan umum. Di Malaysia, terdapat tempat pemprosesan ayam yang besar dan moden serta unit-unit penyembelihan secara kecil-kecilan seperti di pasar basah yang tidak menggunakan teknologi terkini. Kajian awal mendedahkan bahawa penunjuk organisma patogen wujud dalam karkas ayam segar dan ayam yang dijual di pasar runcit. Oleh itu, kajian ini dijalankan untuk menentukan kualiti ayam yang diproses dalam pasar basah dan menilai penggunanaan air ber-terklorin dan air berais dalam mengurangkan jumlah pengkontaminatan.

Sampel telah diambil dari tiga tempat penyembelihan ayam (gerai A, B, C) yang terletak di Taman Sri Serdang iaitu lebih kurang 1 km jaraknya dari Universiti Putra Malaysia. Sebanyak 1051 sampel (sampel kloaka dari kloaka dan sampel

karkas dari permukaan kulit dada dan peha pada ayam pedaging). Sampel ini telah diambil dari lima tempat proses yang berlainan iaitu: (a) sebelum penyembelihan (b) sebelum penceluran (c) selepas pembuangan bulu (d) selepas pembuagan organ-organ dalaman (nyaheviseratan) dan (e) selepas pembilasan pada tiga kali lawatan yang berbeza pada setiap gerai. Kaedah bakteriologi telah digunakan bagi menentukan pengiraan pada standard plate count (SPC), coliform plate count (CPC) dan *Escherichia coli* count (*E. coli* count) dan juga pada prevalens *Salmonella, Campylobacter* dan *Enterococcus* rintang vancomycin (VRE).

Secara keseluruhannnya, pengiraan pada SPC, CPC dan *E.coli* adalah yang tertinggi pada semua peringkat pemerosesan di ketiga-tiga gerai. Pengiraan adalah menurun pada bahagian pembuangan bulu, tetapi telah kembali meningkat pengiraannya pada bahagian pembuangan organ-organ dalaman (nyaheviseratan) dan menurun pula pada proses pembilasan. Gerai C menunjukkan kiran CPC ($p< 0.05$) dan *E.coli* tertinggi berbanding gerai A dan B. Kiraan tertinggi di gerai C mungkin kerana perbezaan dalam amalan pemprosesan pembersihan darah dalam tangki yang dipenuhi air, penggunaan air tercemar yang diambil dari tangki pembersihan organ dalaman untuk bulu yang telah dibersihkan dan perlekatan bulu pada mesin dan visera dalam tangki yang dipenuhi dengan air yang tercemar. Pada proses pembilasan, pengiraan bagi SPC, CPC dan *E.coli* menjangkau sehingga 18 (log1.25 cfu/$cm^{2)}$, 2800 (log3.46 cfu/$cm^{2)}$ dan 27,000 (log4.43 cfu/$cm^{2)}$ kali lebih tinggi berbanding

dengan penunjuk mikrobiologi Malaysia dan antarabangsa yang telah disyorkan bagi daging dan ayam.

Pola yang sama juga dapat dilihat pada prevalens patogen yang dikaji. Proses selepas pembilasan karkas menunjukkan prevalens yang tinggi pada *Salmonella* (57%), VRE (40%) dan *Campylobacter* (7%) berbanding dengan bahagian pemprosesan yang lain yang tercemar dengan najis dan terjadinya pengkontaminatan silang semasa pemprosesan.

Penggunaan air berklorin dan air berais menunjukkan penurunan ($p \leq 0.05$) bagi pengiraan SPC, CPC, dan *E.coli* pada karkas. Penurunan pengiraan SPC, CPC dan *E.coli* pada air berklorin adalah 224 (log 2.35), 37(log1.57) dan 26 (log1.41) kali, manakala kadar penurunan pada air berais 32 (log1.51), 14 (log1.15) dan 8 (log 0.90) kali.

Prevalens patogen dan penunjuk organisma yang tinggi pada karkas menunjukkan ayam dipasar basah diproses dalam persekitaran yang rendah tahap kebersihannya. Pihak berwajib dan agensi yang bertanggungjawab harus lebih serius dalam menaiktaraf prosedur pemprosesan bagi memastikan bekalan daging ayam untuk pengguna adalah segar dan selamat bagi menjamin keselamatan awam. Penggunaan air berklorin dan air berais harus dikuatkuasakan di semua pasar basah untuk mengurangkan pengkontaminatan.

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I certify that an Examination Committee met on 9th February 2004 to conduct the final examination of Parsu Ram Bhusal on his Master of Veterinary Science thesis entitled "Microbiological Quality of Broiler Chicken Carcasses Processed in Serdang Wet Markets'' in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

_____

Parsu Ram Bhusal

Date:

TABLE OF CONTENTS

	Page
DEDICATION	ii
ABSTRACT	iii
ABSTRAK	vi
ACKNOWLEDGEMENTS	ix
APPROVAL	xii
DECLARATION	xiv
LIST OF TABLES	xviii
LIST OF FIGURES	xix
LIST OF PLATES	xx
LIST OF ABBREVIATIONS/NOTATIONS/GLOSSARY OF TERMS	xxii

CHAPTER

I	**GENERAL INTRODUCTION**	1
II	**LITERATURE REVIEW**	5
	Poultry Meat Consumption in Malaysia	5
	Microorganisms in Meat and Poultry	6
	Poultry Meat and Public Health Significance of Microorganisms	6
	Microbial Contamination of Poultry Meat during Slaughter and Processing	9
	General Flow Chart for Modern Poultry Processing	10
	Indicator Organism	14
	Microbiological Criteria for Poultry Meat	17
	Microbial Decontamination of Poultry Meat during processing	20
	Effects on Organoleptic Properties and Composition of Poultry Meat and Safety Aspects	21
	Prevalence of *Salmonella*, *Campylobacter* and Vancomycin Resistant Enterococci in Poultry	22
	Prevalence of *Salmonella*	23
	Prevalence of *Campylobacter*	27
	Prevalence of Vancomycin Resistant	

Enterococcus 33
HACCP and Food Safety 37

III MICROBIOLOGICAL QUALITY OF BROILER CHICKEN CARCASSES PROCESSED IN WET MARKETS 41

Introduction 41
Materials and Methods 42
Slaughter Stalls under Study 42
Sample Collection and Transportation 43
Microbiological Examination 44
Statistical Analysis 46
Results 46
General Observation of Broiler Chicken Slaughtering and Processing in Wet Markets 46
Observation of Broiler Chicken Slaughtering in Stall A 46
Observation of Broiler Chicken Slaughtering Practices in Stall B 51
Observation of Broiler Chicken Slaughtering Practices in Stall C 53
Microbiological Examination 54
Discussion 56

IV ISOLATION AND IDENTIFICATION OF FOODBORNE PATHOGENS FROM BROILER CHICKEN CARCASSES PROCESSED IN WET MARKETS 61

Introduction 61
Materials and Methods 63
Sample Collection and Transportation 63
Culture, Isolation and Identification of Pathogens 64
Culture, Isolation and Identification of *Salmonella* 64
Culture, Isolation and Identification of Vancomycin Resistant Enterococcus 67
Culture, Isolation and Identification of *Campylobacter* 70
Results 72
Discussion 79

V EVALUATION ON THE REDUCTION OF

MICROBIAL CONTAMINATION OF BROILER CHICKEN CARCASSES PROCESSED IN WET MARKETS USING CHLORINATED WATER AND ICED WATER 84

Introduction 84
Materials and Methods 85
Preparation of the Treatment Solution 85
Preparation of Chlorinated Water 85
Preparation of Iced Water 85
Collection, Transportation and Treatment of Broiler chicken Carcasses 86

Microbiological Analysis 86
Statistical Analysis 87
Results 87
Discussion 88

VI GENERAL DISCUSSION AND CONCLUSION 92

REFERENCES/BIBLIOGRAPHY 99
APPENDICES 112
BIODATA OF THE AUTHOR 134