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≤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 $224 \ (\log 2.35)$, $37 (\log 1.57)$ and $26 (\log 1.41)$ times in chlorinated water and $32 (\log 1.51)$, $14 (\log 1.15)$ 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

Pengerusi: Profesor Dato' Sheikh-Omar Abdul Rahman

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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 penggunaan air ber-terklorin dan air beras 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 pembuangan 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 kira 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/cm²), 2800 (log3.46 cfu/cm²) dan 27,000 (log4.43 cfu/cm²) 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≤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:
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