OCCURENCE AND ANTIBIOTIC RESISTANCE OF Salmonella spp. ISOLATED FROM EGGS OF CHICKEN RAISED UNDER FREE-RANGE AND CONVENTIONAL CAGED FARMS

SITI NOOR FADHILAH AZIHI

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OCCURENCE AND ANTIBIOTIC RESISTANCE OF *Salmonella* spp. ISOLATED FROM EGGS OF CHICKEN RAISED UNDER FREE-RANGE ANDCONVENTIONAL CAGED FARMS

SITI NOOR FADHILAH AZIHI

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CERTIFICATION

It is hereby certified that I have read this project paper entitled "Occurrence and Antibiotic Resistance of *Salmonella* spp. Isolated from Eggs of Chicken Raised Under Free-range and Conventional Caged Farms", by Siti Noor Fadhilah Azihi and in my opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfillment of the requirement for the course VPD 4999- Project

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PROF. DR. SALEHA BT. ABDUL AZIZ

DVM (UGM), Grad, Dip. Vet. Preventive Medicine. (Guelph), PhD (UPM)

Lecturer,

Department of Veterinary Pathology and Microbiology

Faculty of Veterinary Medicine

Universiti Putra Malaysia

(Supervisor)

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ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfillment of the course VPD 4999- Final Year Project

OCCURENCE AND ANTIBIOTIC RESISTANCE OF *Salmonella* spp. ISOLATED FROM EGGS OF CHICKEN RAISED UNDER FREE-RANGE AND CONVENTIONAL CAGED FARMS

By

Siti Noor Fadhilah binti Azihi

2016

Supervisor: Prof. Dr. Saleha Abdul Aziz

Free-range and conventional caged farming systems implement different practices in raising their chicken;and therefore this could contribute to differences in the *Salmonella* and other bacterial contamination levels of eggs. The objective of this study was to determine the occurrence of *Salmonella* in eggs produced by free-range chickens and commercial layers. The isolates were then subjected to an antibiotic sensitivity test to determine the antibiotic resistance pattern.A total number of 36 free-range chicken eggs were purchased from three free-range chicken farms and another 36 commercial chicken eggs were purchased from three conventional farms raising chickens in battery cages.

*Salmonella*spp. occurred in 2.8%(1/36 shell swab sample) and 8.4% (1/36 shell swab and 2/36 egg content samples) of conventional caged and free-range chicken eggs, respectively. Chi-square test showed significant association between farming system and level of *Salmonella* contamination in shell swabs and egg contents ($p < 0.05$). The one isolate from conventional caged chicken eggs was resistant to ampicillin. Two isolates (66.7%) from free-range chicken eggs were resistant to nalidixic acid, and 33.3% resistant to tetracycline,streptomycin, and trimethoprim- sulphamethaxzole. The pattern of antibiotic resistance of isolates from eggs obtained from free-range chickens' eggs and those from conventional caged was different. This study suggested that eggs fromboth production systems may not be as wholesome because of the presence of *Salmonella*, although low in number, but it is of public health significance.

Keyword: *Salmonella*spp., chicken eggs, free-range, conventional cages, antibiotic resistance

ABSTRAK

Abstrak daripada kertas kerja projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999- Projek Ilmiah Tahun Akhir Pelajar.

KEJADIAN DAN KETAHANAN ANTIBIOTIK *Salmonella spp*. YANG DIASINGKAN DARIPADA TELUR AYAM YANG DIBESARKAN SECARA TERNAKAN BEBAS DAN KOMERSIL

Oleh

Siti Noor Fadhilah Azihi

2016

Penyelia: Prof. Dr. Saleha Abdul Aziz

Sistem penternakan ayam secara bebas dan konvensional melaksanakan amalan perladangan yang berbeza dalam penternakan ayam mereka; oleh yang demikian perkara ini boleh menyumbang kepada perbezaan tahap kontaminasi oleh *Salmonella* dan bakteria lain di dalam telur. Kajian ini bertujuan untuk menentukan kejadian *Salmonella* dalam telur yang dihasilkan oleh ayam ternakan secara bebas dan komersil. Ujian sensitivity antibiotic telah dijalankan ke atas isolate *Salmonella* untuk menentukan corak ketahanan antibiotik. Sejumlah 36 biji telur ayam kampong telah dibeli daripada tiga lading ternakan ayam secara bebas dan 36 biji telur ayam komersial telah dibeli daripada tiga lading konvensional yang menternak ayam dalam sangkar bateri. Terdapat 2.8% *Salmonella* spp. (sampel calitan kulit 1/36) pada

telur ayam sangkar dan 8.4% (1/36 calitan kulit dan sampel kandungan telur 2/36) pada telur ayam yang diternak bebas. Ujian *Chi-Square* menunjukkan terdapat hubungkait bererti antara sistem penternakan dengan tahap kontaminasi oleh *Salmonella* pada calitan kulit dan kandungan telur. Satu isolate pada telur ayam komersil didapati tahan terhadap *ampicillin*. Dua isolat (66.7%) daripada ayam yang diternak bebas adalah tahan terhadap *nalidixic acid*, dan 33.3% tahan terhadap *tetracycline*, *streptomycin* serta *trimethoprim-sulphamethaxzole*. Corak ketahanan antibiotic yang diperolehi daripada telur ayam yang diternak bebas dan ayam komersil adalah berbeza. Kajian ini menenemukan bahawa telur daripada kedua-dua sistem pengeluaran mungkin tidak seberapa selamat kerana adanya kehadiran *Salmonella*, walaupun pada tahap yang rendah, tetapi ia mempunyai kepentingan kesihatan awam.

Kata kunci: *Salmonella*, telur ayam, sangkar ayam, konvensional, ketahanan antibiotik

1.0 INTRODUCTION

Foodborne disease is one of the most important public health problems, which contributed by large number of cases and associated with economic cost (Kaferstein *et al*., 1997). *Salmonella* are the most common microorganismscausing foodborne disease (Kaferstein, 2003; Mead *et al*., 1999). Several studies reported that human affected by salmonellosis are frequently due to the consumption of poultry and poultry products; other foods involved include consuming raw and unpasteurized milk, drinking untreated water, and handling of pests and infected animals (Wingstrand *et al*., 2006). Eggs can be contaminated by *Salmonella* either on outer shell or in the egg content. The contamination of egg content is due to the penetration of the organism through the egg shell or due to direct contamination of egg contents before oviposition, which originate from infection of the reproductive organs (Gantois *et al*., 2009).

There is perception by many consumers that chicken reared in commercial battery cages were under overcrowded housing condition and overwhelming used of antibiotic to make the birds grow faster. Therefore, it was perceived that this type of birds are more prone to be infected with *Salmonella*and other bacterial pathogens than the free-range or organic birds, which are grown under more ‘‘natural’’ conditions (Bailey *et al*., 2005).Previous studies have also provided evidence indicating higher risks of bacterial contamination thatoccurred in eggs originated from non-housed chickens due to a lesser

degree of contact of the caged animals with fecal material (Fossum *et al*., 2009, Kaufmann-Bart and Hoop, 2009). Therefore this study aimed to identify if such trends are also prevalent in the eggs obtained from free-range and conventionally-raised chicken farms in Malaysia.

Conventional poultry farms are also perceived by the public to have higher usage of antibiotics compared to the free-range farms, with the latter also perceived to be associated with an organic, antibiotic-free farming system (Bailey and Cosby, 2005, Harper and Makatouni, 2002). This however remains as presumption requiring more evidence. This study therefore tests the sensitivity levels of *Salmonella* spp. isolated from eggs.

Thus, the objectives of this study were:

1. to determine the prevalence of *Salmonella* in eggs obtained from free-range and conventional battery cage-raised chickens.

2. to compare the *Salmonella* contamination rates on eggs obtained from free-range and conventional caged layers and if such difference correlates with the housing type and farming practices implemented between the two types of layer farms

3. to determine the antibiotic sensitivity levels of *Salmonella* species isolated from eggs obtained from free-range and conventional caged-raised chickens.

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