



UNIVERSITI PUTRA MALAYSIA

***OCCURRENCE OF SALMONELLA SPP. AND E. COLI ISOLATES FROM
PERIDOMESTIC COCKROACHES (PERIPLANETA AMERICANA) AND
THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERNS***

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(*PERIPLANETA AMERICANA*) AND THEIR ANTIBIOTIC
SUSCEPTIBILITY PATTERNS**

By:

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CERTIFICATION

It is hereby certified that we have read this project paper entitled “Occurrence of *Salmonella* spp. And *E. coli* Isolates From Peridomestic Cockroaches (*Periplaneta Americana*) And Their Antibiotic Susceptibility Patterns”, by Nurliyana Meor Abdullah and in our 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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DEDICATIONS

This project paper is dedicated to

My parents,

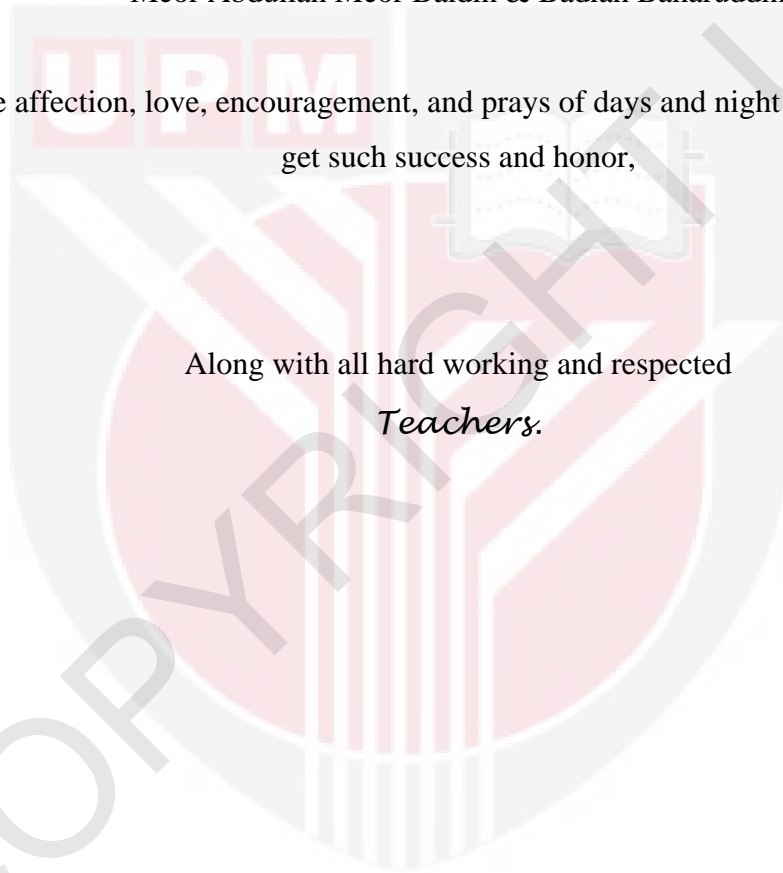
Meor Abdullah Meor Baldin & Badiyah Baharuddin

Whose affection, love, encouragement, and prays of days and night make me able to
get such success and honor,

Along with all hard working and respected

Teachers.

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LIST OF ABBREVIATIONS

| | |
|-----|-----------------------------|
| % | Percent |
| °C | Degree Celsius |
| BGA | Brilliant green agar |
| XLD | Xylose lysine desoxycholate |
| EMB | Eosin-methylene blue |
| LIA | Lysine iron agar |
| TSI | Triple sugar iron |
| SIM | Sulfide indole motility |
| BPW | Buffer peptone water |
| RV | Rappaport-vassiliadis |
| MDR | Multiple drug resistant |

ABSTRAK

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

**KEHADIRAN *SALMONELLA* DAN *E. COLI* DARI LIPAS PERIDOMESTIK
(*PERIPLANETA AMERICANA*) DAN POLA-POLA KECENDERUNGAN
RESISTAN TERHADAP ANTIBIOTIK.**

oleh

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Terdapat banyak lipas di Malaysia yang di dapati membawa pelbagai mikroorganisma merbahaya. Keadaan persekitaran serta kebersihan yang berkaitan dengan demografi/sosio-ekonomi sesuatu kawasan boleh mempengaruhi kehadiran dan jenis patogen pada lipas. Tujuan kajian ini adalah untuk menentukan kehadiran lipas yang membawa mikroorganisma berkaitan kepentingan kesihatan awam dalam persekitaran yang berbeza. Dari 11 Januari-17 Januari 2016, lipas telah ditangkap daripada 4 kawasan yang berbeza pekelilingnya iaitu Serdang, Dengkil dan Kajang. Sebanyak 40 ekor lipas berjaya ditangkap dari semua kawasan. Spesis lipas yang

ditangkap dikenal pasti sebagai lipas peridomestic biasa (*Periplaneta americana*). Sebanyak 40 sampel dari bahagian luaran badan dan 40 sampel dari “homogenate” usus lipas telah dianalisa bagi menentukan kehadiran *Salmonella* (S) dan *Escherichia coli* (EC), dan ujian kerentanan antibiotic (AST). Sampel permukaan luaran badan dan usus “homogenate” lipas telah dipalit ke agar khas dan dibiarkan di dalam inkubator bagi tujuan pengasingan bakteria tertentu. Bakteria yang telah dikenal pasti kemudian perlu melalui ujian AST dengan menggunakan kaedah “Standard Kirby-Bauer (Disk penyebaran)”. Status resistan diukur menggunakan “Zone of Inhibition”. Hasil daripada kajian ini menunjukkan bahawa 6 daripada 80 sampel dianalisa mengandungi S spp. di mana 5.0% terdiri daripada sampel permukaan luar badan dan 10% terdiri daripada sampel usus. Sebanyak 22 daripada 80 sampel yang telah disahkan mengandungi EC, ia itu 42.5% terdiri daripada permukaan luar badan dan 12.5% daripada kandungan usus. *Salmonella* spp. ditemui pada lipas di semua lokasi kecuali lipas di tangkap di bilik pelajar, Fakulti Perubatan Veterinar dan Kolej 17, UPM. Aras keberlakuan *Salmonella* spp. pada semua lokasi yang dikaji adalah rendah. Spesis EC dikenal pasti banyak terdapat di kawasan setinggan dan pasar mini. Kedua-dua bakteria yang dikenalpasti dalam kajian ini didapati resistan terhadap pelbagai ubat antibiotik (MDR) yang digunakan pada manusia. Daripada 6 spesis *Salmonella* yang diasingkan, satu spp didapati positif MDR manakala bagi EC, 5 daripadanya didapati positif MDR. Hasil kajian ini mengesahkan bahawa lipas adalah pembawa pelbagai spesies kuman terutamanya S dan EC, dan bakteria ini didapati mempunyai kesan resistan terhadap beberapa antibiotik. Keberlakuan dan beban kuman jangkitan yang ada pada lipas mungkin berkait rapat dengan keadaan kebersihan kawasan-kawasan yang diujikaji. Malah,

lipas juga berpotensi membawa kuman ke rumah dan berupaya meningkatkan risiko jangkitan pada manusia. Untuk memastikan penghapusan menyeluruh terhadap mikroorganisma ini dalam persekitaran tertentu, pengakawalan lipas merupakan perkara asas yang perlu diberi keutamaan.

Kata kunci:*lipas, Salmonella , E. coli, resistan pelbagai ubat*



ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial requirement of the course VPD 4999-Project.

OCCURRENCE OF *SALMONELLA* SPP. AND *E. COLI* ISOLATES FROM PERIDOMESTIC COCKROACHES (*PERIPLANETA AMERICANA*) AND THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERNS

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Cockroaches are abundant in Malaysia and are seen to harbour an array of pathogens. Environmental and sanitary conditions associated with demographic/socio-economic settings of an area could contribute to the prevalence of disease pathogens in cockroaches. The aim of this study was to determine the incidence of bacteria of public health interest transmitted by cockroaches in different environments. From 11th January to 17th January 2016, cockroaches were trapped in 4 different areas i.e. Serdang, Dengkel and Kajang. A total of 40 cockroaches were collected in all areas. The cockroach species of interest were identified to be the common peridomestic cockroaches (*Periplaneta americana*). A total 40 external body surface and 40 gut homogenates of the cockroaches were analysed for *Salmonella* (S) and *Escherichia coli* (EC), and subjected to antibiotic susceptibility

test (AST). The external body surface and gut homogenates samples were streaked onto special agars and incubated for isolation of the specific bacteria. After the bacteria were identified, they were then subjected to AST using standard Kirby-Beuer Method (Disk diffusion). The status of resistance were measured using Zone of Inhibition. Results from this study showed that 6 out 80 specimens of cockroaches analysed harboured *S* spp. which comprised of 5% recovered from external body surfaces and 10% from gut contents. For EC, a total of 22 out of 80 specimens were confirmed as EC isolates which comprised of 42.5% recovered on external body surfaces and 12.5% from gut contents. *Salmonella* spp. were found in all cockroaches caught from all areas except those trapped in a student room, Faculty of Veterinary Medicine and college 17, UPM. The occurrence of *S* spp. from all samples studied was low. Samples with EC were mostly analysed from cockroaches collected from squatters and mini market. Both *S* and EC isolates in this study were found to be multi-drug-resistant (MDR) to antibiotics used in human. Among the 6 *S* spp. isolates, one of them was found to be MDR positive whereas for EC, 5 out of 22 isolates were found to be MDR positive. Results from this study confirmed that cockroaches were carrier for a number of bacterial species especially *S* and EC, and these bacteria were found to be resistant to some antibiotics. The prevalence and burden of infection in cockroaches is likely to be a reflection of the sanitary conditions of these areas. Also, cockroaches in these areas making incursions in homes may increase the risk of human infections with these disease agents. To ensure adequate elimination of these microorganisms in specific environments, the control of cockroaches appears to be fundamental.

Keywords: *cockroach, salmonella, E. coli, antibiotic, multi-drug-resistance*

1.0 INTRODUCTION

Cockroaches have been on earth for more than 270 million years, and are the world's most usual insects. Approximately thirty of over 4,500 identified species of this insect in the world live close to humans (Chamavit *et al.*, 2011). As a potential mechanical vector of human diseases, many pathogenic organisms have been associated with cockroaches. These include poliomyelitis viruses, bacteria, fungi, protozoa, and helminthes (Baumholtz *et al.*, 1997; Fathpour *et al.*, 2003; Saichua *et al.*, 2008; Tاتفeng *et al.*, 2005).

Cockroaches not only spoil food but also transfer pathogens and cause allergic reactions and psychological distress (Brenner, 1995) They have been found to harbour a number of pathogenic and potentially pathogenic bacteria which were carried either on the cuticle or in the gut (Cloarec *et al.*, 1992). The bacterial loads were up to 14 million on the bodies, and 7 million in each of their faecal droppings (Bennett, 1993).

Reports have proved that cockroaches are the carrier of 40 different species of bacteria which are pathogenic to vertebrates (Roth and Willis 1957,1960; Burgess *et al.*, 1973a, 1973b, 1974; Artyukhina & Evokimov 1973; Ulewicz and Zawistowski 1973; Klowden & Greenberg 1976; Ash & Greenberg, 1980; Cornwell and Mendes, 1981).

American cockroaches are known to transport pathogenic bacterial agents in their intestine and their body surface (Kassiri *et al.*, 2014). This germ may be transferred to food and other items that come in contact with the cockroaches.

Various bacteria universally associated with these insects are recognised to inure diarrhoea, dysentery, and food intoxication (Cornwell, 1968; Cornwell and Mendes, 1981). *Shigella dysenteriae*, *Salmonellatyphi*, and toxigenic strains of *Escherichia coli* can be retained in the gut of cockroaches for up to several days. Thus, these insects also play a role in transmitting food-borne disease (Lamiaa *et al.*, 2007; Chaichanawongsaroj *et al.*, 2004)

Earlier study by Paul *et al.*, (1992) demonstrated that cockroaches also been proposed as likely transmitters of drug-resistant pathogens. In a study conducted by Mpuchane *et al.*, (2006), more than 33.3% of cockroach isolates from the experiment have shown resistance to antimicrobials.

Thus, this investigation was conducted to evaluate the potential risk related to presence of cockroaches and their capacity for disseminating bacteria (*Salmonella* spp. and *E. coli* spp.) and their antibiotic susceptibility patterns in four different sampling areas: Student Room at the Faculty, Squatters in Dengkil, Selangor, College 17 UPM, and mini market at Kajang, Selangor.

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