

# **Isolation and Identification of the medically important bacteria associated with hospital insects**

A Thesis  
submitted in partial fulfillment  
of the requirements for the degree of  
Master of Science

By

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**2015**

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## **Acknowledgements**

I am heartily thankful to my professors and supervisors Prof. Nadia Lotfy , Prof. Nagwa Khamis and Prof. Yousrya Abdel-Hamid for the helps and advices they gave to me whenever I need it and which I couldn't ever step a step without it. Besides they serves as a role model of a typical Egyptian professors who cares and loves their students as if they were their own kids. Thank you.

Also I am extremely grateful to Ass.Prof. Rabab F. Sawaby, Department of Entomology , Faculty of Science, Ain Shams University for her help in insect identification.

And I extend my sincere thanks and gratitude to Prof. Mohamed A. Kenawy , Department of Entomology, Ain Shams University for his help , continuous teaching and his patience with me and a lots of good ideas which I could lost without it and I couldn't ever reply whatever I did to him, I'm forever grateful, Thank you.

Thanks are extended to Mr. Tarek Eid from Research Institute of Medical Entomology , Ministry of health for his cooperation in insects collection.

I want to give all thanks and gratitude to my father, mother, brother and husband for their continuous support at all levels and for my best friend for her support and assistance.

Finally, I give my thanks and appreciation for all my professors , colleagues in Ain Shams University Specialized Hospital (ASUSH) and in entomology department, faculty of science, Ain shams university and friends who gave me an advices and encourage me.

## ABSTRACT

Insects were surveyed in two hospitals (ASUSH, urban) and (BUH, rural) with different hygienic levels and their adjacent residential areas (ASUSHC and BUHC for the two hospitals, respectively) to isolate and identify bacteria associated with such insects. A total of 5257 adults were collected of which Dipterous flies were the abundant ( 72 % insect) and *Musca domestica* was the most abundant species ( 67 % insect) which was present in all areas where it was more common / predominant species (22 %-91% insect), also *M. domestica* had the maximum bacterial carriage (10 spp., 63%). Moreover, higher densities of *M. domestica* were in BUH and BUHC than in ASUSH or ASUSHC. The heavily infested area was ASUSHC (55% species) followed by ASUSH, BUHC and BUH however, the total number of the collected insects was higher in BUH than in ASUSH. In all areas, *M. domestica* was more common during summer/ autumn and spring than in the winter. *Periplaneta americana* collected only during autumn in ASUSHC and was more common in autumn in BUHC while *Blatella germanica* collected only during summer in ASUSHC and was more common in autumn in BUH. Seventeen bacteria spp. were isolated and identified from the external surface and internal organs of the collected insects of which, *Acinetobacter* and *Klebsiella* were the most common (5 insect spp., 31% each) followed by *Anthraxoid*, *Enterobacter*, *E.coli*, MRS-ve, *Bacillus*, *Stenotrophomonas*, MRSA, *Pseudomonas*, *Citrobacter*, *Raoultella*, *Salmonella*, *Enterococci*, *Staph. Coag -ve* , *Non haemolytic strept* and *Diphtheroid*. The present study emphasis the importance of insects mainly housefly and cockroaches as potential vectors of pathogenic bacteria in hospital environments specially rural ones. So that fly and cockroach control strategies as well as hygiene promotion programs should be applied to avoid or eliminate the health risks to the people in residential areas and transmission of nosocomial infections to patients and workers in the hospitals.

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## LIST OF ABBREVIATIONS

<b>ANOVA</b>	Analysis of Variance
<b>ASUSH</b>	Ain Shams University Specialized Hospital
<b>ASUAHC</b>	Ain Shams University Specialized Hospital Control
<b><i>A. melanorhodon</i></b>	<i>Anacridium melanorhodon</i>
<b>BUH</b>	Banha University Hospital
<b>BUHC</b>	Banha University Hospital Control
<b><i>B. germanica</i></b>	<i>Blattella germanica</i>
<b>BHI</b>	Brain and Heart Infusion
<b>Cfu</b>	Colony Forming Unit
<b>cm</b>	Centimeter
<b><i>C. freundii</i></b>	<i>Citrobacter freundii</i>
<b><i>C. megacephala</i></b>	<i>Chrysomia megacephala</i>
<b><i>C. bicolor</i></b>	<i>Cataglyphis bicolor</i>
<b>DMS</b>	Data Management System
<b><i>D. bicolor</i></b>	<i>Dorisiana bicolor</i>
<b><i>D. apache</i></b>	<i>Diceroprocta apache</i>
<b><i>D. pteronyssinus</i></b>	<i>Dermatophagoides pteronyssinus</i>
<b>ES</b>	External surface
<b><i>Etc</i></b>	<i>Et cetera</i>
<b><i>E. amseli</i></b>	<i>Emmelina amseli</i>
<b><i>E. arbustorum</i></b>	<i>Eristalis arbustorum</i>
<b><i>E. coli</i></b>	<i>Escherichia coli</i>

<b><i>E. decipiens</i></b>	<i>Empoasca decipiens</i>
<b>Fig.</b>	Figure
<b>HDM</b>	House Dust Mite
<b>HSD</b>	Honestly Significant Difference
<b>IO</b>	Internal organ
<b>ICU</b>	Intensive Care Unit
<b>Km</b>	Kilometer
<b><i>K.pneumoniae</i></b>	<i>Klebsiella pneumoniae</i>
<b>MAR</b>	<i>Multiple Antibiotic Resistance</i>
<b>MDR</b>	Multi Drug Resistant
<b>MIC</b>	Minimum Inhibitory Concentration
<b>Min.</b>	Minuet
<b>MI</b>	Milliliter
<b>MRS –v</b>	Methicillin Resistant Staph. Coagulase negative
<b>MRSA</b>	Methicillin Resistant Staph. aureus
<b>MRVP</b>	Methyl Red Voges Proskauer
<b><i>M. calliphya</i></b>	<i>Megalagrion calliphya</i>
<b><i>M. cleonymoides</i></b>	<i>Macroteleia cleonymoides</i>
<b><i>M. domestica</i></b>	<i>Musca domestica</i>
<b><i>M. stabulans</i></b>	<i>Muscina stabulans</i>
<b>N</b>	Number
<b>NBPC</b>	Negative Break Point Combo
<b><i>N. faliator</i></b>	<i>Nototrachys faliator</i>
<b>PAST</b>	Paleontological Statistics version
<b>PBPC</b>	Positive Break Point Combo
<b>PBS</b>	Phosphate – Buffered Saline



<b>PI</b>	Post Ingestion
<b><i>P. aeruginosa</i></b>	<i>Pseudomonas aeruginosa</i>
<b><i>P. americana</i></b>	<i>Periplaneta americana</i>
<b><i>P. mirabilis</i></b>	<i>Proteus mirabilis</i>
<b><i>P. vulgaris</i></b>	Proteus vulgaris
<b>SD</b>	Standard Deviation
<b>Spp.</b>	Species
<b><i>Staph. Coag –ve</i></b>	Staphylococcus coagulase negative
<b><i>S.aureus</i></b>	<i>Staphylococcus aureus</i>
<b><i>S. nodosa</i></b>	<i>Sarcophaga nodosa</i>
<b>Tab.</b>	Table
<b>TSB</b>	Tryptic Soy Broth
<b>ug</b>	Microgram
<b>ul</b>	Microliter
<b><i>V. orientalis</i></b>	<i>Vespa orientalis</i>

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## I. INTRODUCTION

The Synanthropic insects are ecologically associated with humans; they feed or wander over feces, wounds and food serving as passive vectors of bacteria. Such insects include ants, flies and cockroaches. Hospitals in general provide ideal and suitable environment for survival and abundance of various medically important insects. Several workers surveyed hospitals for such insects however; they focused mainly on cockroaches and flies.

In hospitals and nearby residential areas several workers (Fotedar *et al*, 1991; Cotton *et al*, 2000; Pai *et al*, 2003; Warrell *et al*, 2003; Pai *et al*, 2004; Chaichanawongsaroj *et al*, 2004; Elgderi *et al*, 2006; Prado *et al*, 2006; Salehzadeh *et al*, 2007; Saitou *et al*, 2009; Zarchi and Vatani, 2009; Fakoorziba *et al*, 2010; Akinjogunla *et al*, 2012; Feizhaddad *et al*, 2012; Jalil *et al*, 2012; Pai, 2013; Brown and Al-Hassan 2014; Fakoorziba *et al*, 2014; Hagi *et al*, 2014; Handol Al-Fattly *et al*, 2014; Menasria *et al*, 2014; Akbari *et al*, 2015) collected several *Blatta* and *Periplaneta* spp, to isolate and identify microorganisms (Bacteria, fungi and parasites) of medical importance, to ascertain their vector potential in the epidemiology of nosocomial infections and to evaluate the antibiotic resistance of the bacteria isolated from these insects. Over 100 species of pathogenic bacteria have been isolated from domestic cockroaches ( Cruden *et al*, 1987; Le Guyader *et al*, 1989; Oothuman *et al*, 1989; Bouamama *et al*, 2010; Tatfeg *et al*. 2005; Tachbele *et al*, 2006 Vahabi *et al*, 2007; Kassiri *et al*, 2012)

including mainly different species of *Salmonella*, *Shigella*, *Campylobacter*, *Escherichia*, *Pseudomonas*, *Klebsiella*, *Staphylococcus*, *Enterobacter*, *Streptococcus*, *Serratia*, *Bacillus*, *Proteus*, *Providencia*, and *Enterococcus*. As for flies, **Sukontason *et al* (2007)** compared the common house fly, *Musca domestica*, and the Oriental latrine fly, *Chrysomya megacephala*, for their potential as carriers of bacteria in urban areas of Chiang Mai Province, northern Thailand. and indicated that *C. megacephala* was significantly more likely to carry bacterial species than *M. domestica*. **Bouamama *et al.* (2007; 2010)** collected *P. americana* and *M. domestica* from the residential areas of six districts in Tangier, Morocco to isolate and identify some bacteria from their body and reported that although both cockroaches and flies may be vectors of human pathogenic bacteria, the infections caused by them are easily treatable as a result of the high susceptibility of their bacteria to antibiotics routinely used in the community or in hospitals.

Other insects as ants that may have a role in disease transmission within hospitals were reported by ( **Santos *et al*, 2009; Maximo *et al*, 2014; Silva *et al*, 2014** ) .

In Egypt, only few reports are available on surveying of insects in hospital and their role in disease transmission. (**Shoukry and Lotfy 1991; Rady *et al*, 1992; Mahmoud *et al*, 2013; Rady *et al*, 2014**)

The present study focuses upon the isolation and identification of pathogenic bacteria from external surfaces and internal organs of the insects which were collected from two hospitals with varying hygienic levels and their nearby residential areas.