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

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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 *Anthracoid, 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.

CONTENT

LIST OF ABBREVIATIONS

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

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

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

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

The Synanthropic insects are ecologically associated with humans; they feed or wander over feaces, 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 avilable 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.