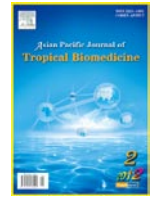




Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Asian Pacific Journal of Tropical Biomedicine

journal homepage: www.elsevier.com/locate/apjtb



Document heading doi:10.1016/S2221-1691(12)60370-0 ©2012 by the Asian Pacific Journal of Tropical Biomedicine. All rights reserved.

Isolation of Pathogenic Bacteria on the House Fly, *Musca domestica* L. (Diptera: Muscidae), Body Surface in Ahwaz Hospitals, Southwestern Iran

Hamid Kassiri^{1*}, Kamran Akbarzadeh², Anvar Ghaderi¹

¹ Department of Medical Entomology & Vector Control, School of Health, Ahwaz Jundishapur University of Medical Sciences, Ahwaz, Iran

² Department of Medical Entomology & Vector Control, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:

Received 2 June 2012
Received in revised form 5 July 2012
Accepted 7 August 2012
Available online 28 August 2012

Keywords:

Bacteria
House Fly
Nosocomial Infection
Ahwaz, Iran

ABSTRACT

Objective: There is abundant opportunity for house fly, *Musca domestica*, to become contaminated and, in turn, to contaminate the patient environment. This study has been conducted with the aim of isolating and identifying the probable pathogenic inoculations of the flies in three hospitals in Ahwaz County, Khuzestan province, south–west of Iran. **Methods:** Adult flies were collected by means of insect net and then transfers to lab for microbiological process. **Results:** Totally on all house fly samples the bacteria genus *Pseudomonas* and *Esherichia coli* had the significantly highest rate of infection ($P<0.05$). The genera *Klebsiella*, *Bacillus*, and *Diphtheroid* has significant lowest rate of infection. Hot and humid weather of the Khuzestan province which is host of patients coming from far localities for hospitalization, provide suitable conditions for housefly activities during the year. **Conclusions:** Thus suitable and applicable control methods such as environmental sanitations should be implemented for hospital environment in Ahwaz County.

1. Introduction

Synanthropic flies constitute a global problem, and the human and animal health risks associated with their activity have been widely discussed [1, 2]. They are responsible for the transmission of a wide variety of pathogens such as viruses, bacteria, fungi, protozoan and metazoan parasites in humans and animals [1, 3, 4].

Besides annoying animals and people, house flies, *Musca domestica*, are responsible for spreading diseases from animals to man and from animal to animal [5]. From the public health point of view, house flies are probably the most important nuisance insect pest and mechanical vector of pathogens [6] such as a number of bacterial infections including enteric fever, cholera, shigellosis and salmonellosis [5].

Understanding the relationship between the gender of insects and their ability to act as vectors of insect–borne diseases could provide clues as to the origin of the intimate interplay among insect, pathogen and vertebrate hosts [4].

The feeding mechanisms, filthy breeding habits [7] and behavioural characteristics of the housefly of synanthropic insects [8] such as house flies make them efficient vectors and transmitters of human enteric protozoan parasites [7]. They feed on feces, detritus of man and domestic animals [9] then land on human food, and regurgitate for predigestion before ingestion [10].

This study has been conducted with the aim of isolating and identifying the probable pathogen inoculations of the flies in three hospitals belonging to Ahwaz Jundishapur University of Medical Sciences.

2. Materials and Methods

The sampling procedure has been done in three educational hospitals belonging to Ahwaz Jundishapur University of Medical Sciences including Abozar, Razi, and Imam Khomeini hospitals. Up to 40 adult houseflies, *Musca domestica*, collected randomly by means of insect net. Collected flies were placed into the sterile tubes individually. These tubes were transferred to lab immediately after capturing. The fly tubes were placed in freezer for killing. All species other than *Musca domestica*

*Corresponding author: Dr. Hamid Kassiri, Assistant professor, School of Health, Ahwaz Jundishapur University of Medical Sciences, Ahwaz, Iran
Tel: 0098–0611–3738269
Fax: 0098–0611–3738282
E-mail: Hamid.kassiri@yahoo.com

were removed. Individual flies in any tubes submerged in 5cc physiologic serum for cleaning. Then flies were incubated at 37 °C after nourishing in Thioglycolate Medium up to 24 hours. Body pieces including mouthparts, legs, and so on were transferred into McKanky, EMS and Blood Agar Media for culturing. McKanky medium is suitable for culturing of gram negative intestinal bacteria. This medium has lactose and inactive red factors which is needed for selecting the lactose fermenting bacteria such as *E. coli* from others. The lactose fermenting bacteria makes reddish pink colony in McKanky media where other non fermenting bacteria makes colourless colonies. We used exclusive EMB medium for culturing and selecting gram negative bacteria. Blood agar medium used for all gram negative and gram positive bacteria. This medium is used to selection and identification of blood haemolysing bacteria. Some other exclusive media such as TSB, SS, TSI, SF, Mr, MIU and TSE were used to selection and identification of other bacteria.

For forming of colonies, the petries should be placed at 37 °C for 24 hours after culturing on EMB. Exclusive metallic color of *Esherichia coli* helped us to selection the colony. Selective media have been used for selecting of other bacteria. The rest bacteria selected by means of microscopic examination.

3.Results

The results of pathogen isolation on flies collected in Abozar Hospital revealed that *Pseudomonas* sp had the highest infection and *Klebsiella* sp had the lowest rate of infection (Figure 1). It is more cleared that *Staphylococcus* sp, *Diphteroid* sp, and *Bacillus* sp have shown a high rate of infections.

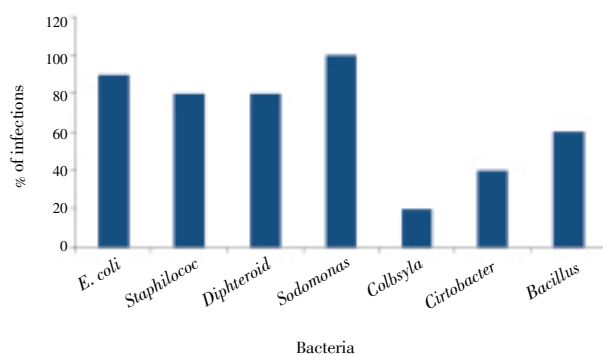


Fig1. Pathogen isolation on house flies collected in Abozar Hospital, Ahwaz, Iran.

Comparative infection rates of various bacteria can be seen in fig 2. *Pseudomonas* sp had the highest rate of infections on flies captured in Razi hospital as well as *E. coli*. The lowest rate of pathogen founded on flies in this hospital belonged to *Bacillus* sp. *Citrobacter* sp, *Staphylococcus* sp, and *Diphteroid* sp had high rates of infections (Figure 2).

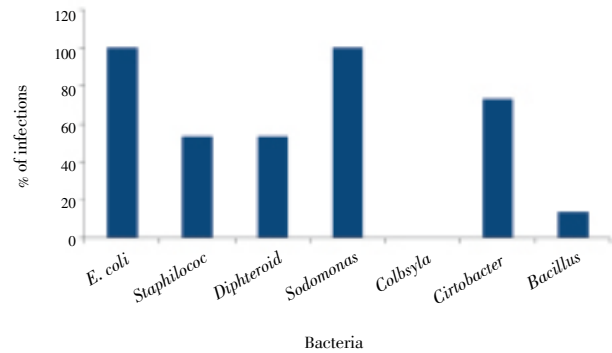


Fig 2. Pathogen isolation on house flies collected in Razi Hospital, Ahwaz, Iran.

Similarly the bacteria *Pseudomonas* sp had the heighest infections on flies sampled in Imam Khomeini Hospital. *E. coli*, *Citrobacter* sp, *Staphylococcus* sp, *Klebsiella* sp and *Bacillus* sp had a range of infections between 80% and 26.6% (Figure 3).

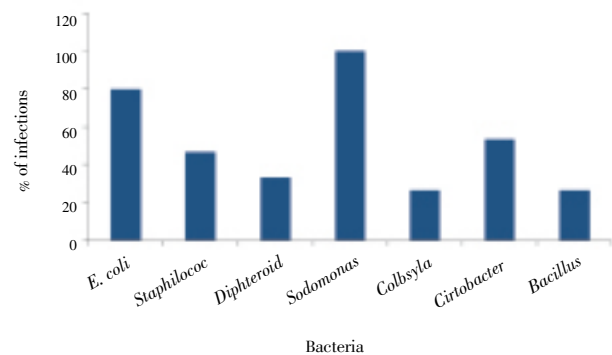


Fig 3. Pathogen isolation on house flies collected in Imam Khomeini Hospital, Ahwaz, Iran.

Totally on all 40 fly samples the bacteria genus *Pseudomonas* had the significantly highest rate of infection ($P < 0.05$) in comparisons with other genera except of *E. coli* (Fig 4). The genus *Klebsiella* has significant lowest rate in comparisons with genera *Citrobacter*, *Staphylococcus*, *E. coli* and *Pseudomonas* ($P < 0.05$) but with *Bacillus* and *Diphteroid* it hasn't significant difference ($P > 0.05$) (Table 1).

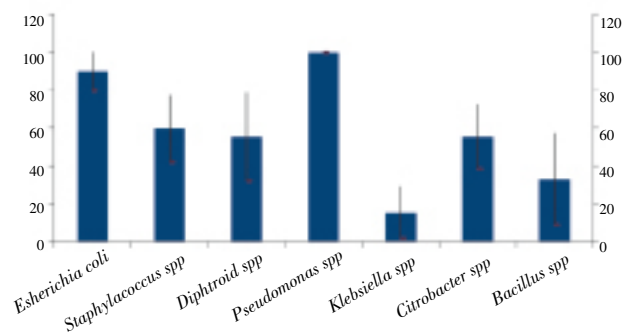


Fig 4. Pathogen isolation on house flies collected in Abozar, Razi and Imam Khomeini Hospitals of Ahwaz, Iran.

Table 1.

The statistical difference between bacterial infection of house flies in Abozr, Razi and Imam Khomeini Hospitals of Ahwaz, Iran

| | <i>Klebsiella</i> | <i>Bacillus</i> | <i>Citobacter</i> | <i>Diphthroid</i> | <i>Staphylococcus</i> | <i>E. coli</i> |
|-----------------------|-------------------|-----------------|-------------------|-------------------|-----------------------|----------------|
| <i>Klebsiella</i> | | | | | | |
| <i>Bacillus</i> | N | | | | | |
| <i>Citobacter</i> | S | N | | | | |
| <i>Diphthroid</i> | N | N | N | | | |
| <i>Staphylococcus</i> | S | N | N | N | | |
| <i>E. coli</i> | S | S | S | N | N | |
| <i>Pseudomonas</i> | S | S | S | S | S | N |

4. Discussion

Mechanical transmission of various pathogenic agents such as bacteria by housefly, *Musca domestica*, has been confirmed[6, 7]. Due to highly anthropophagic behavior of this cosmopolitan species wide variety of places investigated for fly pathogenic inoculations where the close relations with flies and human are easily possible. The most important places for this issue are hospital environments due to the presence of open wounds, unhealed skins, and immune-suppressed patients make the shortest way for transmitting the pathogens.

Isolation and identification of fungi[11] and bacterial[12] from external surface of houseflies collected from human and animal premises in Ahwaz County has been done previously. This is the first report of bacterial infection of housefly in hospitals in Khuzestan province. Ahwaz County is capital of this province where several hospitals and clinics are hosts for patients coming from long distances. Hot and humid weather of this province prepare suitable conditions for housefly activities during the year.

In the previous study of surface bacteria inoculation on housefly in Ahwaz county *E. coli* had the highest rate of infection (36.5%) in human and animal premises[12]. In hospital environment we found that *Pseudomonas* has the greatest rate of bacterial surface infection on housefly in addition to *E. coli*.

Some of bacterial genera such as *Bacillus* sp., *Escherichia* sp. and *Klebsiella* sp. were isolated from the flies of poultry farms in Malaysia[8].

Staphylococcus sp., *Bacillus* sp. and *Escherichia coli* cause diarrhoea which has been obtained from external and internal parts of house fly body[1, 8]. These results are similar to our findings.

Klebsiella sp. is causative agent of pneumonias and some hospital acquired infections[1, 8]. Surface infection of housefly by *Klebsiella* with inoculation rate up to 38% was the most common bacterial inoculation on housefly collected in food stalls, the wet market, and rubbish dumping site in Malaysia[10]. Similarly *Klebsiella* has the highest rate of inoculation on housefly in hospitals in Iran (Kurdistan

province) with 43.3%[5]. These data are clearly higher than our results which were 15.5% in Khuzestan province of Iran.

Bacterial organisms classified in the genus *Corynebacterium* are involved a wide variety of lesions in many domestic and wild animals, as well as in humans. The best known organism in this group is *Corynebacterium diphtheria*, the causing agent of human diphtheria. Other members of this group are often referred to collectively as “diphtheroid bacteria”. Many of these are low pathogenicity, existing as commensals in otherwise normal animals[13].

Outbreaks of diarrhoeal diseases in urban and rural areas of countries are closely related to seasonal increases in the abundance of filth flies and fly control is closely related to the decline in cases of enteric diseases[14]. The same situation can be thought for other pathogens found on house flies. House fly occurrence in hospitals is not acceptable. Thus suitable and applicable control methods such as environmental sanitations should be implemented for hospital environment in Ahwaz County.

Acknowledgements

This study was financially supported by Vice-Chancellor for Research and Technology of Ahwaz Jundishapur University of Medical Sciences No. 87.s59. We would like to acknowledge Mrs. F. Shamakhte for her assistance in the isolation and identification of bacteria .

Conflict interest statement

This study was founded by Ahwaz Jundishapur University of Medical Sciences Vice-Chancellor for Research Affairs.

References

- [1] Bouamama L, Sorlozano A, Laglaoui A, Lebbadi M, Aarab A, Gutierrez J. Antibiotic resistance patterns of bacterial strains isolated from *Periplaneta americana* and *Musca domestica* in

- Tangier, Morocco. *J Infect Dev Ctries* 2010, **4**(4):194–201.
- [2] Blunt R, McOrist S, McKillen J, McNair I, Jiang T, Mellits K. House fly vector for porcine circovirus 2b on commercial pig farms. *Vet Microb* 2011, **149**: 452–455.
- [3] Gupta A K, Nayduch D, Verma P, Shah B, Ghate H V, Patole M S, Shouche Y S. Phylogenetic characterization of bacteria in the gut of house flies (*Musca domestica* L.). *FEMS Microbiol Ecol* 2012, **79**: 581–593.
- [4] Forster M, Klimpel S, Sievert K. The house fly (*Musca domestica*) as a potential vector of metazoan parasites caught in a pig–pen in Germany. *Veterinary Parasitology*. 2009; **160**: 163–167.
- [5] Ugbo O C, Nwachukwu N C, Ogbuagu U N. Isolation of Salmonella and Shigella species from house flies (*Musca domestica* L.) in Uturu, Nigeria. *African Journal of Biotechnology*. 2006; **5**(11): 1090–1091.
- [6] Graczyk TK, Knight R, Gilman RH, Cranfield MR. The role of non-biting flies in the epidemiology of human infectious diseases. *Microb. Infect.* 2001; **3**: 231–235.
- [7] Thaddeus K, Graczyk, Knight R, Tamang L. Mechanical Transmission of Human Protozoan Parasites by Insects. *Clinical Microbiology Review*. 2005: 128–132.
- [8] Nazni WA, Seleena B, Lee HL, Jeffery J, Rogayah TAR, Sofian MA. Bacteria fauna from the house fly, *Musca domestica* (L.). *Tropical Biomedicine*. 2005; **2**(2): 225–231.
- [9] Doud C W, Zurek L. Enterococcus faecalis OG1RF:pMV158 Survives and Proliferates in the House Fly Digestive Tract. *J Med Entomol* 2012, **49**(1):150–155.
- [10] Sulaiman S, Othman MZ, Aziz AH. Isolations of Enteric Pathogens from Synanthropic Flies Trapped in Downtown Kuala Lumpur. *Journal of Vector Ecology*. 1999; **25**(1): 90–93.
- [11] Srivorama T, Chaiwong T, Sanford M. Isolation of fungi from adult house fly, *Musca domestica* and the blow fly *Chrysomya megacephala* in Ubon Ratchathani province, northeastern Thailand. *Intl J Parasitol Res* 2012, **4** (1): 53–56.
- [12] Vazirianzadeh B, Shams Solary S, Rahdar M, Hajhossien R, Mehdinejad M. Identification of bacteria which possible transmitted by *Musca domestica* (Diptera: Muscidae) in the region of Ahvaz, SW Iran. *Jundishapur Journal of Microbiology*. 2008; **1**(1): 28–31.
- [13] Davari B, Kalantar E, Zahirnia A, Moosa–Kazemi SH. Frequency of Resistance and Susceptible Bacteria Isolated from Houseflies. *Iranian J Arthropod–Borne Dis*. 2010; **4**(2): 50–55.
- [14] Barin A, Arabkhazaeli F, Rahbari S, Madani S A. The housefly, *Musca domestica*, as a possible mechanical vector of Newcastle disease virus in the laboratory and field. *Medical and Veterinary Entomology*. 2010; **24**: 88–90.