
Original article**Identification of bacteria which possible transmitted by *Polyphaga aegyptica* (Blattodea: Blattidae) in the region of Ahvaz, SW Iran****Babak Vazirianzadeh¹, Manijeh Mehdinejad², Rohullah Dehghani³**¹*Department of Medical Mycoparasitology, School of Medicine, and Infectious Diseases and Tropical Research Centre, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran*²*Department of Medical Microbiology, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran*³*Department of Environmental Health, School of Health, Kashan University of Medical Sciences, Kashan, Iran***Received:** February 2009**Accepted:** March 2009

Abstract

Cockroaches, Blattodea order insects, act as an important mechanical vector for lots of pathogenic microorganism agents, including bacteria, protozoa, worms, fungi, and viruses amongst humans and animals. *Polyphaga aegyptica* is a rare species of cockroaches than the common cockroaches. The aim of this study was to isolate and identify bacteria that are picked up by *P. aegyptica* over the human and animal premises. In this study totally five *P. aegyptica* were collected to isolate their bacteria, from the house in Ahvaz SW Iran using common bacteriology methods. The isolated bacteria in this study were *Escherichia coli*, *Klebsiella pneumoniae*, *Neisseria* species, *Bacillus cereus*, *B. subtilis* and *Staphylococci aureus* based on sampling of external body and feces pellets of Egyptian cockroaches. The medical importance of *P. aegyptica* can be referred to transmitting medical importance reported bacteria in the present study.

Keywords: *Polyphaga aegyptica*, *Escherichia coli*, *Klebsiella pneumoniae***Introduction**

Many insect species can transmit the varieties of pathogens. Cockroaches, Blattodea order insects, act as an important mechanical vector for lots of pathogenic microorganism agents, including bacteria, protozoa, worms, fungi, and viruses amongst humans and animals. However, they are very prepared to carry the bacteria very readily than the other pathogen microorganisms. The population of cockroaches transmit the disease agents by means of different parts of their bodies (body hairs, appendages and mouth parts) and secretions (regurgitates and

feces). Cockroaches enter to the several places, including contaminated premises because of their own biologic habits for feeding [1,2].

There are more than 4000 known species of cockroaches over the world, however less than 40 of them are very close to human dwellings. One of those species is *Polyphaga aegyptica*. However this species is less common than the three other very common house species: the German cockroach, *Blattella germanica*, the American cockroach, *Periplaneta americana*, and the Oriental cockroach,

Blatta orientalis [3,4]. *P. aegyptica*, Egyptian or desert cockroach is distributed in the Mediterranean Sea region and toward Iranian region and the Caspian Sea. The other species of *Polyphaga*, *P. saussurei* is found in the former USSR toward Iran, the Caspian Sea, and India with less geographical distribution [5]. Length of *P. aegyptica* ranges from 24 to 33mm [6]. They are very adapted to their habitat including desert and semi desert with loamy sandy soil to sandy soil [5]. This species is very tolerant to the debt of water condition. These roaches usually reach adulthood in four to six months and then will live another 10-15 months (Fig. 1) [6].



Fig. 1: *Polyphaga aegyptica* male (left) and female (right) (from Cochran. World Health Organization, 1999 [5])

The medical importance of *P. aegyptica* is unknown. However Fathpour *et al.* [7] have isolated *Salmonella* species from *P. aegyptica* in a hospital in Esfahan, Iran. There is no other Iranian or world evident which pathogen is transmitted by this species. As the new findings, Tachbele *et al.* [8] have reported that *B. germanica* in food-handling and serving facilities carry and may have the capacity to transfer antibiotic-resistant and potentially virulent bacteria like *Salmonella*, *Shigella*, *Escherichia coli*, *Staphylococcus aureus* and *Bacillus cereus*. Due to the biological similarity between *P. aegyptica* and *B. germanica* cockroaches, it is possible that *P. aegyptica* transmit the

same bacteria transmitted by *B. germanica*. The aim of this study was to identify the bacteria possibly transmitted by *P. aegyptica*.

Materials and methods

In this study a total of five Egyptian cockroaches were collected from a back garden of a resident house in Ahvaz SW Iran. The samples were transported to the medical microbiology laboratory and placed in the sterile dishes in freeze-temperature for 60min to anaesthetize them. They were recognized as *P. aegyptica* using Cochran [5] key. All samples for bacteriology have been taken directly from external surfaces and feces pellets of insect *P. aegyptica*. The procedure of Vazirianzadeh *et al.* [2] was followed to prepare the samples for culturing: The cockroach samples were washed by distilled water two times and for one minute in each time. In the last stage, one cockroach was soaked in 0.85% saline solution using a test tube. Then, the yield solution was transferred to a culture media Blood agar (Hi Media, India) and MacConkey's agar (Merck, Germany) plates under sterile conditions [2].

Cultured media were incubated at 37°C for 24 hours. The various bacteria growth on the agar media were identified by colonial morphology on blood agar plates, Gram stains characteristics. In addition, other necessary biochemical tests such as oxidase, catalase, motility, coagulase, indole, methyl red, voges proskaeur (MRVP), gelatine hydrolysis, gas from glucose, H₂S production and acid produced from various sugar according to standard microbiological procedures were also used for identification [9,10].

Results and discussion

A total of 16 samples as positive cultures were obtained including: *E. coli* two cases (12.5%) and *Klebsiella pneumoniae* two cases (12.5%) from *Enterobacteriaceae*, four cases non-pathogen *Neisseria* species (25%) from Gram negative *Diplococci*, two

cases of *B. cereus*, one case of *B. subtilis* and other isolated bacteria belonged to: two cases coagulase-positive *Staphylococci* including: *S. aureus* (12.5%), two cases non pathogens coagulase-negative *Staphylococci* (12.5%) when the cultures have been made based on sampling of external body of Egyptian cockroaches. When the cultures have been made based on sampling of feces pellets of Egyptian cockroaches the isolated bacteria were: *E. coli*, *K. pneumoniae*, *Neisseria* species, *B. cereus*, *B. subtilis*, *S. aureus* and non pathogens coagulase-negative *Staphylococci*.

In the current study some isolated bacteria from *P. aegyptica*, both external body and feces pellets, are pathogenic. These bacteria are for the first times which are reported from the external body and feces pellet of *P. aegyptica*. They are *E. coli*, *K. pneumoniae*, *B. cereus*, *B. subtilis* and *S. aureus* of external body and same species of feces pellets. This agrees partially with the results of Sisaib *et al.* [11] in Botswana. *E. coli* and *B. cereus* were isolated in their study from surface body of German cockroach. The cockroaches were collected from kitchen and toilets of hospitals in Botswana. This confirms the potential of *P. aegyptica* in the transmission of bacterial diseases to human in spite of less population than the common cockroaches.

The difference between results of two studies is reflected on getting more various species in the current study than the Sisaib *et al.* [11] study in Botswana, can be addressed to the using different methods regarding making the cultures. Sisaib *et al.* [11] used peptone water but in contrast in the current study in the first stage used distilled water and for the second stage, normal saline solution was used to wash the cockroaches. It is possible that peptone water has the great anti infection property. However, the cockroach specimens in the current study have been collected from the outdoor field. In contrast to external body of *P. aegyptica* the bacterial fauna of feces pellets of

German cockroaches were more diverse than the *P. aegyptica* feces pellets.

In the other study which was conducted by Tachbele *et al.* [8] in hospitals and restaurants of Ethiopia the isolated pathogenic bacteria were *Salmonella* species, *Shigella flexneri*, *E. coli*, *S. aureus* and *B. cereus*. The specimens were taken from digestive systems of *B. germanica* [8]. There is a more similarity between the fauna of bacteria of feces pellets in the present research and the Tachbele *et al.* [8] study. Elgderi *et al.* [12] have isolated 25 species of potential pathogen from the hospital and household cockroaches, respectively, with *Klebsiella*, *Enterobacter*, *Serratia* and *Streptococcus* predominant from Libya. They have revealed that the place of collecting the cockroaches can affect the results according to transmitted bacteria. *Klebsiella* and *Enterobacter* were common among the household cockroaches than among the hospital. The results of Elgderi *et al.* [12] is similar to the present study from the point of isolating of *Klebsiella* and *Enterobacter*.

In another study which was carried out in three hospitals of Iran by Karimi Zarchi and Vatani [13], the most common species of bacteria isolated from cockroaches were *E. coli*, *Streptococcus* Group D, *Bacillus* species, *K. pneumoniae*, and *Proteus vulgaris*. Those species of bacteria were similar to the current study results. Bouamama *et al.* [3] have reported *S. aureus*, *S. epidermidis*, *Streptococcus* species, *Salmonella* species, *Shigella* species, *P. vulgaris*, *Proteus* species, *Serratia* species, *Klebsiella* species, *Enterobacter* species, and *E. coli* from the external body of *P. americana*. The results of Bouamama *et al.* [3] are more or less in accordance to the results of current research.

Vahabi *et al.* [14] have identified two species of cockroaches from two hospitals of Sanandaj Kordestan province, west of Iran: American cockroaches and German cockroaches. They have reported *E. coli* from external part of cockroach's body while

no internal contamination has reported by this bacterium. They have reported *Proteus* species from both external and internal body (digestive system) of the cockroaches. There is very less similarity between present study and Vahabi *et al.* [14] study, which they are shared only in *E. coli* from external part of cockroaches.

The only very related study that is referred to *P. aegyptica* is from Iran, by Fathpour *et al.* [7]. They have isolated only *Salmonella* species from the cockroach guts. Because of different sampling method, the result of present study differs from Fathpour *et al.* [7]. In the current study external body and the feces pellets were detected for bacteriology in contrast to the Fathpour *et al.* [7] which the sampling was based on the gut detection only.

The different results due to isolation of different species of bacteria in the above studies can be addressed to the different species of cockroaches and using different bacteriology methods. The medical importance of *P. aegyptica* can be referred to transmitting medical importance reported bacteria in the present study. They can transmit similar bacteria to the transmitted bacteria by common cockroaches. However, the population of this species is less than the common cockroaches, but there is a potential to increase their population like the other cockroaches. This increasing population provides the more probability of transmission the bacterial disease agents for *P. aegyptica*.

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