

Vectorial Role of Phlebotomine Sandflies

Sajida Sboui¹
Malak Belkhiri¹
Ahmed Tabbabi^{2*}

¹Faculty of Medicine of Monastir, Monastir University, Tunisia

²Department of Hygiene and Environmental Protection, Ministry of Public Health, Tunisia

Short Communication

Biology of phlebotomine sand flies

The mating of sand flies is done at the beginning of the adult stage, it occurs after the blood meal, necessary for the maturation of the eggs. There are about 100 eggs per female. Egg incubation time ranges from 5 to 10 days in humid, relatively constant temperature environments and is close to organic matter required for larval nutrition such as burrows, upper soil layers furniture, cracks in the walls [1]. The hatching gives birth to a larva that passes through four larval stages separated by three moults; the fourth gives birth to a nymph. Pupation is done in a less humid place and the nymph gives the adult 7-10 days later. The duration of the development cycle is 35 to 60 days depending on the climatic conditions [2]. The drop in temperature during the bad season, coupled with an increase in humidity, causes diapause in the fourth larval stage [3].

The life span of females ranges from 2 weeks to 2 months, depending on external factors, particularly temperature and humidity [2]. Some species are clearly endophilic, others are exophilic. Sandflies of both sexes feed on plant juices, but only the female is hematophagous. Hematophagy is telmophagic type and the blood meal is necessary for the development of eggs and the gonotrophic cycle of the female.

Adults start to come out at night if the temperature is high enough (above 19 to 20° C), if there is no wind and the humidity is high. During the day, they hide in dark, sheltered places. In tropical regions, they are active all year, while in temperate regions, their activity is seasonal. Their appearance, their density, their period of activity and their disappearance vary according to the latitude, the altitude, the season and the species [4]. In Tunisia, the period of activity of sandflies is closely related to the transmission of leishmaniasis. It is spread from May to October [5]. The peak activity period appears to be in August [6].

The flight of the sandfly is perfectly silent; it is made by small leaps but can also cover quite large distances. Studies in different countries have shown that flying distance varies with species and bioclimatic factors [7-10].

Transmission of Disease Agents by Phlebotomine Sand Flies

Exposure to repeated bites of sandflies can induce allergic reactions. Many people suffer from the toxic effect of their saliva. The sting is telmophagous and painful, but the intensity of the host's reactions varies according to the species of sandflies involved (pain, appearance of a papule or a haemorrhagic stain).

Sandflies are also known by their carrier roles of many agents of various human, animal and even plant diseases. In 1969, Macfarlane and his collaborators showed that males of *Phlebotomus langeroni* can play the role of mechanical vector of *Brevipalpus phoenicis* (mite of the family Tenuipalpidae). Indeed, these authors collected on this vector five copies of this parasite. The latter is parasitic plants like Citrus, Thea, Coffea. It attacks these plants by essentially causing browning or necrotic areas on the leaves, fruits, stems, twigs and bud tissues of the infected host.

Two genera, *Phlebotomus* in the Old World and *Lutzomyia* in the New World, are of medical interest: they transmit leishmaniasis, bartonellosis and several arboviruses [4,11-13]. Recently, the detection of Toscana virus RNA in *Sergentomyia minuta* and *Leishmania major* in *Sergentomyia* species, a species of sandfly considered as herpetophile, made it possible to incriminate the vector role of species of the genus *Sergentomyia* [14-16]. In this context, it is important to note that there is a specific association between insect vector species and parasites although permissive sandflies were recently reported [17]. *Phlebotomus sergenti* is known to transmit *Leishmania tropica*. However, several studies showed that this parasite can be transmitted by *Phlebotomus arabicus* in some areas of the world [18].

Since the beginning of the last century, leishmaniasis has been the subject of numerous clinical and epidemiological studies [19-22]. The suffering due to leishmaniasis is threatening 350 million people in 88 countries. In its most serious form, this disease is fatal. Leishmaniasis is a parasitic disease with a wide variety of clinical manifestations.

Article Information

DOI: 10.31021/jer.20192111
Article Type: Short Communication
Journal Type: Open Access
Volume: 2 Issue: 1
Manuscript ID: JER-2-111
Publisher: Boffin Access Limited

Received Date: April 09, 2018
Accepted Date: April 24, 2018
Published Date: April 30, 2018

*Corresponding author:

Ahmed Tabbabi

Department of Hygiene and Environmental
Protection
Ministry of Public Health, Tunisia
Tel: 0021697085424
E-mail: tabbabi.ahmed@gmail.com

Citation: Sboui S, Belkhiri M, Tabbabi A. Vectorial Role of Phlebotomine Sandflies. J Emerg Rare Dis. 2018 Apr;2(1):111.

Copyright: © 2018 Sboui S, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 international License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Bartonellosis, a disease restricted to the high valleys of Latin America, has also been well studied [23-25]. The cause of this disease, also known as “Oroya fever”, is a bacterium, called *Bartonella bacilliformis*, transmitted by sandflies belonging to the genus *Lutzomyia*. As for arboviroses due to sandflies, they remain insufficiently known. The transmitted viruses are divided into three genera belonging to different families: Phlebovirus, Vesiculovirus distributed in the old world and the new world and Orbivirus which affects only the new world. In the Mediterranean region, only phleboviruses are involved in medicine. They define what is commonly known as the “sand fly fever”, “papatasi fever” or “three-day fever” group [26,27].

References

- Eldbridge BF, Edman JD. Medical Entomology: A Textbook on Public Health and Veterinary Problems Caused by Arthropods. Dordrecht / Boston / London: Kluwers Academic Publishers; 2000.
- Dedet JP. *Les Leishmanioses*. Paris:Ellipses. 1999.
- Vattier Bernard G. Contribution to the systematic and biological study of cave sandflies in intertropical Africa : 1st part. Cahiers ORSTOM. Series Med Entomo Parasit. 1970;8(2):175-230.
- Abonnenc E. Phlebotomine sandflies from the Ethiopian region (Diptera, *Psychodidae*). Paris: ORSTOM; 1972 ;(55),p. 289.
- Ben Ismail R, Ben Rachid MS. Epidemiology of leishmaniasis in Tunisia. Mal Trop Trans. 1989;1:73-80.
- Ghrab J, Rhim A, Bach-Hamba D, Chahed MK, Aoun K, et al. Phlebotominae (Diptera: *Psychodidae*) of human leishmaniasis sites in Tunisia. Parasite. 2006 Mar;13(1):23-33.
- Srinivasan R, Panicker KN, Dhanda V. Population dynamics of *Phlebotomus papatasi* (Diptera: *Phlebotomidae*) in Pondicherry, India. Acta Trop. 1993 Aug;54(2):125-130.
- Killick-Kendrick R. The biology and Control of Phlebotomine Sandflies. Clin Dermatol. 1999 May-Jun;17(3): 279-289.
- Singh KV. Studies on the role of climatological factors in the distribution of phlebotomine sand flies (Diptera: *Psychodidae*) in semi-arid areas of Rajasthan, India. J. Arid Environ. 1999;42(1):43-48.
- Wasserberg G, Yarom I, Warburg A. Seasonal abundance patterns of the sand fly *Phlebotomus papatasi* in climatically distinct foci of cutaneous leishmaniasis in Israeli deserts. Med Vet Entomol. 2003 Dec;17(4):452-456.
- Dolmatova AV, Demina NA. Phlebotomine (*Phlebotominae*) and the diseases they transmit. ORSTOM; 1971. p. 168.
- Es-Sette N, Ajouad M, Laamarani-Idrissi A, Mellouk F, Lemrani A. Molecular detection and identification of *Leishmania* infection in naturally infected sand flies in a focus of cutaneous leishmaniasis in northern Morocco. Parasit Vectors. 2014 Jul;7:305.
- Torres-Guerrero E, Quintanilla-Cedillo MR, Ruiz-Esmenjaud J, Arenas R. Leishmaniasis: a review. F1000Res. 2017 May;6:750.
- Charrel RN, Izri A, Temmam S, Lamballerie X, Parola P. Toscana Virus RNA in *Sergentomyia minuta* Flies. Emerg Infect Dis. 2006 Aug;12(8):1299-1300.
- Jaouadi K, Ghawar W, Salem S, Gharbi M, Bettaieb J, Yazidi R, et al. First report of naturally infected *Sergentomyia minuta* with *Leishmania major* in Tunisia. Parasit Vectors. 2015 Dec;8:649.
- Ayari C, Ben Othman S, Chemkhi J, Tabbabi A, Fisa R, et al. First detection of *Leishmania major* DNA in *Sergentomyia* (*Sintonius*) *clydei* (Sinton, 1928, *Psychodidae*: *Phlebotominae*), from an outbreak area of cutaneous leishmaniasis in Tunisia. Infect Genet Evol. 2016 Apr;39:241-248.
- Volf P, Myskova J. Sand flies and *Leishmania*: specific versus permissive vectors. Trends Parasitol. 2007 Mar;23(3):91-92.
- Jacobson RL, Eisenberger CL, Svobodova M, Baneth G, Sztern J, et al. Outbreak of Cutaneous Leishmaniasis in Northern Israel. J Infect Dis. 2003 Oct;188(7):1065-1073.
- Ashford RW, Desjeux P, Deraadt P. Estimation of population at risk of infection and number of cases of leishmaniasis. Parasitol Today. 1992 Mar;8(3):104-105.
- Desjeux P. Leishmaniasis: current situation and new perspectives. Comp Immunol Microbiol Infect Dis. 2004 Sep;27(5):305-318.
- Marty P, Pomares-Estran C, Hasseine L, Delaunay P, Haas H, et al. News about leishmaniasis in France. Pediatric Archives. 2009 Oct;16(2):96-100.
- Zaghi D, Panosian C, Gutierrez MA, Gregson A, Taylor E, Ochoa MT. New World cutaneous leishmaniasis: current challenges in diagnosis and parenteral treatment. J Am Acad Dermatol. 2011 Mar;64(3):587-592.
- Caceres AG. Geographic distribution of *Lutzomyia verrucarum* (Townsend, 1913) (Diptera, *Psychodidae*, *Phlebotominae*), vector of human bartonellosis in Peru. Rev Inst Med Trop Sao Paulo. 1993 Dec;35(6):485-490.
- Feliciangeli MD. Natural breeding places of phlebotomine sandflies. Med Vet Entomol. 2004 Mar;18(1):71-80.
- Biswas S, Rolain JM. Bartonella infection: treatment and drug resistance. Future Microbiol. 2010 Nov;5(11):1719-1731.
- Izri A, Depaquit J, Parola P. Phlebotomine and transmission of pathogens around the Mediterranean Basin. Med Trop. 2006 Oct;66(5):429-435.
- Dachraoui K, Fares W, Bichaud L, Barhoumi W, Beier JC, et al. Phleboviruses associated with sand flies in arid bio-geographical areas of Central Tunisia. Acta Trop. 2016 Jun;158:13-19.