

Mosquitoes (Diptera:Culicidae) are also vectors of bacteria

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SHORT COMMUNICATION

Vector control is one of the most important components of medical entomology and requires precise identification of vectors. On the other hand the detection of a pathogen in an arthropod does not necessarily imply its ability to transmit. The criminalization of an arthropod as a vector respects certain rules ranging from suspicion to the demonstration of its vector competence in the laboratory (Brenda et al, 2000).

Rickettsia, Orientia, Ehrlichia, Anaplasma, and Coxiella spp were considered to belong to the same family, but current genetic analyzes have shown that they are distinct entities. Although this group of microbes requires living cells for growth, they are true bacteria because they have metabolic enzymes and a cell wall; they use O₂, and are sensitive to antibiotics. These microorganisms usually have an animal reservoir and an arthropod vector; the exceptions are *Rickettsia prowazekii*, for which humans are the main reservoir, and *Coxiella burnetii*, which does not require an arthropod vector. Vectors, reservoirs and specific endemic regions differ widely. *Rickettsia felis* is an emerging pathogen, described for the first time in 1990 (La Scola et al, 2002; Parola, 2011). The bacteria are most commonly transmitted to humans by a range of ticks and fleas (Reif & Macaluso, 2009). However, in some countries where the prevalence of *Rickettsia felis* infections is particularly high, as in Senegal, fleas have not been implicated in the transmission of the bacteria (Socolovschi et al, 2012b). Long confused with murine typhus, incidence and clinical expressions remain poorly understood. Rickettsioses are one of the most important causes of fever among travelers in developed countries, but little is known about their incidence among indigenous people (Cristina et al, 2010).

Mosquitoes are the primary vectors of human infectious diseases, and are well known for transmitting parasites and viruses. They put our nerves alive and the skin on fire. Some even

inoculate us with parasitic or viral diseases: malaria, dengue, chikungunya. However, the curse of the mosquito does not stop there: by biting us, these nasty creatures can also inflict fevers of bacterial origin. A bacterium, *Rickettsia felis*, can be transmitted to humans by these vampire insects. It is responsible for many diseases that were so far unexplained in the world and among travelers (Cristina et al, 2010). Four years ago, however, *Rickettsia felis* was detected by molecular biology in mosquitoes, including mosquitoes that stung humans. The recent detection of DNA of *Rickettsia felis* in mosquitoes including *Aedes* spp., *Anopheles* spp. and *Mansonia* in Africa (Socolovschi et al, 2012a, b; Mediannikov et al, 2013) and *Anopheles sinensis* and *Culex pipiens* in China (Zhang et al, 2014) let authors suggest their vectorial role of bacteria. In their laboratory, the researchers fed *Anopheles gambiae* with *Rickettsia felis*-infected blood. Similarly, the researchers found that *Rickettsia felis* infections were particularly prevalent in areas where malaria is endemic. Further, other authors found the bacteria's DNA in the *Anopheles gambiae* tissues, up to two weeks after this test meal. Bacterial DNA has also been found on cotton pieces that were later used to feed these same mosquitoes with sucrose suggesting that mosquitoes can transmit the bacteria through salivary. The researchers found *Rickettsia felis* in the salivary glands of the infected mosquitoes. The researchers then moved on to experiments on the animal: when mosquitoes "stung" healthy mice, the latter developed a rickettsiosis, transiently. In conclusion, authors confirmed that mosquito vectors of malaria can also transmit *Rickettsia felis* (Dieme et al, 2015). It remains to be seen if they do it in the wild and if other mosquitoes can also be involved. It is important to mention that other *Rickettsia* species has been detected in *Anopheles gambiae* and *Anopheles melas* from Africa (Socolovschi et al, 2012a) and in *Culex pipiens* collected from China (Zhang et al, 2014). Finally, the occurrence of

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the *Rickettsia* in male and unfed female of *Culex pipiens* let authors suggests the possible transovarial transmission of these bacteria (Zhang et al, 2016).

Briefly, mosquitoes responsible for parasites and viruses transmission could also transmit a bacterium, *Rickettsia felis*, responsible for many unexplained fevers. This is the first demonstration in the world that mosquitoes can transmit not only parasites and viruses, but also bacteria. To confirm this hypothesis, both natural and artificial infections were reported. While some rickettsioses, such as Mediterranean spotted fever or Lyme disease, have been known for a long time, others have been discovered more recently in the last decade. *Rickettsia felis* is responsible for typhoid fever. Recently, teams have shown that in tropical areas, particularly in sub-Saharan Africa, *Rickettsia felis* was involved in 10 to 15% of cases of unexplained fevers.

In conclusions, many studies have recently showed that bed bugs can also be vectors of infectious diseases. The trench fever, this well-known disease during the war of 14 and still present in homes of homeless, can be transmitted by these insects. Like what, it is by looking for the little beast that one sometimes makes important discoveries.

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