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Editorial

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Bee Viruses: An Emerging Problem That Need Better Diagnosis, Prevention and Control Strategies

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Editorial

The role of the honeybee (*Apis mellifera L.*) in pollination is crucial for the maintenance of biodiversity of most terrestrial ecosystems and global agricultural production. In this way, biotic pollination is required for the reproduction of 70% of flowering plants. Particularly, pollination with bees is needed for more than 35% of the world's crops that produce basic food for man. Recently, the fraction of global crops that require animal pollination has tripled, making food production more dependant of pollinators that before [1].

On the other hand, honeybee population experienced losses worldwide due to unknown causes. Consequently, there is the possibility that we may be facing a "pollination crisis" in the future [2,3]. Among the multi-factorial causes of this problem, pesticides residues and several pathogens have been proposed to explain these losses. In recent years, viral diseases of bees have also acquired particular interest because they have caused severe problems in honey producing countries such as United States [4]. In general, honey bee viruses commonly can be detected in healthy populations, because these viruses could remain latent and confined within certain cells or tissues with no active replications and no disruption of several function. Moreover, they could replicate at low levels in permissive cells or in non-vital sites or honeybee life stage so, they do not exhibit any symptoms [5].

Up to now, 22 honeybee viruses have been isolated, characterized and described in the literature [6]. Most of these viruses have a single-stranded RNA genome with positive polarity and are classified as *Picorna-like virus* [7]. Between these pathogens, Israeli acute paralysis virus (IAPV), Deformed wing virus (DWV) and Acute bee paralysis virus (ABPV) were postulate as one of the possible causes of the Colony Collapse Disorder, a serious disorder that has already killed thousands of bee hives in several countries worldwide [4].

Many of these viruses often exist in colony as latent infections and can multiply rapidly under stress and cause disease. This often occur when the colony is threatened by external stressors such as infestation with *Varroa destructor* mite, which can also transmit some of these viruses [8] and impaired immune function of the bees [9]. Since the effects of viral infection are not always observable, there is an additional challenge in the diagnosis and monitoring of viral infections [6]. Many viruses that infect bees have similar symptoms, so the clinical diagnosis is often complicated. The gold standard method to make the diagnosis of a viral disease is isolate the causal agent from diseased bees, for which a widely equipped laboratory is required. Moreover, as all these viruses have similar characteristics, it is very difficult to distinguish morphologically by electron microscopy. Others less complex methods, such as immunodiffusion techniques, western blot or ELISA, was whole used for diagnosis. However, these methods can give cross-reactions between related viruses (e.g. IAPV, ABPV and Kashmir Bee Virus). In this scenario, Reverse transcription followed by a Polymerase Chain Reaction (RT-PCR) is preferred as the most appropriate test for the detection of RNA virus in samples of bees since it more accurate and sensitive. Recently two new techniques have been developed, a multiplex-ligation probe dependent amplification (MLPA) called BeeDoc – MLPA for the detection of 10 honey bee virus [10] and a microarray based technique capable of detecting viruses, microbes, and metazoans associated to arthropod [11].

Even though recent studies demonstrated that IAPV can be silenced in bees by iRNA technique [12] no proven effective method for the treatment of any viruses was developed yet. However, as most diseases caused by viruses can occur only after a stress condition in the hive or, due to the presence of other pathogens such as *V. destructor* mite and fungus of the genus *Nosema*. The best possible treatment is the prophylactic management of hives.

In conclusion, the knowledge of the incidence of each of these viruses worldwide is vital for predicting epidemics. The detection of unapparent viral infection in apiaries could contribute in the understanding of the spread of these viruses from one hive to another and understand the dynamics and the interactions of the virus populations within colonies. The comprehension of all of this topics would probably help us to assure the health of bees and thus, ensuring biodiversity worldwide.

References

1. Aizen MA, Harder LD (2009) The global stock of domesticated honey bees is growing slower than agricultural demand for pollination. Curr Biol 19: 915-918.
2. Holden C (2006) Ecology. Report warns of looming pollination crisis in North America. Science 314: 397.
3. Potts SG, Roberts SPM, Dean R, Marris G, Brown MA, Jones R, Neumann P, Settele J (2010) Declines of Managed Honeybees and Beekeepers in Europe. J Apic Res 49: 15-22.
4. Cox-Foster DL, Conlan S, Holmes EC, Palacios G, Evans JD, et al. (2007) A metagenomic survey of microbes in honey bee colony collapse disorder. Science 318: 283-287.
5. Gauthier L, Tentcheva D, Tournaire M, Dainat B, Cousserans F, et al. (2007) Viral load estimation in asymptomatic honey bee colonies using the quantitative RT-PCR technique. Apidologie 38: 426-435.
6. Freiberg M1, De Jong D, Message D, Cox-Foster D (2012) First report of sacbrood virus in honey bee (Apis mellifera) colonies in Brazil. Genet Mol Res 11: 3310-3314.
7. Chen YP, Siede R (2007) Honey bee viruses. Adv Virus Res 70: 33–80
8. Genersch E, Aubert M (2010) Emerging and re-emerging viruses of the honey bee (Apis mellifera L.). Vet Res 41: 54.
9. Yang X, Cox-Foster DL (2005) Impact of an ectoparasite on the immunity and

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pathology of an invertebrate: evidence for host immunosuppression and viral amplification. Proc Natl Acad Sci U S A 102: 7470-7475.

10. De Smet L, Ravoet J, de Miranda JR, Wenseleers T, Mueller MY, et al. (2012) BeeDoctor, a versatile MLPA-based diagnostic tool for screening bee viruses. PLoS One 7: e47953.
11. Runckel C, Flenniken ML, Engel JC, Ruby JG, Ganem D, et al. (2011) Temporal analysis of the honey bee microbiome reveals four novel viruses and seasonal prevalence of known viruses, Nosema, and Crithidia. PLoS One 6: e20656.
12. Maori E, Paldi N, Shafir S, Kalev H, Tsur E, et al. (2009) IAPV, a bee-affecting virus associated with Colony Collapse Disorder can be silenced by dsRNA ingestion. Insect Mol Biol 18: 55-60.

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