Honeybees’ physiological and behavioural immunity deficit induced by DW viruses

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Honeybee societies are formed by thousands of individuals which incessantly interact in the sheltered nest space. As a consequence they are exposed to risk of epidemics and are often associated with high infection levels of viruses, bacteria and fungi. As a result of co-evolutionary dynamics between parasites and host, honeybees have evolved several adaptations to face the increased risks of epidemic diseases. One of the most important defence is represented by antimicrobial compounds present either in hemolymph and venom. In particular, the application of venom on the body surface and on the wax of the comb as a way of protection against pathogens has been suggested for *Apis mellifera*. Nevertheless, whether the expression of melittin (a strong venom antimicrobial peptide) and its presence on the cuticle is affected by ongoing infections is still under debate. For example, the quantity of melittin on the cuticle might be actively increased by bees to counteract an incipient infection. By contrast, this defence might be weakened or neutralised by the infection itself or it might follow both trends depending on the pathogen load. Here we described the ontogeny of the chemical shield on the cuticle in both healthy and deformed wing virus infected bees and we studied the relationship between the synthesis and the use of antimicrobial peptides, mostly melittin, and the DWV titer. RT-PCR, qRT-PCR and MALDI-TOF Mass Spectrometry analyses were used to quantified the viruses' genome copies, the transcriptional level of melittin and the amount of melittin on the cuticle in healthy, naturally and artificially infected bees. Behavioural experiments showed how the grooming behaviour is responsible for the presence of the venom antimicrobial layer on the cuticles of healthy bees and the way DWVs affect the immune system either at the behavioural and the physiological level.