



# **EurBee 8** **8th Congress of Apidology**

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cool-adapted bumblebee species simultaneously. Therefore, studies assessing how thermal stress influences gene expression patterns involved in different biological processes are needed to determine how climate change will affect bumblebees. Expression studies require the use of several reference genes known to be stably expressed under the conditions tested, making them acceptable internal controls in the experiments. To date, several reference genes have been validated for RT-qPCR in *Bombus terrestris*, but no information regarding their stability under thermal stress is available. In this study, six candidate reference genes (Arginine kinase-AK, Elongation factor 1 $\alpha$ -EEF1 $\alpha$ , Phospholipase A2-PLA2,  $\alpha$ -Tubulin-TUB,  $\beta$ -Actin-ACTB and Ribosomal protein L13-RPL13) were selected from the literature and their stability under different temperature conditions was tested using RT-qPCR. Two out of the six genes did not amplify properly (PLA2 and ACTB). The stability for the four remaining genes was analysed with the algorithms GeNorm, NormFinder and BestKeeper. All four genes analysed (AK, EEF1 $\alpha$ , TUB, and RPL13) showed appropriate stability values under different temperature conditions. Nevertheless, AK was the least stable gene, while RPL13 and EEF1 $\alpha$  presented the most stable values and are thus postulated as the two best reference genes for RT-qPCR studies under thermal stress in *B. terrestris*.

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### BeeHeal: promoting bee health for sustainable agriculture

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During the last years there is an alarming increase in the collapse of honeybee colonies (*Apis mellifera*) where bee parasites and pathogens like *Varroa destructor* mites, the microsporidia *Nosema* ssp. and viruses have played the leading role. Colony decline might compromise not only food security but also present and future income to the growers. Hence, four institutions from Mediterranean area have joined forces to put together a project entitled, "BEEHEAL: Promoting bee health for sustainable agriculture". BEEHEAL is a collaborative research between Centro de Investigación Apícola y Agroambiental de Marchamalo - CAR (Spain), Centre de recherche Provence-Alpes-Côte d'Azur Unité: Abeilles et Environnement - INRA (France), Agricultural Research Organization, The Volcani Center - ARO (Israel) and Mountain Research Center (CMO), Polytechnic Institute of Bragança (Portugal). The aim of this project is to determine the phenology and interaction of the microsporidia *Nosema ceranae* and viruses including acute bee paralysis virus (ABPV), Israeli acute paralysis virus (IAPV), Black queen cell virus (BQCV) Chronic bee paralysis virus (CBPV) and Deformed wing virus (DWV), in Spain, France, Portugal and Israel. The findings of this project, which involves an active and unique cooperation among partners representing Mediterranean countries which encompasses a wide range of environmental and beekeeping management conditions, will contribute to ameliorate the damage caused by the expansion of *N. ceranae* through a rational implementation of existing treatments to avoid emergence of synergistic pathogens that accelerate colony collapse compromising food security. This project started at 2017 and it will end in 2020. BEEHEAL is funded through the ARIMNet2 (2016) Call by the following funding agencies: INIA (Spain), ANR (France), MOARD (Israel), and FCT (Portugal). This presentation will detail the tasks that are ongoing in the BEEHEAL project.

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