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Honeybee (*Apis mellifera*) gut microbiota shaping post medicaments oral administration

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In the last decades, honeybees have been afflicted by several gut diseases such as the American Foulbrood (caused by *Paenibacillus larvae*), the European Foulbrood (*Melissococcus plutonius*) and Nosemosis (*Nosema ceranae*). The virulence of these diseases is enhanced by synergy with abiotic stressors such as climate change, causing noteworthy losses in honeybee colonies and consequently honey production.

To counteract losses, pharmaceutical companies have developed specific medications against microbial mediated honeybee diseases. Antibiotics and chemotherapeutics, such as tetracycline, tylosin or sulfonamides, are diffused worldwide among beekeepers. After the ban of antibiotics at a European level in 2001, researchers and pharmaceutical companies alike have made a strong effort to find alternative medications. Consequently, several new medications based on natural oils with proven strong antimicrobial activity such as thymol, Neem oil and probiotics have been brought forward on the veterinary market, or suggested by researchers as future ‘natural’ alternatives. However, the use of oral medications on animals may effect honeybees’ gut microbial community.

In this work, we investigated if and how traditional chemotherapeutic strategies and new approaches, based on the use of oils and probiotics, can change the honeybee gut microbial community. A field and laboratory trial was carried out using eight assays based on the use of thymol, neem oil, probiotics, tylosin, tetracycline, sulfaquinolaxaline, tween80 and a control with no treatment. Six micro hives for each assays (for a total of 48 micro hives) were establishes near Bologna and each hive was treated once a week for three weeks according to the instructions of the veterinary medication manufacturers. Four weeks after the beginning of the test, ten bees were sampled from each micro hive. Microbial gut DNA was extracted, amplified and sequenced on the MiSeq Illumina platform. Preliminary data shows important changes in the gut microbiota community of honeybees, with thymol and tetracycline identified as the main therapeutic ingredients responsible for shaping the microbial community.

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