

# Master 2 internship project Year 2019-2020

**Laboratory/Institute:** IAB

**Director:** Pierre HAINAUT

**Team:** Immunologie Analytique des Pathologies Chroniques

**Head of the team:** Patrice MARCHE

**Name and status of the scientist in charge of the project:** Dr Philippe BULET,  
**HDR:** yes x

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## Program of the Master's degree in Biology:

Immunology, Microbiology, Infectious Diseases       Integrative Structural Biology  
 Physiology, Epigenetics, Differentiation, Cancer       Neurosciences and Neurobiology  
 Planta International

**Title of the project: Study of the effect of a natural antifungal molecule on honey bees following an *per os* infection with microsporidia.**

### Objectives (up to 3 lines):

The objective of your Master 2 internship project will be to set up an experimental approach to monitor and measure the effect of a natural antifungal molecule on *Nosema ceranae*, a microsporidium responsible for infection in honey bees.

### Abstract (up to 10 lines):

Two different microsporidia affect the honey bee (*Apis mellifera* L.) causing nosemosis: the historical *Nosema apis*, responsible for nosemosis type A and *Nosema ceranae*, responsible for nosemosis type C. Both microsporidia are obligate intracellular eukaryotic parasites, nowadays classified as fungi. We will focus on *N. ceranae*, which has been associated with reduced honey production, weakness and increased colony mortality. In the last decade, detection of *N. ceranae* infection in honey bees has increased worldwide and most specifically in Southern European countries. Despite numerous recent publications, it is still a challenge for scientists working in the fields of apiculture and insect pathology to carry out research on *Nosema*. Over the years of confronting nosemosis, much effort has been invested in search of effective cure against it. We propose in this study to evaluate the effect of a natural antifungal molecule as a possible treatment to fight this pathogen.

### Methods (up to 3 lines):

You will have to (i) isolate *Nosema* spores, (ii) identify them by MALDI-MS and flow cytometry, (iii) perform infections of bees, (iv) collect and prepare bee tissues for molecular analyses, (iv) evaluate the impact of the molecule on spore's viability and the microbiote of

bees and (v) monitor the presence and effect of the molecule on the immune status of the bee by MALDI-MS.

Up to 3 relevant publications of the team:

1. Arafah K, Voisin S, Masson V, Alaux C, Le Conte Y, Bocquet M, Bulet P: A MALDI-MS Biotyping-like method to address the honeybee health status through computational modelling. Submitted to PNAS
2. Masson V, Arafah K, Voisin S, Bulet P: Comparative Proteomics Studies of Insect Cuticle by Tandem Mass Spectrometry: Application of a Novel Proteomics Approach to the Pea Aphid Cuticular Proteins. PROTEOMICS 2018, 18 (3-4), 1700368. <https://doi.org/10.1002/pmic.201700368>
3. Pisani C, Voisin S, Arafah K, Durand P, Perrard M-H, Guichaoua M-R, Bulet P, Prat O: *Ex Vivo* Assessment of Testicular Toxicity Induced by Carbendazim and Iprodione, Alone or in a Mixture. ALTEX - Altern. Anim. Exp. 2016, 33 (4), 393-413. <https://doi.org/10.14573/altex.1601253>

Requested domains of expertise (up to 5 keywords): Microbiology, biochemistry, chromatography (HPLC) and mass spectrometry (MALDI-MS), immunology and flow cytometry.