



**Ph.D. in Molecular Genetics in Marseilles (France)**

**Impact of Bacteria on Neuronally-Controlled Behavior in *Drosophila***

**Subject**: Our body hosts billions of bacteria that colonize our skin our lungs and our gut. The beneficial effects of some of these microorganisms on the development and functioning of these body parts are well documented. Although recent studies show that by acting on the nervous system, gut-associated bacteria can also change the behavior of infected individuals (1,2), the underlying cellular and molecular mechanisms remain mostly unknown. Our laboratory uses the *Drosophila* model to dissect the molecular dialog between exogenous and endogenous bacteria and the nervous system of the host. We have recently shown that infected flies have an altered behavior and demonstrated that bacteria-derived peptidoglycan is changing the comportment of infected *Drosophila* by modulating NF-kB signaling in few brain octopaminergic neurons (3, 4). Our latest data demonstrate that the same bacteria component, which is the main trigger of the immune response in fly (5), is also sensed by gustatory neurons (6, 7). Using *Drosophila* genetics, CRISPR-mediated genome editing and latest imaging technologies, the student will perform experiments to understand how bacteria modulates the activity of neurons and how this modulation translates into behavioral changes. Given the remarkable evolutionary conservation in host defense and neuronal mechanisms (8), we believe that the results obtained should be of significant relevance to an in-depth understanding of bacteria-neurons interactions in organisms other than *Drosophila* and namely in mammals in which such analyses are more difficult to conduct.

Institut : IBDM, Camps de Luminy, Marseilles (<http://www.ibdm.univ-mrs.fr/>)

Team: <http://www.ibdm.univ-mrs.fr/equipe/immune-response-and-development-in-drosophila/>



**Expected start**:1st January 2023

**Required skills:** Good oral English skills as the entire PhD training will be in English, experience in Neurobiology and fly genetics will help but are not mandatory.

**Contact:** Applicants should send a CV (max 2 pages) a motivation letter (max 1 page) and the email address of two referees to Leo.kurz@univ-amu.fr and Julien.royet@univ-amu.fr.

1. Masuzzo A et al, How Bacteria Impact Host Nervous System and Behaviors: Lessons from Flies and Worms. Trends Neurosci. 2020 Dec;43(12):998-1010.
2. Montanari M and J Royet. Impact of Microorganisms and Parasites on Neuronally Controlled Drosophila Behaviours Cells 2021, 10(9), 2350; https://doi.org/10.3390/cells10092350
3. Kurz CL, et. al. Peptidoglycan sensing by octopaminergic neurons modulates Drosophila oviposition. Elife. 2017 Mar 7;6. pii: e21937.
4. Masuzzo A, et al, Peptidoglycan-dependent NF-κB activation in a small subset of brain octopaminergic neurons controls female oviposition. Elife. 2019 Oct 29;8:e50559. doi: 10.7554/eLife.50559.
5. Charroux B, et al. Cytosolic and Secreted Peptidoglycan-Degrading Enzymes in Drosophila Respectively Control Local and Systemic Immune Responses to Microbiota. Cell Host Microbe. 2018 Feb 14;23(2):215-228.e4.
6. Charroux B, Daian F and Royet J. Drosophila Aversive Behavior toward Erwinia carotovora carotovora Is Mediated by Bitter Neurons and Leukokinin. iScience. 2020 Jun 26;23(6):101152. doi: 10.1016/j.isci.2020.101152.
7. Masuzzo et al., Bacteria-derived peptidoglycan triggers a non-canonical NF-kB dependent response in *Drosophila* gustatory neurons. Journal of Neurosciences. 2022. In press.
8. Gabanyi I ezt al, Bacterial sensing via neuronal Nod2 regulates appetite and body temperature. Science. 2022 Apr 15;376(6590):eabj3986. doi: 10.1126/science.abj3986.