

Offre de stage de Master / Master Internship offer

- **Tuteur du stage et laboratoire d'accueil / Internship supervisor and Host laboratory :**

Team : Functional genomics of host/intestinal bacteria interactions (PI : François Leulier)
Institut de Génomique Fonctionnelle de Lyon (IGFL)

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Additional info :

<http://igfl.ens-lyon.fr/equipes/f.-leulier-functional-genomics-of-host-intestinal-bacteria-interactions>

- **Titre du projet de recherche / Research project title :**

The impact of commensal bacteria on *Drosophila* tissue growth, maturation and coordination upon undernutrition.

- **Description du projet / Project description :**

The juvenile growth period is particularly crucial since undernutrition leads to severe wasting, stunting and in extreme cases, childhood mortality. Importantly, it has been shown that children suffering from malnutrition have a persistent gut immaturity. In this context, the Leulier team has recently revealed using gnotobiotic models (mice and *Drosophila*) the **evolutionarily conserved impact of the intestinal microbiota** on the promotion of linear growth. Specifically, the lab demonstrated that a **single natural fly gut commensal bacteria, *Lactobacillus plantarum*, fully recapitulates the beneficial effect of an intact microbiota by accelerating juvenile growth and maturation rate.** Also, through transcriptomics, metabolomics and functional studies using *Drosophila*, our lab showed that *Lactobacillus plantarum* influences juvenile growth at least partly **through the increased expression of a set of specific intestinal digestive enzymes.** These results strongly suggest a **causative link between microbiome activities, enhanced digestion capabilities and growth promotion.**

In this context, we want to determine whether the linear growth promoting effect of *Lactobacillus plantarum* we observed impacts differently specific organs. Thus, the master trainee will focus on deciphering the molecular mechanisms that sustain **the coordination of organ growth and maturation upon undernutrition and whether (and how) *Lactobacillus plantarum* affects them** by exploiting the well-established *Drosophila/Lactobacillus plantarum* partnership model

Methods used in the laboratory :

Drosophila genetics, RNA-Seq, RT-qPCR, immunohistochemistry, confocal imaging.

Trainee profile : The candidate has to show a great interest for Science in general and be highly motivated by cellular biology, microbiology and/or genetics.

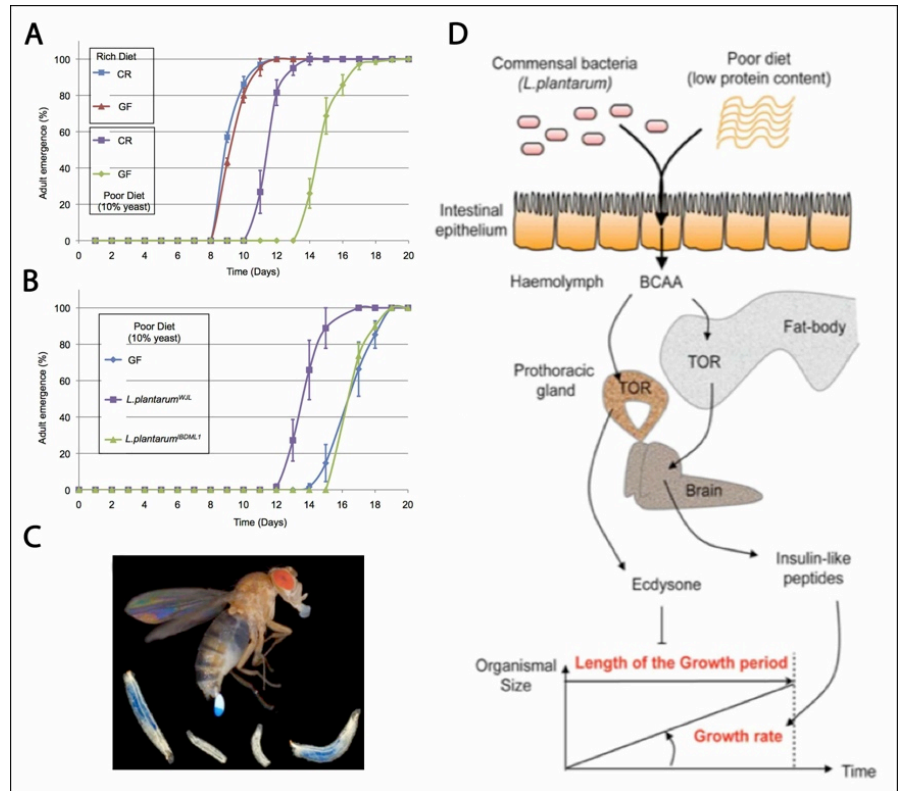
***Lactobacillus plantarum* / *Drosophila melanogaster* mutualistic interaction.**

A) *Drosophila* microbiota accelerates developmental timing upon nutrient scarcity. No change is observed on animals grown on rich diet, while upon nutrient scarcity the GF larvae metamorphosis is delayed. CR: conventionally raised (commensal microbiota); GF: germ free.

B) *L.plantarum* (*Lp*) re-association of GF individual accelerates *Drosophila* development timing in a strain specific manner (*Lp*^{WJL} vs *Lp*^{BDML1}).

C) *L.plantarum* (associated with blue food and faeces) colonizes the host intestine (in both adults and larvae) and is transmitted vertically to progenies and promotes larval growth vs non-colonized larvae (no blue in the intestinal) when grown for six days on a low nutrient diet.

D) Our current model of the integrated action of *L.plantarum* association on its host hormonal system controlling systemic growth. BCAA: branched chain amino acids; TOR: target of rapamycin kinase. From (Storelli et al. 2011).



Publications du laboratoire (5 max) / Lab publications (5 max) :

- **Storelli, G. et al.**, *Drosophila* Perpetuates Nutritional Mutualism by Promoting the Fitness of Its Intestinal Symbiont *Lactobacillus plantarum*. *Cell Metabolism* 27(2), 362–377 (2018).
- **Matos, R. et al.**, D-alanine esterification of teichoic acids contributes to *Lactobacillus plantarum* mediated *Drosophila* growth promotion upon chronic undernutrition. *Nature Microbiology* 2(12), 1635–1647. (2017)
- **Schwarzer, M. et al.** *Lactobacillus plantarum* strain maintains growth of infant mice during chronic undernutrition. *Science* 351, 854–857 (2016).
- **Erkosar, B. et al.** Pathogen Virulence Impedes Mutualist-Mediated Enhancement of Host Juvenile Growth via Inhibition of Protein Digestion. *Cell Host Microbe* 18, 445–455 (2015).
- **Storelli, G. et al.** *Lactobacillus plantarum* promotes *Drosophila* systemic growth by modulating hormonal signals through TOR-dependent nutrient sensing. *Cell Metabolism* 14, 403–414 (2011).