MASTER 2 BMC
PARCOURS GENOPATH
ANNÉE 2024-2025

Titre : Opto-genetic manipulation of individual cells in living animals

Nom, adresse de l'Unité d'accueil / Nom du responsable de l'unité :

Laboratoire de Biologie et Modélisation de la Cellule (LBMC), UMR5239

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Nom, adresse de l'Equipe d'accueil / Nom du responsable d'équipe :

Equipe quantitative regulatory genomics, LBMC / Mirko Francesconi.

Equipe Epigenetic regulation of cell identity and environmental stress response, LBMC/ Francesca Palladino.

Nom, tel, adresse e-mail de l'encadrant de stage : Stage co-encadré par

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Sujet de stage :

Molecular genetics allows to discover causal links between mutations/genes and biological processes, such as molecular regulations, development, cellular adaptation and disease. Model organisms are powerful for this, but available procedures remain limited because we lack the possibility to introduce genetic changes with high temporal and spatial precision. Gael Yvert team has developed a light activated Cre/Lox recombination system to induce specific genetic perturbations using light[1]. This system has been tested in yeast and human cells. We have now introduced it the *C. elegans* nematode model system and have established that LiCre can recombine 2 LoxP sites in this model when induced by blue light (see figure). The objective is now to characterize and optimize the system (illumination conditions/use of a laser beam, temperature, etc…) to systematically study time- and cell- specific genetics in a whole animal. Moreover, we want to use this system in combination with a transgene to rescue RNA interference in a mutant, to be able knock down genes in a cell and time specific manner using light. You will be trained to molecular biology, genetics, and microscopy under the supervision by Mirko Francesconi and Valérie Robert. We expect the work to open a variety of novel and exciting routes of investigations.

Modèle et techniques utilisées :
C. elegans, molecular biology, nematode genetics, microscopy, optogenetics.

Publications d'intérêt :
Original publication of the optogenetic tool
Duplus-Bottin, H. *et al.* A single-chain and fast-responding light-inducible Cre recombinase as a novel optogenetic switch. *eLife* https://elifesciences.org/articles/61268 (2021) doi:10.7554/eLife.61268.
See also the following review articles:
Lorena de Mena et al. 2018 https://doi.org/10.3389/fgene.2018.00518
Salinas et al. 2017 https://link.springer.com/article/10.1007/s00253-017-8178-8