Master de Sciences et Technologies
Mention Biologie Intégrative et Physiologie
Parcours : Neurosciences
Responsable : Professeur Régis Lambert

Internship Proposal
Academic Year 2018-2019

1. Host team :

Research Unit (e.g. Department or Institute): UMR 7221 CNRS-MNHN. Evolution of Endocrine Regulations
Research Unit Director : Dr Giovanni Levi
Research Team Director : Pr Hervé Tostivint
Team name : Development and Evolution of Neurosecretory systems

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2. Internship project title:

Relationships between neuropeptide expression and locomotor activity in the zebrafish

3. Internship Description :

The acquisition of motor autonomy is a key step of development. The zebrafish has recently emerged as a model of choice to study the mechanisms involved in this process. Peptides of the family of urotensin II (UII), collectively called UII-related peptides (URPs) are newly discovered neuropeptides. Not less than four URPs have been identified in zebrafish (UII, URP0, URP1 and URP2) [1]. Their functions are poorly known but a number of preliminary observations made in our team suggest that they may play an important role in the control of motor functions during the early development of zebrafish.
The starting point of this project is a recent study performed in a zebrafish mutant totally devoid of fins (therefore called finless) [2]. This study revealed that some of the URPs (whose exact nature could not be specified because they were revealed using an antibody incapable of discriminating against them) are much more strongly expressed in the mutant than in the wild-type in two particular types of neurons: Mauthner cells and cerebrospinal fluid-contacting neurons. Knowing that these neurons are known to play an important role in the control of motor function [3,4], we hypothesize that the abnormal expression of URPs in the finless mutant is the consequence of its locomotor defect, which could mean that the expression of these peptides is modulated by the level of motor activity of the animals.
In order to test this hypothesis, our project has the following two objectives:

- Confirm by in situ hybridization and quantitative PCR the results obtained by immunohistochemistry and thus specify which URPs genes are actually overexpressed in cerebrospinal fluid-contacting neurons and Mauthner neurons in the finless mutant.

• To determine if the overexpression of URPs in the finless mutant is due to its lack of motility. To do this, evaluate the level of expression of these peptides in other types of fish with motor impairment (genetic origin or caused by pharmacological or surgical treatment).

Techniques practiced during the internship:
In situ hybridization, quantitative PCR, confocal imaging, motor activity recordings

References:

1. Tostivint H., Ocampo Daza D., Bergqvist C.A., Quan F.B, Bougerol M., Lihrmann I, Larhammar D. (2014) Molecular evolution of somatostatin and urotensin II systems. Journal of Molecular Endocrinology 52:T61-T86.
2. Harris MP, Rohner N, Schwarz H, Perathoner S, Konstantinidis P, Nüsslein-Volhard C. (2008) Zebrafish eda and edar mutants reveal conserved and ancestral roles of ectodysplasin signaling in vertebrates. PLoS Genetics 4:e1000206
3. Sillar KT. (2009) Mauthner cells. Curr Biol. 19:R353-5.
4. Orts-Del'Immagine A, Wyart C (2017). Cerebrospinal-fluid-contacting neurons. Curr Biol. 27:R1198-R1200.