



Offer for a Thesis Allowance

Doctoral School of Natural Sciences - ED 211
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THESIS SUBJECT

TITLE: Study of amino acid transporters in rainbow trout

Abstract:

The global expansion of aquaculture over the last three decades is now facing new ecological and economic challenges. It is becoming imperative to overcome them in order to develop this activity in a sustainable manner and thus feed a human population with exponential demographics. One of these challenges stems from the dependence of aquaculture on industrial fishing for the supply of fishmeal and fish oil needed to feed farmed fish. For many years, the scientific community has been working to identify alternatives to fishmeal. At present, the best considered alternative, i.e. the substitution of fishmeal by vegetable meal, still does not ensure optimal growth of fish, especially carnivorous species such as rainbow trout. In fact, despite a rebalancing of the amino acid profile of these new plant-based diets by adding free amino acids to cover the needs of the fish, the growth performance obtained remains below that usually observed with fishmeal-based diets. Previous data, as well as our own preliminary results, suggest that a lack of absorption of the supplemented free amino acids, associated with deregulation of the expression of amino acid transporters, is responsible for the poorer growth performances of fish fed with plant-based diets. In this context, through comprehensive approaches, from molecular and cellular techniques (cell culture) to *in vivo* experimentations, the proposed thesis project aims to identify all the amino acid transporters in rainbow trout and to study their nutrient regulation modes.

Key words: Cell culture, Transporters, Signalling, Amino acid metabolism, autophagy, growth factor, fish, aquaculture

WORKING CONDITIONS

Hosting laboratory: UMR1419 INRAE-UPPA NuMeA

Website: https://www6.bordeaux-aquitaine.inra.fr/st_pee_eng/UR-NuMeA

Thesis Director: Florian Beaumatin

Thesis Co-Director: Iban Seilliez

Localisation address: Aquapôle, 64310 St-Pée-sur-Nivelle, France

Starting date: September 2021

Length: 3 years

Employer: Université de Pau et des Pays de l'Adour (UPPA)

Gross monthly salary: 1878 € (including extra gratification for teaching duties – 32h/year)

LABORATORY EXPERTISE

The NuMÉA unit benefits from experimental facilities, unique in Europe, which gives us a perfect autonomy for carrying out nutrition and metabolism experiments on the complete biological life cycle of rainbow trout. In addition, the unit has all the equipment necessary for molecular (RT-qPCR, Western blot, UPLC-MS...) and cellular studies (primary and cell line cultures). Thus, by combining *in vitro* and *in vivo* approaches, the NuMÉA laboratory's research is based on an integrative biology approach ranging from the study of the regulation of gene expression to the performance of the animal in its rearing system, made possible by a panel of complementary skills and adapted analytical devices.

MISSION – MAIN ACTIVITIES

Scientific framework

Previous results obtained in the lab (Morin et al., 2020) confirmed that amino acids are not only building blocks for protein synthesis but are also signalling molecules controlling anabolic and catabolic pathways in rainbow trout cell lines. Although it has already been shown that dietary amino acids play a major role in the metabolism of rainbow trout - and thus its growth – to date, none of the mechanisms by which amino acids are imported into the cells are known in rainbow trout.

Purpose(s)

In this context, we propose to study amino acid metabolism in rainbow trout, from specific amino acid transporter activities to signalling pathways governed by amino acids. Thus, by combining *in vitro* and *in vivo* experiments, we aim to identify amino acid transporters in trout and study their specificities as well as the outcomes of their different expression levels on trout metabolism and physiology.

Expected results

Altogether this study will considerably help to better understand amino acid metabolism in trout and will offer new strategies to develop appropriate diets for trout aquaculture.

Research collaborations

The successful candidate will work in a young and dynamic group in close collaborations with local, national and international talented scientists. He/she will also be given the opportunity to be involved in the teaching program of the University of Pau for a total of 32 hours per years.

Morin, G., Pinel, K., Dias, K., Seiliez, I., and Beaumatin, F. (2020). RTH-149 Cell Line, a Useful Tool to Decipher Molecular Mechanisms Related to Fish Nutrition. *Cells* 9, 1754.

REQUIRED SKILLS AND COMPETENCES

The ideal candidate has a master degree in biochemistry or cellular biology. He/She is passionate for biology, rigorous and highly motivated. A previous experience in molecular and cell biology techniques would be a plus. The candidate must have a good English level and the capacity to work autonomously.

APPLICATION - EVALUATION CRITERIA

Application file assessment: Selection committee

Candidates will first be selected based on their application file.
Those selected after this first step, will then be interviewed.

Application files will be evaluated based on the following criteria:

- Grades and ranking during your Master degree, steadiness in your academic background
- English proficiency
- Candidate's ability to present her/his work and results
- Work experience similar to an internship in a laboratory – or likewise; previously achieved research work (reports, publications).

APPLICATION FILE COMPOSITION & SUBMISSION DEADLINE

Your application file must be sent by mail and should be made up of the following documents:

- CV
- Cover letter
- Master degree grade transcripts and ranking
- Reference letter
- Contact details of at least two people, from you work environment, who can be contacted for further reference

SUBMISSION DEADLINE:

18th of June 2021

CONTACT PERSON

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