**PhD SUBJECT**

**TITLE:** Development of analytical approaches for species specific isotopic characterization of proteins and biomolecules binding Hg

**ABSTRACT:**

Mercury (Hg) pollution is considered a major environmental problem. Due to its extreme toxicity, Hg has been recently included in the list of the top ten chemicals of major public health concern by the World Health Organization. However, Hg metabolic pathways in biota remain elusive. Its understanding is crucial to elucidate its (eco)toxic effect as well as its biogeochemical cycle. Hg binding with proteins has been evoked as a cause for toxicity and the role of selenium (Se) as antagonist for Hg toxicity is acknowledged but not understood so far. This work will advance the understanding of Hg metabolic pathways in living organisms paying also attention to its (antagonist) interaction with Se. The project is based on the development of new analytical approaches that combines speciation and natural isotopic fractionation in a unique pattern. Speciation provides valuable information about reactivity and potential toxicity of the metabolites. Complementary, the natural abundance isotopic signature adds a dynamic dimension, comprising the life history of the target element, its (pollution) source and reaction tracking. The resulting (bio)molecular and isotopic signature will be precious in the insight of Hg in biota and its detoxification mechanisms, including its relation with Se. On a long term prospective, this highly innovative methodology could be extended to other metal/loids and push back frontiers in life and environmental sciences related to them.

**Keywords:** mercury, selenium, isotopic signature, speciation, HPLC, biomolecules, living organisms

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**WORKING CONDITIONS**

**Laboratoire :** UMR 5254 CNRS-UPPA, Institut des Sciences Analytiques et de Physico-Chimie pour l'Environnement et les Matériaux (IPREM)

**Site web :** www.iprem.univ-pau.fr

**PhD Director:** David AMOUROUX

**PhD co-Director:** Zoyne PEDRERO ZAYAS

**In Collaboration with:** Sylvain Berail (IPREM), Maite Bueno (IPREM), Laurent Ouerdane (IPREM), Emmanuel Tessier (IPREM), Stéphanie Fontagné(INRA)

**Place:** IPREM. Hélioparc, 2 Avenue du Président Angot 64053 Pau cedex 09

**Start:** October 2019  
**Duration:** 3 years

**Employeur (employer):** Université de Pau et des Pays de l’Adour (UPPA)

**Salaire mensuel brut (monthly salary before taxes):** 1685 €

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**HOST LABORATORY PROFILE**

The PhD will principally work at IPREM, specifically, he/she will be member of the Environmental Chemistry and Microbiology Cluster. The working group has a vast experience on environmental and...
analytical chemistry, trace metal speciation, stable isotope tracers and fractionation mechanisms.

To reach the outlined objectives, the project will be supported by the unique instrumental facilities of the host laboratory. This platform possess, among others, the state of the art instruments required for the theses project (MC-ICP-MS, HPLC/GC-ICPMS, LC-ESI-MS/MS).


**MISSION - ACTIVITES PRINCIPALES / MISSION – PRINCIPAL ACTIVITIES**

I. Scientific Context

The PhD student will work on the frame of the research project named MERSEL: “Pushing speciation frontiers for investigation of mercury and its detoxification by selenium in key organisms” funded by the Agence nationale de la recherche (ANR). The analytical method to be developed will allow going well beyond the state of the art knowledge concerning the study of the fate of Hg and Se in the environment, specifically within animals, by being able to correlate speciation and isotopic fractionation of Hg and Se with toxicity status.

II. Objectives

The PhD work will focuses on the development of analytical approaches for species specific isotopic characterization of proteins and biomolecules binding Hg. On line and off line techniques will be used before MC-ICP-MS analyses. On a long term prospective, this highly innovative methodology could be extended to other metal/loids and push back frontiers in life and environmental sciences related to them.

III. Work plan

Several methods will be explored in order to achieve the Hg species specific isotopic composition characterization in biomolecules and proteins binding Hg. Different off line and liquid chromatographic approaches will be tested for direct coupling to multicollector (MC)-ICP-MS. The developed methodology will be applied to the analyses of model fish (organs) from aquaculture and marine mammals.

IV. Literature References

REQUIRED COMPETENCES

The candidate should have a Master (or BAC+5 homologated) on Analytical/Environmental Chemistry or Pharmacy.

Previous experience on hyphenated chromatographic techniques, mass spectrometry or stable isotopes would be appreciated.

CRITERIA USED TO SELECT CANDIDATE

Selection process steps:
- Establishment of the selection committee.
- Evaluation of the applicants’ CVs
- Interview with the selected candidates and ranking.

Criteria used in selection of the candidate:
- The candidate’s motivation, scientific maturity and curiosity.
- Previous experience on hyphenated chromatographic techniques, mass spectrometry or stable isotopes would be appreciated.
- Candidate’s marks and rankings in M1 and M2.
- English proficiency

REQUIRED DOSSIER, DATE

Send an e-mail with your candidature containing):
- CV
- Cover letter detailing candidate’s motivations
- Candidate’s MSc marks and ranking
- Minimum two contact details for 2 referees

Limiting date: 13/05/2019

CONTACTS

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