Postdoctoral position: Role of microbial interactions in mercury methylation

From December 19, 2019 to January 24, 2020

Context

Mercury (Hg) is a persistent pollutant, highly volatile that can be converted into highly toxic methylmercury (MeHg). MeHg is a serious threat as it is a neurotoxic compound, which is bioaccumulated and bioamplified in food webs. Microorganisms play a central role in MeHg conversion, by controlling Hg methylation and MeHg degradation. However, little is known about the cellular, interspecific and environmental mechanisms favouring Hg transformations. The role of microorganisms in biotic transformations of mercury species and their significance with respect to different metabolisms in the same microbial community are hardly known. The microorganisms in their environment interact with each other, for example, primary producers with nutrients recycling microorganisms (Fe, S, C compounds principally), and these interactions can affect the global mercury cycle. The current knowledge in Hg cycle originate from studies of few microorganism models. It is now important to advance these knowledge’s by relating Hg transformations, especially Hg methylation, to environmental relevant microorganisms. Indeed, few microorganisms are known to methylate mercury, although many more are suspected to perform this process but not cultivated yet. Notably, trophic transfers between primary producers and/or heterotrophic methylators are of interest to understand mercury methylation in natural ecosystems. In addition, previous studies have demonstrated the important role of thiol-compounds in mercury transformation, and therefore the transfer of thiols between microorganisms should also be deciphered.

Keywords: mercury speciation, microbial ecophysiology, autotrophs, heterotrophs, sulfate-reducing bacteria, iron reducing bacteria, anoxygenic phototrophs, fermentative, sulphide oxidizers, trophic transfer and thiols

Position and assignments

1. The candidate will work with strains from different metabolic groups, including Desulfobulbus (sulfate reducer), Geobacter (iron reducer), Syntrophobacter (fermentative), and some autotrophs (to be determined). These bacteria are often associated in the environment and are involved in different reactions in mercury cycle. Co-cultures of two or more of these strains will be established in order to decipher the role of microbial interactions (carbon transfer, sulfur recycling, production of thiols, variations in environmental parameters). The genomes of selected strains are sequenced, and some of them can be used as models for genetic purposes.

2. The candidate will also work with natural samples known to efficiently methylate mercury. Indeed, metagenomic data show that many populations that could be involved in mercury
methylation remain uncultivated. Therefore, high-throughput isolation approaches will be used in order to cultivate and isolate new bacterial or archaeal candidates involved in mercury methylation. Their representation in their natural community will be established through barcoding diversity analysis.

The candidate will perform physiological studies to understand the changes in cell growth, gene expression and mercury methylation and speciation.

The post-doc will work with two PhD students, specialist on analytical chemistry and microbial physiology. The candidate should have skills in microbial physiology.

Hosting laboratory: IPREM

The proposed post-doctoral position is part of the project ‘MesMic’ (Metals in Environmental Systems Microbiology) funded by E2S from 2018 to 2022.

MesMic, selected as a ‘Hub E2S-UPPA’ (http://e2s-uppa.eu/en/index.html) is a collaborative and transdisciplinary project involving microbiology and analytical chemistry.

The objective of the project is to unravel metal ion interactions with microbial ecosystems at the molecular, cellular and community levels. 6 PhD and 6 Post-Doctorates are funded by MesMic project.

Post-doc Supervisor: Rémy Guyoneaud

Scientific team:

Molecular microbiologists: M.Goñi, B.Khalfaoui-Hassani, C. Gassie

Microbial physiologists: R.Guyoneaud


3PhD students and 1 post-doc.

Localisation address: IPREM, Université de Pau et des Pays de l’Adour, Pau, Nouvelle-Aquitaine, France

Starting period: spring 2020 to summer 2020

Duration: 1 to 3 years (full-time)

Gross salary: 2960 euros/month (including 64h of teaching)
Funding: This postdoc position is funded by the project E2S UPPA (Energy Environment Solutions) which has a core scientific domain focused on Environment and Energy to meet challenges related to the energy transition, geo-resources, aquatic habitats and the environmental effects of natural and anthropogenic changes.


Requirements

Required competences: Microbial Ecology and Physiology, cultivation of microorganisms; Molecular Biology

Application procedure

Applications must be sent as a single pdf file and must include:

* a CV (max 2 pages)
* a cover letter describing the candidate's motivations, previous research experience and how it is related to the present position (one, or maximum two pages)
* a copy of the candidate's PhD thesis diploma
* candidate's PhD abstract and publications
* two reference letters
* contact details (2 referees, including the PhD supervisor and post-doc supervisor (if applicable))

Selecion criteria and Evaluation

Two steps selection process:

1st step:

* Evaluation of the applicants' files
* Candidates will be contacted by e-mail before January 31st 2020

2nd step: (February 2020, date to be determined)
* Interview of the selected candidates (either at the IPREM or by videoconference)
* Candidates will have 5 min to present their CV, 5 min to present their PhD and 5 min to present their views on the post-doc subject
* Discussion with the candidates for at least 20 min

**Criteria used during the selection of the candidates:**

* The candidate's motivation, scientific maturity and curiosity.
* Candidate's knowledge on microbial ecophysiology and metabolism
* Candidate's publications
* English proficiency
* Candidate's ability to present his work
* Experimental proficiency

**Application deadline**

Please submit your application to Rémy Guyoneaud: remy.guyoneaud@univ-pau.fr before January 24th, 2020, mentioning [Postdoc] in the subject of your email.