Post-Doc fellowship at the Food Microbial Ecology lab.

Micalis Institute. INRAe. (France).

- ## Title of the Project.

Prediction of microbial community-wide metabolic profiles and interactions in two food fermentation models using synthetic microbial ecology approaches.

- ## Context.

Metasimfood (https://www.metasimfood.inrae.fr/) is a French National project funded by the French Research Agency (ANR). It will run from 2022 to 2025 on the field of sustainable food production. The increasing consumption of fermented food and beverages made from vegetables and fruits is among one of the striking diet transition observed in western societies. However, the strong demand for **clean label food** (with no chemical additives) and for **sustainable agricultural practices** leads to unforeseen modifications in the quality and safety of these foods. Generic scientific approaches to understand and anticipate the complex microbial ecology changes are needed, but solutions have to focus on sustainable approaches, like leveraging the potential of microorganisms and their biodiversity rather than modification of the process itself. We will develop a knowledge-based strategy using a Synthetic Ecology approach combining high throughput meta-omics analysis with ecological networks modelling for understanding how new custom made microbial consortia can be built to overcome those changes. Wine and fermented vegetables will be used as two emblematic food models at the heart of this challenge.

- ## About the position topic.

The postdoctoral fellow will have to construct appropriate strategies to mine genomic functional metabolic potential of many bacterial and fungal isolates in order to construct artificial microbial consortia for a synthetic ecology approach. This approach will aim at deciphering the role of microbial diversity and of many other variables (biotic and abiotic) in the metabolic interactions during the fermentation process of our two food models . The main objective is to use appropriate mathematical models including surface response models to estimate the role of each variable in the community functions. It includes the use of growth and predictive metabolic models at the community scale to identify minimal consortia. Finally, ecological network reconstruction will be performed from meta-omics data (metabarcoding, metatranscriptomics and metabolomics) acquired during the project on the food models. This work should bring hypotheses on the evolution of interactions between the microbes during the fermentation and how they are modulated by the community and the type of abiotic variables used.

- ## Location & academic environment.

You will be located at the INRAe research center of Jouy-en-Josas (25 km south-west of Paris) and you will be supervised by two scientists:

1. Stéphane Chaillou, coordinator of MetasimFood project and specialist of food microbiome research at the Micalis Institute. Micalis is a research unit in Food and Gut microbiology for Human Health that host the Food Microbial Ecology lab (http://fme.micalis.fr/). It gathers more than 300 persons working from microbiome science to synthetic microbiology.

2. Mahendra Mariadassou, biostatistician specialized in meta-omics data integration at the MaIAge research unit which gathers about 80 persons working on applied mathematics and bioinformatics for genomics and hosts a HPC facility (https://maiage.mathnum.inrae.fr/en).

In this environment you will become member of the University Paris-Saclay, one of the top ranking University in Europe. At the academic level, University Paris-Saclay represents a community of more than 600 microbiologists. It offers excellent access to many advanced equipment and platforms in Microbiology and to very high level of computational facilities.

• Required profile.

The candidate must have a Ph-D degree with experience in the use of meta-omics data and biostatistics. Knowledge in microbial ecology would be highly welcomed. Dedication and creative mind will be important to conduct the project. Joining a National research project with 6 different partners, the candidate should also be a good team player with excellent communication skills which are key in interdisciplinary research projects and towards different groups of scientists, engineers and technicians. Speaking French is not required to apply and is not a selection criteria.

Technical skills: PhD in bioanalyses, biostatistics, bioinformatics or a related field with relevant expertise in some of the project topics. Experience with R tools are mandatory as well as with high throughput data, analysis, management and integration. Additional experience in metabolic reconstruction and metabolic modelling are appreciated. .

• Start date and duration.

The fellowship is for 30 months (2.5 years-contract) starting on the 1st of July 2023 and ending on the 31st of December 2025, at the end of the project.

Salary: ~2 800 € gross/month (depending on experience)

• How to apply & recruitment process.

Application should be sent to Stéphane Chaillou (stephane.chaillou@inrae.fr) and to Mahendra Mariadassou (mahendra.mariadassou@inrae.fr) and should address :

1. A 2-pages CV including a complete list of publications, research outputs, names and contact information for 2 persons willing to act as referees.
2. A cover letter arguing of the relevance of your profile and your motivation for the position.

Opening date: 1st December 2022.

Closing date: 15st March 2023.

Interviews will be performed between these two dates. It is possible that the candidate would have to perform two auditions. Applications will be evaluated by the two supervisors and 1 or 2 additional scientists from the two research units. Online auditions can be considered for candidates outside France. Auditions will be conducted in English.