



**Ecole Doctorale - 104**

Sciences de la Matière, du Rayonnement  
et de l'Environnement

**ESTABLISHMENT :University of Lille**

**Laboratory(ies) of affiliation :** UMRt BioEcoAgro

**Scientific field, Speciality:**

**DS10 | Food Biotechnology, Food Science, Physiology**

**Thesis director:** François COUTTE, MCF HDR, francois.coutte@polytech-lille.fr

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**Affiliate programme(s):** CPER BiHauts Eco de France / ANR ReBON

**Planned (co)-funding :** Région Hauts de France/Gembloux AgroBioTech (in progress)

**Title of the thesis : Bioinformatics-assisted metabolic engineering for the optimization of *Bacillus* lipopeptide production from renewable resources**

Lipopeptides produced by *Bacillus* represent an important source of active biomolecules. They have shown very promising results as biosurfactants and antimicrobials. One of the obstacles to their widespread use remains the low level of strain production and the cost of fermentation substrates. This interdisciplinary project, combining metabolic engineering and bioinformatics, aims to adapt *Bacillus* metabolism to optimize lipopeptide production using renewable substrates.

The objectives of this project are to

- Develop precise computational algorithms based on the analysis of complex metabolic networks to define efficient metabolic engineering strategies of these networks for a defined objective;
- Use the algorithms to identify the modifications to be made to *Bacillus* metabolism in order to optimize the production of lipopeptides by genetic engineering, using renewable resources as substrates;
- Develop corresponding mutants and evaluate their ability to overproduce lipopeptides on these renewable substrate

This topic will be developed as part of a joint thesis between researchers from UMRt Team 4 (Université de Lille and Gembloux AgroBioTech/Université de Liège) and the BioComputing team from the CRISTAL laboratory. This ten-year collaboration will be supported from 2023 by the ANR ReBON project. This project is also part of the WP2 of the CPER BiHauts Eco de France, as well as the MaisMisVal project funded by the Walloon Region at Gembloux AgroBioTech, which provides half of the thesis funding. Last but not least, it fits in perfectly with the theme of co-product valorization promoted by the Charles Viollette Industrial Chair at the University of Lille.

**Expected date of recruitment :September - October 2024**

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**Additional remarks/comments: :** Thèse en co-tutelle entre la France et la Belgique

