



Biotechnology and
Biological Sciences
Research Council



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EBNet Placement Support
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(PL202404)



Polarographic analysis of bacterial surfactants – onsite at the Lyell Centre, Heriot Watt July 2024

This placement has helped me to improve as a scientist, learn new skills and obtain valuable experience working and discussing with other scientists away from my institution
- Hector de las Heras Prieto, Sheffield Hallam University

Foaming events present a major disturbance in wastewater treatment reactors, potentially leading to decreased treatment efficiency and accidental releases of contaminated water (aligned to EBNet's remit of controlling environmental pollution). These events are caused by excessive growth of filamentous bacteria, including mycobacteria, which produce biosurfactants, soap-like compounds which accumulate and stabilize foam. Mycobacteria have mycolic acids (MA) as major components of their cell walls. I recently developed a method for measurement of MA lipid isomers by cyclic ion mobility-high resolution mass spectrometry. Bulk quantification of biosurfactants produced by mycobacteria along their growth curve, together with analysis of their lipidomic and DOM profiles, has potential to be used as a tool to predict and track foaming events (aligned with EBNet's remit of optimizing engineered microbial systems for environmental protection, including in wastewater treatment). However, the state-of-the-art instrumentation and procedures for biosurfactant analysis and deconstructing DOM size fractions are only found at a limited number of institutions worldwide, and together only at Heriot Watt University.

I had a 1-month placement at the Lyell centre at Heriot Watt University (Edinburgh campus) between June - July 2024, thanks to EBNet's placement award. The placement was a great opportunity to learn new skills in microbiology and biosurfactants analysis, and to have the experience of working in another laboratory with other methodologies during my PhD. These skills will support my post-PhD career development.

The Lyell centre is one of Europe's leading centres in Earth, marine and ecosystem sciences, so it was a privilege to work there during the placement. I met researchers from a variety of fields and our discussions about our diverse projects gave me useful insights and I received good advice for the continuation of my PhD.

During my laboratory work, I learnt about polarography and how to use it to measure surfactant activity in samples. I was trained to confidently use this specialist equipment and to perform daily maintenance on it. During this placement, I cultured mycobacteria (known to produce biosurfactants that cause foaming events in activated sludge reactors in wastewater treatment plants) in different minimal media to induce and measure its biosurfactant production along its growth curve. All this data will help me in my research and, possibly, in finding biomarkers to prevent foaming events and, consequently, decreasing environmental pollution from wastewater.

This placement will hopefully, create a precedent for future collaborations between Sheffield Hallam University and Heriot-Watt University.



[Separation of mycolic acid isomers by cyclic ion mobility-mass spectrometry.](#)

De Las Heras Prieto, H., Cole, L.M., Forbes, S., Palmer, M. and Schwartz-Narbonne, R., 2024. *Rapid Communications in Mass Spectrometry*, 38(23), p.e9917.

For video report on the placement see <https://youtu.be/ctmbOleuvU4>

