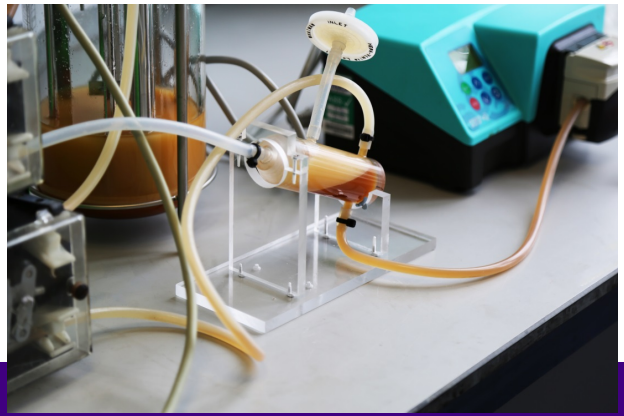
Collaborative development of glycolipid separation technology to reduce costs

BIV funding from BioProNET has enabled James Winterburn and Ben Dolman from The University of Manchester to work with Croda to scale up a new separation technology for the production of high-value glycolipids. Their novel method increases fermentation productivity and yield, and so has potential to reduce costs.

The challenge – Sophorolipids are glycolipid biosurfactants that are used in environmentally friendly cleaning products and cosmetic/personal care products. Yet current fermentation methods are inefficient as the fermentation must be stopped when product concentrations reach a certain value. The use of sophorolipids could be widened — for use in bioremediation and enhanced oil recovery — if production costs can be reduced.

Aims – This project built on the Winterburn Group's previous work showing that separation of sophorolipids from a fermentation broth during production can give higher overall productivities, (patent application 1610932.4**)**. This collaborative project with Croda tested the functionality of the novel separation process at pilot scale.

The collaboration – A high productivity sophorolipid fermentation protocol, using *Candida bombicola* as the producer strain and gravity-based separation of the sophorolipid from the fermentation broth, was carried out at the University of Manchester. A gravity-based separator was then designed and built by University of Manchester engineers for pilot scale (30 l) trials at Croda.



Integrated biosurfactant separation

"The personal development of the research assistant who carried out the work was enhanced through experience of working collaboratively in an industrial environment."

Key findings – Sophorolipid recovery was demonstrated for extended periods, and a total of 550 g sophorolipid was recovered per litre of broth. Both the sophorolipid productivity and the yield were higher than those reported in the literature to date. The separator could recover the phase containing the sophorolipid at over 2 g per hour, a separation rate that makes the system applicable to continuous separation from bioreactors of around 600 times the size, or 200 l working volume, an important achievement given many integrated separation systems cannot be translated from lab scale.

Outcomes and next steps

- Paper entitled 'Characterisation and scale up of integrated production and separation of sophorolipids' in preparation
- EPSRC responsive mode grant in preparation 'Advanced glycolipid biosurfactant processing and separation'
- Potential further work with Croda testing the system at larger scales (>100 l) and with other glycolipid biosurfactants.
- Possible BBSRC DTP CASE studentship to grow the collaboration

Find out more here:
https://www.youtube.com/watch?v=jwT22t5lVKQ

Dolman, B.M. *et al.* (2016) *Process Biochemistry*, 54, 162-171
http://dx.doi.org/10.1016/j.procbio.2016.12.021

"Both the sophorolipid productivity and the yield were higher than those reported in the literature."