

## Modelling of multi-factorial solvent stress on membranes

### The Challenge

Green Biologics converts a wide range of sustainable feedstocks into high performance green chemicals. They combine advanced, high productivity fermentation utilising superior-performing *Clostridium* microbial biocatalysts to produce renewable n-butanol and acetone.

Solventogenic *Clostridia* are used by Green Biologics to generate n-butanol from a variety of feed-stocks providing sugars for fermentation. However, n-butanol is expensive to purify from the fermentation broth. The cost of in-situ solvent removal is greatly decreased by fermenting at higher concentrations of n-butanol. However, n-butanol is toxic to *Clostridia* at concentrations above ~2%.

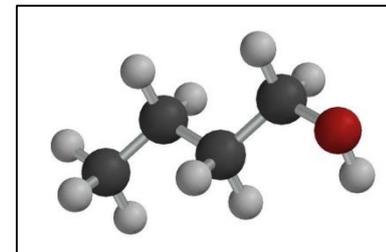
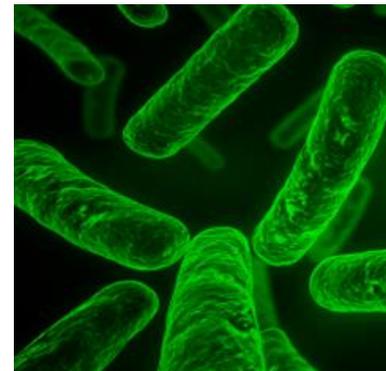
n-Butanol is produced as part of the acetone-butanol-ethanol (ABE) process. Whilst we have previously characterised the damage caused by n-butanol to the cell membrane of *Clostridia*, we have not looked at possible synergistic effects in the presence of other solvents.

### The Research

Dr Alan Goddard is a Lecturer at Aston University. The research in his laboratory focusses mainly on the lipid membrane that surrounds cells and the integral proteins residing within this. He has a particular interest in biochemical and biophysical assays.

Dr Goddard applied for a Vacation Scholarship to further his collaboration with Green Biologics and to allow an undergraduate student the opportunity to undertake a project at the academic-industrial interface.

The project aimed to use a variety of biophysical assays to determine the effects of mixed-solvent environments on membrane stability.



## The Result

Dr Goddard's group obtained results demonstrating that whilst n-butanol has a significant effect on the cell membrane, other solvents produced in the ABE process did not appear to cause membrane disruption at physiological levels. However, it may be the case that strains which are more resistant to n-butanol will encounter concomitantly increased acetone and ethanol levels.

Abigail Sawyer-Parker, an undergraduate Biochemistry student gained valuable laboratory experience as well as the opportunity to work in an interdisciplinary group investigating the effect of solvents on biological membranes.

## The Future

The data generated in this project will feed into a future research council funding application to continue the collaboration between Dr Goddard and Green Biologics Ltd.

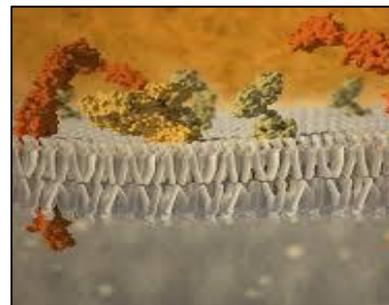
The methods developed during this project have since been applied by undergraduate project students and other researchers in Dr Goddard's laboratory.

*"The CBMNet Vacation Scholarship scheme is an excellent opportunity for students to become engaged in cutting-edge research in the biotechnology field. The industrial engagement and "real world" problems give context to the theoretical background they have learned during their degree and enables them to contribute to a current impactful scientific study."*

Dr Alan Goddard  
University of Aston

*"I really enjoyed my time in the lab - I learnt a lot of things I otherwise wouldn't have got the chance to, and it was really interesting to experience a real research lab and work together to overcome any problems. It's definitely made me want to pursue a research career in the future and I look forward to developing the skills I've learnt."*

Abigail Sawyer-Parker is a second year BSc (Hons) Biochemistry student at the University of Lincoln



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Email: [cbm@sheffield.ac.uk](mailto:cbm@sheffield.ac.uk)  
Telephone: 0114 222 9766

Website: [www.cbmnetnibb.net](http://www.cbmnetnibb.net)  
Twitter: @CBMNet\_NIBB