CBMNet

CROSSING BIOLOGICAL MEMBRANES NETWORK, A BBSRC NIBB

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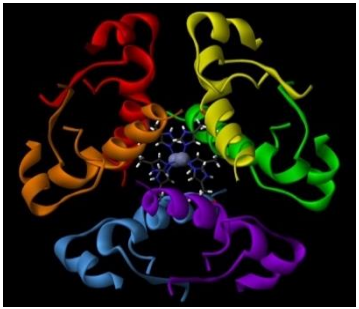
Understanding the production of biologic drugs made using bacteria



CBMNet Vacation Scholarship

The Challenge

Many of the most effective new treatments for cancer, arthritis and other conditions are protein-based biologic drugs that have to be manufactured using living cells such as bacteria. Although high levels of these therapeutic proteins can be produced in bacteria, further downstream processing can lead to low yields of the drug.

Previous research suggested that bacterial "cell factories" can sometimes release these therapeutic proteins prematurely, which could account for the low yield observed in some cases. This research aimed to investigate the phenomenon further, leading to a better understanding of biologic drug production in bacterial cells.

The Research

Dr Teuta Pilizota is a Chancellor's Fellow at the University of Edinburgh. The research in her laboratory focuses on developing novel tools for quantitative observations of changes in physiological parameters in single bacterial cells.

Dr Pilizota applied for a CBMNet Vacation Scholarship, which provided funding for an undergraduate student to carry out this cutting edge research in her laboratory. The project focused on the mechanisms by which the bacterium *Escherichia coli* releases its cellular contents in response to osmotic shock.

The Result

Dr Pilizota's student obtained results confirming that in addition to mechanosensitive channel activity upon osmotic shock, *E. coli* actively excretes cytoplasmic content, possibly by activating efflux pumps. Her student determined the range of external solute concentrations at which this response is observed, and created the bacterial strains required to test the mechanism behind the observed response.

The undergraduate student who undertook the CBMNet Vacation Scholarship developed a strong interest in industrial biotechnology whilst working in Dr Pilizota's lab, and she is hoping to undertake her PhD in this area in the future.

The Future

The data that came out of this project led Dr Pilizota to successfully apply for CBMNet Proof of Concept funding in collaboration with Fujifilm Diosynth Biotechnologies, with the aim of expanding on the initial findings and helping to improve industrial processes at Fujifilm.

Using data from this project, Dr Pilizota also successfully applied with Fujifilm for an IBioIC funded Scholarship for a 4 year PhD project to study osmotic shock in *E. coli*, as well as applying with Fujifilm and other colleagues at the University of Edinburgh for IB Catalyst funding.

"Funding offered by CBMNet has enabled Fujifilm Diosynth Biotechnologies and the Pilizota lab at The University of Edinburgh to carry out translational research based on the academic lab's recent findings. CBMNet has helped inform the Pilizota lab on the challenges faced by the industry and has given Fujifilm access to the latest research findings that would not be translated without this interaction through the network."

Dr Teuta Pilizota, University of Edinburgh

"Following on from initial meetings with Teuta, initiated through CBMNet, it was clear that her laboratory's work had potential to significantly impact on the understanding and performance of our industrial platform. Our joint research will I'm sure increase understanding and provide solutions, but more importantly it will build a longer term relationship between Fujifilm scientists and researchers in Teuta's lab."

Dr Bo Kara, Fujifilm Diosynth

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