CBMNet

CROSSING BIOLOGICAL MEMBRANES NETWORK, A BBSRC NIBB

The University Of Sheffield.

UNIVERSITY of York

BBSRC

Development of a novel technique to characterise membrane transport and its application to metal transport

The Challenge

Metal homeostasis is important in all aspects of life and transport of metals across the membrane is important for the cellular uptake of essential (trace) elements or resistance against toxic levels of metals, which need to be exported.

Understanding how metal transporters function or monitoring metal transport is thus vital for many applications. For instance, engineering the metal uptake of microbes has applications in bioremediation, while export of metals is fundamental for the resistance of microbes against metal-based antimicrobials.

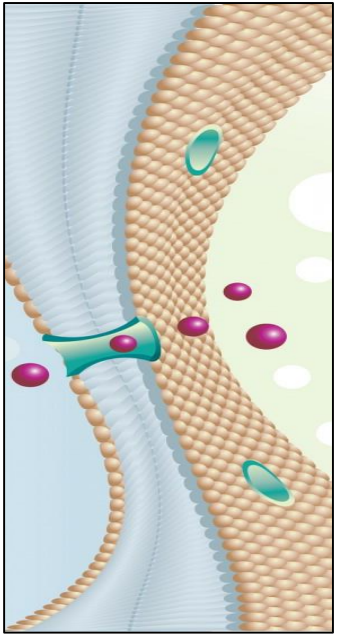
Metal transport across the lipid membrane can, however, be challenging to monitor experimentally, especially in (semi-) high throughput.

The Research

Dr Lars Jeuken is a Reader at the University of Leeds. His research focuses mainly on redox-active membrane proteins and biological electron transfer.

Dr Jeuken applied for a CBMNet Vacation Scholarship which provided funding for an undergraduate student to carry out this cutting edge research in his laboratory.

This vacation studentship aimed to see if a novel electrophysiological technique known as Surfe^{2}r is able to experimental monitor metal transport across the lipid membrane. Five different metal transporters were cloned and expressed in the lab-micro of choice, *Escherichia coli.* Membrane transporters were harvested and the Surfe^{2}r methodology was applied to see if uptake could be detected.



CBMNet Vacation Scholarship

The Result

The results showed that it was very difficult to detect metal uptake in membrane fraction directly taken from microbes, although small signals were detected.

However, when the transporter was purified and then reconstituted in lipid membranes, very good signals were obtained. This means that the Surfe^{2}r technology might be less suitable for high-throughput studies that use crude membrane extracts from bacteria.

In contrast, the technology is very suited for detailed characterisation of transporters. For instance, for a particular transporter from *Enterococcus faecalis* we found that it could transport nickel, zinc and manganese, but not iron.

The Future

This project will now be taken up by a PhD student to fully characterise how certain metal transporter function and how they contribute the maintained the metal homeostasis of bacteria.

Using CBMNet and other networks, we also aim to disseminate our findings and start new collaborations with industry and academics who can benefit from this novel techniques.

"This Vacation Scholarship offered by CMBNet gave an undergraduate student a great experience in membrane protein research, while excellent pilot data was obtained that paved the way to a new research project, which is now taken up by a student on a 4-year Welcome Trust programme."

Dr Lars Jeuken, Reader at the University of Leeds.

"I would like to thank CBMNet for the funding and everybody in the Jeuken research group for helping me to learn valuable research skills in membrane proteins and Industrial Biotechnology."

Mr Kristopher Jones, undergraduate student at the University of Leeds

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