

PhD Studentship

Bacterial cell biology: understanding trafficking of folded proteins

Prof Frank Sargent (University of Dundee)

Project to start: Sept/Oct 2010

Description

The targeting of proteins to their sites of physiological function is an essential feature of all cellular systems. Bacteria are no exception and *Escherichia coli* must target proteins to the inner (plasma) membrane, outer membrane, periplasm (between the two membranes), or completely outwith the cell. The inner membrane is the ionically-sealed energy-transducing membrane and the focus of all respiratory processes. Respiratory ('redox') enzymes are amongst the most complicated of proteins comprising multiple subunits, multiple cofactors, and are often membrane-embedded. Indeed, redox enzymes are localized on both sides of the inner membrane and the cell therefore faces a problem in how to build complex proteins outside the regulated environment of the cytoplasm. One solution is to assemble, fold, and activate a complex enzyme in the cytoplasm *before* the membrane translocation event and *E. coli* contains a targeting system designed for this very purpose. A subset of *E. coli* proteins are synthesized as precursors with signal peptides bearing an SRRxFLK 'twin-arginine' amino acid motif. Such proteins are transported in a folded conformation by the twin-arginine translocation (Tat) system. One *E. coli* Tat-targeted enzyme is the trimethylamine *N*-oxide (TMAO) reductase (TorA), a redox enzyme that binds a molybdenum cofactor prior to export to the periplasm. In order to prevent premature transport of the apoprotein, the signal peptide is bound tightly in the cytoplasm (and so shielded from the Tat transporter) by a chaperone called TorD. This quality-control process is termed 'Tat proofreading'. The overall aim of this project is to understand at the molecular and cellular levels the TorD-mediated Tat proofreading process. Protein-protein interactions are at the heart of this project and live cell imaging and interaction techniques (including Fluorescence Lifetime Imaging Microscopy and other advanced microscopy techniques) will be combined with genetic and biochemical expertise to generate a complete picture of redox enzyme assembly in the bacterial cell. The project will be based within the College of Life Sciences, University of Dundee, but is a formal collaboration with Dr Rory Duncan's laboratory at the University of Edinburgh.

This studentship is funded for 4 years jointly by **SULSA** and the **University of Dundee** and is available to UK and other EU nationals (due to funding criteria) and provides fees and stipend. Applicants should hold (or be about to obtain) a first or upper second class honours degree or equivalent in a related area.

Further information and Application

Further information about this project and the College of Life Sciences can be found at: <http://www.lifesci.dundee.ac.uk/>

Full details of how to apply can be found at: <http://www.lifesci.dundee.ac.uk/phd>

Click here for further information on Dundee <http://www.dundee.ac.uk/> and /or/ Click here for Employer Profile (as per other job adverts from Dundee) <http://www.jobs.ac.uk/profiles/links/63/>