

Molecular mechanisms of action for the Toxin₁₀ insecticidal proteins

Supervisory team:

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Project description:

Insecticidal toxins are a major part of the arsenal of agents available to control pest insects and reduce losses to agriculture. At the same time their use reduces reliance on chemical pesticides and results in greater target specificity and less environmental impact. In order to exploit these agents fully, we need to develop a molecular understanding of their modes of action. Toxin₁₀ family toxins are emerging agents for crop protection but their mechanisms of action in inducing cellular dysfunction and subsequent insect death are poorly understood. However, these mechanisms rely in some way upon specific lipid glycosylation in combination with binding of toxin to a membrane receptor. This cross-disciplinary project will explore these interactions and the underlying toxin activity. Specifically, this project will investigate toxin molecular interactions with receptor proteins and glycolipids and subsequent disruption of cellular function including resulting *in vivo* mechanisms of cell death. The student will gain experience in techniques in protein biochemistry and cell biology including: recombinant protein expression, mutagenesis, crystallisation trials, binding assays, glycolipid analysis, intracellular trafficking and cutting edge cellular imaging. The project will utilise state-of-the-art imaging equipment to track toxin binding and cellular responses to intoxication. These facilities include super-resolution confocal and lightsheet microscopy that will be used to image both cultured cells and whole insects treated with toxins. Understanding this class of toxins, their mechanisms of action and their specificity will facilitate their further development in ecologically friendly biological control programmes and will support our ability to prevent/overcome resistance and to retarget the toxins to new target pests. Applicants for this PhD post with experience and/or degree in biochemistry or cell biology would be favourable.

