

Molecular analysis of the interaction of Bin pesticidal protein with its receptor

Supervisory team:

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Project description:

Bacillus and Lysinibacillus bacteria are able to produce a range of insecticidal toxins that are highly specific for narrow ranges of target insects. This makes them attractive agents for use as biopesticides for the control of pest insects. Specificity is determined by recognition of receptors on target cells but the molecular details of toxin-receptor interactions have not been elucidated for any of these toxins. The Bin toxin of Lysinibacillus sphaericus is selectively active against Culex and Anopheles mosquitoes and the receptor protein, an alpha glycosidase, has been identified. Recognition of this receptor is mediated by the BinB protein and a structure for the latter has been elucidated.

The project will investigate the interaction of BinB and the Cqm1 receptor from Culex quinquefasciatus. The receptor will be produced in recombinant form for crystallisation trials to solve its structure. Complexes of BinB and Cqm1 will be produced for further crystal trials. Regions of the proteins interacting will also be probed by modelling. Cluspro and Rosetta will be used to predict interacting regions. Mutation of toxin and receptor will be used to probe the importance of these regions. The incorporation of unnatural amino acids amenable to photoactivatable cross linking will allow the trapping of complexes. The effects of mutations will be tested in cells in culture and in toxicity bioassays monitoring killing of mosquito larvae.

The student appointed will learn techniques of molecular biology, protein biochemistry, cell culture and structural analysis.