

Identification of plant protein interactors for fungal pathogen effectors by proximity labelling

Supervisory team:

Rothamsted supervisor: Prof Kim Hammond-Kosack (Rothamsted Research)

Academic supervisor: Dr Neil Brown (University of Bath), Dr Ryan Ames (University of Exeter), Dr Mike Deery (Proteomic Facility at the University of Cambridge), Dr Daniel Henk (University of Bath), Prof Alison Lovegrove (Rothamsted Research), Dr Martin Urban (Rothamsted Research)

Host institution: Rothamsted Research (Harpenden)

Submit applications for this project to the University of Bath

Project description:

Ensuring global food security for the ever-growing world's population is a major concern. Fungal pathogens destroy a substantial amount of all food crops each year (~15%). Particularly serious are Fusarium Head blight diseases of wheat caused by cereal infecting Fusaria (figure- see separate ppt image), Dean (2012) Molecular Plant Pathology 13, 414–430. These fungi produce secondary metabolites that include various harmful toxins that allow the pathogens to overcome the host's innate defence system and cause disease.

Fusarium species also secrete proteinaceous effectors that suppress the plant immunity to enable infection. The main scientific aims of this project are (A) to identify and then validate plant protein interactor(s) targeted by these small secreted fungal effectors, (B) to determine the cellular locations of these interactions, and (C) to identify whether specific fungal effector complexes form during the infection process. Various computational protein-protein interaction and network analyses approaches will be learnt and used to identify key plant protein-fungal effector interactors as well as the other common proteins expressed during pathogen infections. Collectively, this information can then be used to inform the development of novel disease control strategies.

The student will gain knowledge on protein-protein interactions and mass spectroscopy, in addition to invaluable training in molecular genetics (fungal transformation and virus induced gene silencing (VIGS) in plants), molecular and biochemical techniques (including the emerging technology of proximity labelling), confocal microscopy and computational biology. This will provide them with excellent transferable skills for careers in biosciences.

The student will spend the 1st six months of their PhD at Rothamsted Research (RRes) undertaking initial research training and specific taught courses. Subsequently, they transfer to the University of Bath (UoB) for a further research training period, before returning to RRes for the full PhD project. The University of Exeter (UoE) will provide training in proteomics and protein interactions analyses. The advisory team includes Dr Brown (UoB), Dr Ames (UoE) and at RRes Drs Urban and Darino and Prof. Kim Hammond-Kosack (main supervisor) and Dr Alison Lovegrove. The student will have access to world class research facilities and will receive outstanding interdisciplinary training from their advisory team. The student will also receive training in how to give oral/poster presentations at laboratory meetings, workshops, national/international conferences, write a scientific paper for peer review and will take part in suitable public outreach events, for example The British Festival of Science.

Selected references: doi 10.3390/microorganisms5010003; 10.1371/journal.ppat.1007666; 10.1111/nph.17116; 10.1046/j.1364-3703.2003.00183.x; 10.1371/journal.pone.0062670; 10.1186/s12862-016-0608-1.

