

The role of Rho GTPases in plant immunity

Supervisory team:

Main supervisor: Dr Michael Deeks (University of Exeter)

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Host institution: University of Exeter (Streatham)

Project description:

This project utilises parallels with mammalian cell biology to better understand plant immunity. Discovering how plants respond to microbial pathogens is of vital importance as 90% of all calorie intake worldwide comes directly from crop plants. During infection, plant cells locate their immune defences to the site of infection with the aim of repelling the invader. In our recent paper (<https://doi.org/10.1016/j.cub.2018.05.014>) we demonstrated that the protein FORMIN4 links the plant cytoskeleton to this immune response. This raises several questions such as: How does the plant cell 'flag' the site of microbial contact as being a special location to deliver cargo like FORMIN4? What are the specific molecules involved? Can we use paradigms from mammal and yeast FORMINs to help solve these questions and will this give us new fundamental insights into the evolution of eukaryotes as a whole?

This project will address these questions by exploring the role of Rho GTPases in plant immunity. Members of this protein family in animals and fungi recruit and activate FORMINs. In plants, Rho GTPases play complex roles in cell growth and development but their relationship to plant FORMINs is mysterious. You will combine advanced live-cell light microscopy with molecular biology and plant pathology. Furthermore you will have the opportunity to learn the multidisciplinary skills needed to quantify data from images and use mathematical modelling to design experiments. You will join a supervisory and research team that are dedicated to integrating 'traditional' wet-lab approaches typical of bioscience research laboratories with hypothesis testing guided by bioinformatics and mathematical modelling. This project is co-supervised by Prof. Harry Mellor at the University of Bristol who is an expert in mammalian FORMINs, Rho GTPases and polarised secretion. Both Exeter supervisors have industrial collaborations and are keen to develop further industrial engagement as part of this project.

