

## How do novel membrane-bound antifungal drug targets control fungal diseases of crops?

This project is one of a number that are in competition for funding from the [South West Biosciences Doctoral Training Partnership \(SWBio DTP\)](#). The DTP offers an interdisciplinary research training programme delivered by a consortium comprising the Universities of Bath, Bristol and Exeter, Cardiff University and Rothamsted Research, alongside six regional associate partners: Marine Biological Association, Plymouth Marine Laboratory, Swansea University, UCB Pharma, University of the West of England and SETSquared Bristol. The partnership has a strong track record in advancing knowledge through high quality research and teaching, in collaboration with industry and government.

Studentships are available for entry in October 2021.

All SWBio DTP projects will follow a structured 4-year PhD model, combining traditional project-focussed studies with a taught first year which includes directed rotation projects.

Lead supervisor: [Prof Karen Edler](#), Department of Chemistry  
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Co-supervisor: Prof Frank Vollmer, (University of Exeter), Dr Neil Brown (University of Bath)

### Project description

**WHY ARE FUNGAL DISEASES A THREAT?** Increasingly fungal pathogens are destroying and contaminating our crops with harmful toxins. New fungicides are needed to ensure sustainable disease control and our future food security. Fusarium Head Blight (FHB) is the most damaging floral disease of cereals worldwide and a serious health hazard, for which there is no effective control.

**ARE FUNGAL MEMBRANE PROTEINS A TARGET FOR CONTROL?** Fungal membrane proteins are key cellular components and signalling molecules, with many being essential for life and/or disease (Brown, Nature Microbiology doi:10.1038/s41564-018-0127-5). This includes Fusarium receptors and transporters required for FHB and toxin contamination of wheat (Dilks, Plos Pathogens doi:10.1371/journal.ppat.1007666). But we do not have effective tools to study fungal proteins in their native membrane environment. This impedes our understanding of their functions and their development as novel fungicide targets.

**HOW DO FUNGI SENSE THEIR HOST TO PROMOTE DISEASE?** Here, we will combine technological advances in nanotechnology, biophysics and gene editing to study how fungal membrane proteins sense their host plant environment and promote disease. We will use of styrene maleic acid lipid particles (SMALPs) to isolate Fusarium proteins in their native membranes (doi:10.1021/acs.biomac.7b01539; doi:10.1007/s12274-014-0560-6). Subsequently, we will use single-molecule photonics and scattering techniques to study their structures, interactions and functions at an unprecedented scale (doi:/10.1038/s41467-020-15822-8; doi:10.1126/sciadv.1603044). Insights into these dynamic protein structures and functions will then be validated by fungal gene editing and the importance to FHB and toxin contamination on wheat confirmed.

**WHAT IMPACT WILL THIS HAVE?** This research will deliver a cutting-edge platform to study fungal membrane proteins, with 'transferable' applications to many pathogens, opening fungal membrane proteins as new avenues for fungicide discovery. This FHB study will serve as a proof-of-principle, by

advancing our fundamental understanding of why Fusarium membrane proteins are essential for disease, while providing tools to develop novel approaches to inhibit their function and combat FHB.

HOW WILL WE SUPPORT THE STUDENT? Collectively, we offer the student advanced cross-disciplinary training in plant pathology, nanotechnology and structural biology, applying molecular, biochemical and biophysical approaches. The expert supervisory Bath and Exeter teams have a proven track record in funding and publishing high quality science. The student will join their vibrant Infection & Immunity team (Bath) and the interdisciplinary community of the Living Systems Institute (Exeter), plus their associated postgraduate support communities. They will benefit from spending significant time at both institutions and gain expert mentoring from the diverse supervisory team, enhancing their career development opportunities.

### Applications

Applicants must have obtained, or be about to obtain, a First or Upper Second Class UK Honours degree, or the equivalent qualifications gained outside the UK, in an appropriate area of science or technology.

Informal enquiries are welcomed and should be addressed to the lead supervisor.

Enquiries about the application process should be addressed to [doctoraladmissions@bath.ac.uk](mailto:doctoraladmissions@bath.ac.uk).

Formal applications should be submitted on the [University of Bath's online application form for a PhD in Biosciences](#). Please ensure that you quote the supervisor's name and project title in the 'Your research interests' section. You may apply for more than one project if you wish but you should submit a separate personal statement relevant to each one.

If you are an EU/EEA/Swiss national with settled or pre-settled status in the UK under the EU Settlement Scheme, please upload documentary evidence with your application.

More information about applying for a PhD at Bath may be found on our [website](#).

The deadline for the receipt of applications is **Monday 7 December 2020 (23:59 GMT)**.