PhD Project Advertisement

Project title: Development of novel tests to evaluate the food safety risk associated with mycotoxigenic fungi in wheat

Project No: FBS2023-61-Verheecke-Vaessen-cq

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Co-supervisors:

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Project description:

Between 2013 and 2021, 16% of the Food Safety Agency incidents of biological origin were due to mycotoxins – toxic fungal secondary metabolites[1]. Within the UK, wheat is the main food product subject to mycotoxin occurrence with up to 60% of the crops contaminated[2]. With wheat production representing £2.4B (2018)[3] annually in the UK, there is a need to secure this production within the UK mycotoxin regulations[4].

In the UK, the mycotoxins of most concern are Fusarium deoxynivalenol (DON) and zearalenone (ZON) and Penicillium Ochratoxin A (OTA). There is a need to develop techniques that can give an accurate and quantitative representation of the mycobiota and microbiota.

The aim of this project is to develop a new technique to efficiently predict the mycotoxin-associated food safety risk. The objectives are:

1. At Cranfield University (CU), develop long-read sequencing-based DNA analysis protocol for wheat, focussed on the detection of the relevant pathogenic fungi, with maximal resolution (ideally up to strain level), including both – experimental procedures and bioinformatics pipeline,
2. Validate the accuracy and quantification capacity of long-read data analysis on artificial in vitro trials, using in-house prepared mixes with varying known proportions of the fungal strains,
3. Analysis of real-life samples collected from wheat producing farms (available through connections with the National Farming Union) integrating the metagenomic data and mycotoxin quantification using the metabolite sensors techniques (Cranfield and Queen's University Belfast).

Training opportunities:

The student will receive a very cohesive and complementary plan of opportunities. At Cranfield, the student will be part of two groups:

1. The Applied Mycology Group with expertise in fungal ecology, ecophysiology, analytical chemistry, and molecular biology which will help the student in significantly enhancing their fundamental and applied research expertise.
2. The Bioinformatics Group with expertise in long reads sequencing and metagenomic data analysis and machine learning development.

Co-supervision from these groups will give the researcher the opportunity to attend MSc course modules in our Applied Bioinformatics, Food Systems and Management, and Future Food Sustainability courses which will provide excellent background knowledge on data analysis, programming, food diagnostics, food mycology and the food security agenda. In addition, Cranfield provides through the Doctoral Researchers' Core Development (DRCD) programme training in project and time management, scientific writing skills, statistics and data management, and presentation skills.

The student will also have the chance to spend 2 months at the diagnostics lab (QUB) with excellent facilities and the PhD student will be trained on these techniques through the placement at QUB.

The student will also interact with farmers through the local National Farming Union to develop their understanding of the Agrifood sector.

Student profile:

A student with a background and/or experience in bioinformatics/metagenomics is recommended although not mandatory. Experience with PCR design may be an advantage (again: not mandatory). Additionally, skills in either food microbiology/mycology, molecular biology and/or chemistry would be appropriate for this type of project. Training will be made available for the areas where needed by the student. Thus, someone with a background in the Agrifood sector with the right focus for developing additional and complimentary skills would be appropriate for this studentship.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2022/23 this will be £17,668 and this will increase slightly each year at rate set by UKRI.

Equality Diversity and Inclusion:

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher(DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the [FoodBioSystems DTP website](#).

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.

References:

https://www.mdpi.com/2072-6651/14/9/592/htmhttps://www.pacb.com/products-and-services/applications/complex-populations/microbial/

https://nanoporetech.com/applications/metagenomics

https://www.nature.com/articles/s41467-019-13036-1

https://journals.asm.org/doi/10.1128/spectrum.02017-21

https://nanoporetech.com/resource-centre/using-ribosomal-operons-species-identification

For up to date information on funding eligibility, studentship rates and part time registration, please visit the [FoodBioSystems website](#).