**University of Leicester**

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| **Project Reference** | BRC Studentships |

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| **Additional Supervisor** |  |

**Section 2 – *Project Information***

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| **Project Title** | ​The relationship between environmental fungi and clinical fungal infections in patients with chronic respiratory disease ​ |
| **Project Highlights:** | 1. | Using culture and genomic analysis, explore the environmental sources of *Aspergillus* *fumigatus* and the genomic evolution associated with disease |
| 2. | Using next generation sequencing techniques, investigate the relationship between the respiratory microbiome and *Aspergillus* *fumigatus* infection to model potential impact of microbial interaction and patient outcomes |
| 3. | Explore clinically relevant interkingdom associations involved in the evolution of fungal disease phenotypes using co-culture experiments with both clinical and environmental isolates |
| **Project Summary**  |
| **Background**: ​Fungal diseases, ranging from allergic, to superficial infections or severe invasive disease, affect around a billion people worldwide with over 1.5 million deaths. In 2022 the WHO published their first fungal priority pathogen list emphasising the need for improved mycological research, better diagnostics and highlighting the risks of increasing antifungal resistance (1).  Indoor and outdoor air pollution is an important source of fungal exposure and it is estimated that we inhale between 1,000 and 10 billion fungal spores daily from our environment. The recent publication of the death of 2 year old Awaab Ishak, as a direct result of prolonged exposure to mould has brought the impact of environmental fungal exposure into the public interest. In patients with chronic respiratory conditions, fungal infections are associated with increased disease severity, exacerbations and mortality (2). Despite this our understanding of the relationship between environmental exposure and infection is in its infancy. *Aspergillus* spp. are some of the most frequently isolated filamentous fungi from air samples. It is therefore unsurprising that *A. fumigatus* is also the most frequently cultured filamentous fungal species identified from lung samples. Despite this there are large gaps in our knowledge of fungal infections and the influence of environmental exposures on the development of disease. **Aim**: ​This multidisciplinary project aims to explore the associations between environmental and clinical fungal strains and their relationship to clinical outcomes using a combination of microbiological, microbial ecology and modelling techniques​. This exciting project is hosted by the University of Leicester Centre of Environmental Health and Sustainability with support from NIHR Biomedical Research Centre. The student will gain extensive knowledge of some of the most important chronic respiratory conditions in humans and employ state-of-the-art techniques, including metagenomic sequencing, pathogenicity testing and interkingdom microbiological modelling. They will have the opportunity to explore the mechanisms of fungal airway infection and understand the link between environmental exposures and clinical outcomes.   |
| **References**1. WHO fungal priority pathogens list to guide research, development and public health action. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO.
2. Hong G., Alby K., Ng S.C.W., Fleck V. Kubrak C., Rubenstein R.C. et al. The presence of Aspergillus fumigatus is associated with worse respiratory quality of life in cystic fibrosis. J Cyst Fibros. 2020; 19: 125-130
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