**University of Leicester**

**Future 50 PhD Scholarship**

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| **Project Reference** | RS Cuthbertson |

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**Section 2 – *Project Information***

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| **Project Title** | **Novel methods for the identification of *Aspergillus fumigatus* in chronic respiratory disease** |
| **Project Highlights:** | 1. | You will study *Aspergillus* spp. infection in the respiratory tract of patients with chronic respiratory disease using innovative culture techniques and next generation sequencing that will allow you to model the impacts of *Aspergillus* infection on disease progression using the patient metadata.  |
| 2. | You will explore the mechanisms of how *A. fumigatus* leads to symptomatic infection in co-culture models with respiratory epithelial cells and determine changes in epithelial cell and fungal gene expression associated with clinically relevant stages of fungal infection using RT-qPCR and RNA sequencing methodologies |
| 3. | You will collect clinical and environmental isolates of *A. fumigatus to* evaluate in respiratory epithelial cell co-culture models to establish key biomarkers associated with symptomatic respiratory infections.  |
| **Project Summary**  |
| Fungal diseases affect around a billion people worldwide. These infections range from allergic disease, to superficial infections or severe invasive disease. Patients with chronic respiratory conditions are particularly vulnerable to fungal infections and these often play a key role in poor clinical outcomes. Despite the risk that fungal respiratory infections pose to these patients, diagnosis is challenging. This is related to slow fungal growth and range of morphologies making them difficult to identify using standard culture. *Aspergillus* spp. are some of the most frequently isolated filamentous fungi from air samples. It is therefore unsurprising that *A. fumigatus* is one of the most frequently cultured fungal species identified in samples obtained from the lungs of patients with chronic respiratory disease such as cystic fibrosis*.* Infection with *A. fumigatus* is associated with worse airway structural damage and decreased lung function as well as frequent pulmonary exacerbations. However, recent culture independent studies have shown frequent *A. fumigatus* colonisation in patients with no symptomatic fungal infection. Establishing the prevalence of *Aspergillus* colonisation in respiratory tract of patients is a key step in understanding the impact of fungal colonisation on disease progression. Using a mixture of culture independent screening methodologies and human airway epithelial co-culture this exciting project will explore *Aspergillus* spp. in the respiratory tract with the aims of establishing the clinical risk factors associated with colonisation and identify the key biomarkers for the diagnosis of *A. fumigatus* respiratory infections. This exciting project is hosted by the University of Leicester NIHR Biomedical Research Centre, and will benefit from the £26 million NIHR infrastructure fund awarded in 2022. You will gain extensive knowledge of some of the most important chronic respiratory conditions in humans and employ state-of-the-art techniques to study fungal airway disease and the mechanisms of how fungi damage airways. This knowledge may lead to the development of new diagnostics and treatments against invasive fungal airway disease in the future. |