**University of Leicester**

**College of Life Sciences**

**CLS / HPRU Grant studentship**

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| **First Supervisor** | Prof Julie Morrissey  |
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| **Second Supervisor** | Dr Emma Marczylo, UK Health Security Agency (UKHSA) |

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| **Additional Supervisor** | Emma-Jane Goode emma-jane.goode@ukhsa.gov.uk |

**Section 2 – *Project Information***

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| **Project Title** | **The impact of particulate air pollutants on bacteria and how pollutant-adapted bacteria interact with human respiratory epithelium** |
| **Project Summary**  |
| **Project description** Air pollution is a major risk to human health, exacerbating respiratory diseases such as chronic respiratory disease (COPD, asthma) and acute and chronic infectious diseases (e.g. pneumonia, chronic rhinosinusitis), antimicrobial resistance and disruption of human microbiomes. Our interdisciplinary research shows that air-borne particulate pollutants interact directly with bacteria to potentiate infection, irrespective of the effect of pollutants on the host. We found that physical interaction of bacteria with the particulate pollutant, black carbon, results in an atypical pattern of gene expression, increasing colonisation of abiotic and biotic surfaces including the respiratory tract. Notably pollutant-adapted bacteria show increased tolerance to antibiotics including antibiotic of last resort for methicillin resistant Staphylococcus aureus (MRSA).All bacteria investigated show similar phenotypic responses e.g. Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenzae and Moraxella catarrhalis but all have different global transcriptional responses. We still do not understand how particulate interaction with the bacterial cell surface changes gene expression. Additionally, understanding of how air pollutants alter bacterial interaction with the human respiratory tract is still severely lacking.This aim of this project is to increase understanding of the biological mechanisms involved in the relationship between pollutant-adapted bacteria and respiratory tract health to lead to novel therapeutic strategies for COPD, asthma or other chronic infectious diseases.Our objectives are to1. Understand how pollution-adapted bacteria effect respiratory tract integrity and immune responses.
2. Determine the importance of particulate-regulated biological pathways in infection and antimicrobial resistance.

The student will be supervised by a multi-disciplinary project supervisory team Morrissey (UoL), Marczylo and Goode (UKHSA) and will be well-provided with all the necessary training and facilities. The student will be registered with the University of Leicester for the PhD but will spend time at UKHSA becoming familiar with UKHSA public health and expertise with epithelial models. Expected outcomes and training. The student will benefit from being part of large inter-disciplinary Health Protection Research Unit (HPRU) funded by the National Institute of Health Research (NIHR) at the University of Leicester (UoL). The student will be part of a lively and friendly interdisciplinary research group and will be trained in a wide range of methodologies including molecular microbiology, mammalian tissue culture, omics methodologies, and advanced microscopy. Additionally, the student will benefit from active research project meetings with respiratory and infectious disease clinicians and chemists, and association with the NIHR Biomedical Research Centre and Health Protection Research Unit, and UK Health Science Agency. |