

University of Leicester

PhD Project Template

Please complete all fields and email to pgr3i@le.ac.uk

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| Project Title | The effects of air pollution on the allergenicity and pathogenicity of respiratory fungi |
| Supervisors (2 Max) Include email addresses | Dr Catherine Pashley chp5@leicester.ac.uk |
| | Dr Julie Morrissey jam26@leicester.ac.uk |
| Funding Status | <u>Self-Funded Students Only</u> |
| Application Deadline date | Ongoing |
| Project Description (max 700 words) | <p>Allergies in children and adults have increased, with studies suggesting this may result from increased susceptibility due to increased exposure to urban pollutants. Some pollutants affect the immune system and modulate airway diseases such as asthma by increasing the release of inflammatory mediators. Furthermore, there is evidence that air pollution may interact with airborne allergens such as pollens and fungal spores enhancing the risk of atopic sensitisation and exacerbation of symptoms in sensitised individuals.</p> <p>Particulate matter (PM) is the principal component of indoor and outdoor air pollution. Growing epidemiologic evidence suggests that inhalation of airborne PM increases respiratory mortality and morbidity and produces a range of adverse respiratory health outcomes, and recent evidence suggests it may increase the colonisation ability of some respiratory bacteria ¹.</p> <p>Ambient inhalable PM readily adhere to free airborne allergens released by bioaerosols, potentially modulating their allergenicity. PM can adhere to pollen grains making the cell wall more fragile and liable to release the allergenic contents. Fine particles have also been shown to enhance the production of specific IgE in mice exposed to the sensitising pollen, and in atopic humans the inflammatory response was shown to be greater-than-additive ².</p> <p>Little work has been carried out on airborne fungal spores although gaseous air pollution has been shown to increase the allergenicity of <i>Aspergillus fumigatus</i> ³. Many airborne fungi are capable of causing disease by direct infection, toxicoses, or allergy. Allergy to fungi is common in asthma, particularly among individuals with severe asthma. Most fungi are unable to grow at body temperature, however, thermotolerant fungi, such as <i>Aspergillus fumigatus</i>, have the ability to act as both aeroallergens and as colonisers of the airway and are associated with poorer lung function ^{4, 5}.</p> <p>Hypothesis: PM can induce changes to the allergenic potency and pathogenicity of respiratory fungi</p> |

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| | <p>Research plan:</p> <p>This project will focus on fungi of potential importance in asthma pathogenesis. You will look at the effects of black carbon, a major component of air pollution particulate matter, on the growth and allergenicity of the fungi themselves. Furthermore you will investigate the impact of black carbon on the human inflammatory response to the fungi. You will learn a wide range of techniques in the disciplines of microbiology, mycology and molecular biology including culture, ELISA, ex vivo models, imaging and Real Time PCR.</p> |
| References | <ol style="list-style-type: none"> 1. Hussey SJK, Purves J, Allcock N, Fernandes VE, Monks PS, Ketley JM, et al. Air pollution alters Staphylococcus aureus and Streptococcus pneumoniae biofilms, antibiotic tolerance and colonisation. <i>Environmental Microbiology</i> 2017; 19:1868-80. 2. Senechal H, Visez N, Charpin D, Shahali Y, Peltre G, Biolley J-P, et al. A Review of the Effects of Major Atmospheric Pollutants on Pollen Grains, Pollen Content, and Allergenicity. <i>TheScientificWorldJournal</i> 2015; 2015:940243-. 3. Lang-Yona N, Shuster-Meiseles T, Mazar Y, Yarden O, Rudich Y. Impact of urban air pollution on the allergenicity of <i>Aspergillus fumigatus</i> conidia: Outdoor exposure study supported by laboratory experiments. <i>Science of the Total Environment</i> 2016; 541:365-71. 4. Fairs A, Agbetile J, Hargadon B, Bourne M, Monteiro WR, Brightling CE, et al. IgE sensitization to <i>Aspergillus fumigatus</i> is associated with reduced lung function in asthma. <i>American Journal of Respiratory and Critical Care Medicine</i> 2010; 182:1362-8. 5. Agbetile J, Fairs A, Desai D, Hargadon B, Bourne M, Mutalithas K, et al. Isolation of filamentous fungi from sputum in asthma is associated with reduced post-bronchodilator FEV1. <i>Clinical and Experimental Allergy</i> 2012; 42:782–91. |
| Funding Information | This is a self-funded project. |
| Link to online Application web page | https://www2.le.ac.uk/research-degrees/phd/applyphd |
| Email enquiries to (name and email address) | Dr Catherine Pashley, chp5@leicester.ac.uk and Dr Julie Morrissey, jam26@leicester.ac.uk |
| Telephone enquiries (name and phone number) | |