

Project Title	Systems biology approach for mechanistic understanding of paediatric asthma exacerbations
Supervisor	Dr Reiko Tanaka
Theme(s)	Computational and theoretical modelling
Project Type	Desk Based
Project Description	<p>Asthma is the most common chronic disease of childhood, affecting up to 10% of children in Westernised societies and 200,000,000 individuals worldwide. Many factors indicate the importance of the microbiome in asthma. Asthma is rare in rural societies, and its prevalence has been increasing markedly in the developing world as populations become urbanised. Exacerbations of asthma are often precipitated by otherwise trivial viral infections.</p> <p>Our studies have shown that the normal human airways contain a characteristic microbiome that is altered in children and adults with the illness. Asthmatic airways contain an excess of pathogens (which may damage the airways) and also lack particular commensal species that may be necessary for normal airway functions.</p> <p>This project will take a systems biology approach, by combining experiments with primary bronchial epithelial cells, in silico modelling, and clinical data analysis, to elucidate the effects of the airway bacterial microbiome in asthma, and the role of epithelium barrier integrity in disease initiation and control. We already have - a preliminary mathematical model that will be used to quantify the dynamic interactions among pathogen, commensals at the airway surface, the airway barrier and the immune system, - preliminary data from in vitro experiments, and - clinical data to be analysed.</p> <p>The student(s) will conduct several computational methods to identify the model structures and model parameters, using MATLAB.</p>