PhD Studentship in Immunology and Inflammation

Department of Immunology and Inflammation

Hammersmith Campus

Imperial College London

**Project title:** Integrative proteo-genomic analysis to investigative immune-mediated disease aetiology

We are offering an exciting 3.5 year PhD studentship within the Department of Immunology and Inflammation at Imperial College London funded by UK Research and Innovation (UKRI).

Familial genetic diseases are monogenic (i.e., caused by a mutation in a single gene). However, most common diseases do not follow a Mendelian pattern of inheritance and are instead polygenic (i.e., influenced by many genes). The disease risk conferred by any particular genomic locus is typically small but nevertheless the cumulative load of risk alleles across a large number of susceptibility loci probabilistically confers a substantial effect. This can be quantified using a polygenic risk score (PRS), which provides a measure of an individual’s genetic predisposition to a particular disease. The PRS is calculated by the summing the number of risk alleles, each weighted by its estimated effect size. Individuals in a population typically form a Gaussian distribution in terms of their PRS for a given common disease.

To date, research on PRS has largely focussed on their utility in disease risk prediction. However, their use in understanding disease biology and aetiology remains largely unexplored.In this project, we seek to utilise PRS to identify the pathways that mediate disease pathogenesis, focussing on immune-mediated diseases (IMDs). IMDs (e.g. rheumatoid arthritis and inflammatory bowel disease) are, like most common diseases, polygenic. Proteins are the effector molecules by which genes mediate disease risk and the targets of most drugs. In particular, circulating proteins, such as cytokines, chemokines, soluble receptors and growth factors, play important roles in immune and inflammatory responses, and therapeutic targeting of these molecules has proven a highly effective therapeutic strategy in IMDs.In this project, we propose to examine how genetic risk for a range of IMDs impacts the circulating proteome. This should highlight key aetiological pathways and potential therapeutic targets and drug repurposing opportunities.

This PhD will be a data science project, involving analysis of genomic and proteomic data. The project will provide the student excellent training in data science approaches including working with data at scale (both in terms of number of samples and number of features). In particular, the data will include two high-dimensional ‘-omic’ domains. Data skills developed will include coding, data wrangling, visualisation and advanced statistical analysis, particularly statistical genetics and causal inference using Mendelian randomisation. The supervisor, Dr Peters is a clinician scientist with formal training in computational biology and extensive experience in data science and multi-omics (former HDR UK Innovation Fellow). Thus the PhD will be interdisciplinary, bridging both biomedicine and data science.

Applicants must hold (or obtain by September 2024) a first or upper-second-class honours degree or equivalent in Life Sciences, Computer Science or Applied Statistics. A Master’s degree in computational biology, genetic epidemiology, or health data science or similar is desirable but not essential. The ability to program using the R language is highly desirable. Applicants must also meet Imperial College’s English language requirements – further details can be found at   <https://www.imperial.ac.uk/study/pg/apply/requirements/english/>.

Funding includes course fees at the Home fee rate ([Faculty of Medicine | Imperial students | Imperial College London](https://www.imperial.ac.uk/students/fees-and-funding/tuition-fees/postgraduate-tuition-fees/2023-24/postgraduate-research-programmes/faculty-of-medicine/)) for 36 months and a tax‐free stipend of £20,622 (in 2023/2024) for 42 months. Funding for overseas fees is not provided.

Applicants should submit their CV and a cover letter (max 1 page) outlining why they wish to undertake this studentship and any relevant previous experience, including full contact details of two referees, to James Peters (j.peters@imperial.ac.uk)

All Imperial College London PhD [entry requirements](https://www.imperial.ac.uk/study/help-centre/postgraduate-admissions/-what-are-the-entry-requirements-and-what-qualifications-do-you-accept.php) must be met and the successful applicant will subsequently need to [apply online](https://www.imperial.ac.uk/study/apply/postgraduate-doctoral/).

We look forward to receiving applications from all candidates and will select those who display the potential to become world-leading researchers of the future based on their application and performance at an interview.

For further information about the research or queries about the application process please contact James Peters ([j.peters@imperial.ac.uk](mailto:j.peters@imperial.ac.uk)) We regret that due to the large volume of applications received, we are only able to notify those shortlisted for interview.

The deadline for applications is 24th July 2024