WTDTP Projects for September 2023

Project Reference: T1/62

Project Title: **Phenome wide association studies of the human leukocyte antigen region**

Theme(s): Theme 1: Genomics for drug development & pharmacogenetics

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Department: Health Sciences

Project Summary: The human leukocyte antigen (HLA) genes code proteins that present foreign antigens to the adaptive immune system, providing protection from pathogens. HLA genes are also heavily associated with several autoimmune diseases which have higher prevalence in females. The full impact of the HLA on human disease is not completely understood and has not been fully explored in resources such as UK Biobank.

To answer these questions the project will use genetic and healthcare data from the 500,000 participants in UK Biobank with advanced genomic techniques to impute the HLA region and perform phenome wide association analyses (PheWAS) and sex interaction analyses, progressing to analysis of sequenced data. The analyses would be the largest of its kind and provide significant insights into the wide-ranging effects of the HLA on human disease and the role of that sex plays in combination with the HLA.

Anticipated new data and established industry partnerships provide for several possible project extensions and/or an industry placement, including the study of other complex genomic variation, gene-gene interactions, multi-ancestry studies and use of findings to inform drug development. The project would suit a student with strong computational skills and a biological/genomics knowledge. Strong statistical skills would be an advantage.