Research Theme
Metabolic Disorders

Research Project Title
Novel Biomarkers for Early Prediction and Diagnosis of Type1 Diabetes

Principal Investigator
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Co-supervisor
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Project Description
Type 1 diabetes mellitus (T1D) is a chronic autoimmune condition and remains a widespread disease in adults and in children alike imposing an increased health burden worldwide including Singapore. T1D occurs when beta cells, the insulin-producing cells of the pancreas, die off to the extent the body is unable to produce enough insulin, which is needed for glucose utilization. A fundamental problem in current diabetes care is the inability of prediction and early diagnosis of T1D, mainly due to marked disease heterogeneity and lack of sensitive, reliable and cost-effective tools. Moreover, delayed diagnosis of T1D can limit therapeutic options available to the patient resulting in severe illness or death. Thus, it becomes important to identify and develop novel biomarkers for early prediction and diagnosis of T1D for screening and monitoring of disease progression, treatment selection and therapy responses.

The aim of this PhD project is to comprehensively analyze blood and urine samples from T1D patients in Singapore cohort and identify differentially present molecules that could be developed as biomarkers. Samples from age-matched healthy controls, first degree relatives of T1D patients (both suffering and healthy, if available) and possibly twin-pairs of T1D will be included in the analysis. Utilizing cutting-edge technologies and ultra-sensitive detection methods, we will perform high content imaging, transcriptomics, proteomics, metabolomics and bioinformatics analyses to detect signature genes, proteins, peptides and/or enzymes associated with T1D (aim1). Subsequently, using a number of cellular, biochemical and imaging assays we will verify the status of a panel of selected candidate molecules (aim2). A subset of the identified candidate molecules will then be investigated for the development of diagnostic biomarkers (aim3).

The student will work as a team with the co-supervisor and clinicians in close collaboration with the SingHealth to address the current clinical need for improved diabetes diagnostics. He/she will gain specialized training in biomarker development with techniques to include cell culture, proteomics, immunophenotyping, microscopy, cellular, molecular, biochemical and metabolic assays. The knowledge gained through this work will advance the understanding of T1D with broader implications in health and diseases. He/she will write scientific papers that will form the basis of his/her PhD thesis.
Contact Us

If you have questions regarding this project, please email the Principal Investigator.

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