Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia and is together with its associated complications such as ischaemic heart disease and stroke one of the top three leading causes of premature death and ill-health in Singapore. While leukocytes form an important defence mechanism in our body, the role of leukocytes in pathobiology of diabetes and its associated vascular complications remains poorly understood. However, recent evidence suggest that leukocytes act as a driver of the chronic inflammatory state in diabetic patients. This project focuses on developing novel microfluidic point-of-care technologies to enable multi-parametric leukocyte phenotypic and functional profiling in T2DM patients with and without vascular complications. If abnormal leukocyte phenotypes are associated with endothelial dysfunction, the assays can be further developed into point of care testing methods for endothelial function as part of routine monitoring to look at the sum effects of diabetes, hypertension and hyperlipidemia on a prototypic pro-inflammatory phenotype. This can provide insights into the association between alterations of established cardiovascular risk factors, abnormal leukocyte phenotypes and endothelial dysfunction and enable proper identification and stratification of patients with chronic (vascular) diseases including diabetes.

In this project, the student will develop microfluidic strategies to isolate leukocyte subtypes from whole blood for immunophenotyping and characterization of (pro)inflammatory functions (leukocyte rolling and chemotaxis) in type 2 diabetes (T2DM) patients. These technologies will be used in pilot clinical-experimental studies to characterize diabetes patient to identify surrogate biomarkers for endothelial dysfunction, arterial stiffness, peripheral markers of inflammation and oxidative stress. This interdisciplinary work provides extensive research training in engineering (BioMEMs, microfabrication), biology (molecular biology and immunology) and clinical-experimental medicine (related to a major chronic disease such as diabetes mellitus).
Contact Us
If you have questions regarding this project, please email the Principal Investigator.

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