LKCMedicine PhD Research Project Submission Form

### Research Theme (Please indicate as appropriate)

- [ ] Dermatology & Skin Biology
- [ ] Health Systems & Population Health
- [x] Metabolic Disorders
- [ ] Medical Education
- [ ] Family Medicine & Primary Care
- [ ] Infection & Immunity
- [ ] Neuroscience & Mental Health
- [ ] Others (Please specify):

### Research Project Title:

Metabolic tissue macrophages and their impact on health and Type-2 diabetes.

### Project Description:

Beyond simply phagosomes, macrophages are phenotypically and metabolically diverse depending on the tissue microenvironment where they are localized. The pancreatic islet, the source of key metabolic hormones insulin and glucagon, is no exception. Islet macrophages are found to be not only phenotypically but also developmentally distinct from the surrounding exocrine macrophages and their numbers increase during obesity. However, their exact role on pancreatic hormonal regulation in healthy and Type-2 diabetic conditions remains unclear. This project seeks to examine the paracrine role of distinct macrophage sub-populations in controlling insulin secretion and whole body glucose regulation taking advantage of novel transgenic mice and diet-induced diabetes mouse models. In parallel, to mouse experiments, corresponding human tissues will be analysed to unravel the islet-resident macrophage contribution to the development of Type-2 diabetes in humans.

### Brief summary of main Methodologies and/or Techniques to be learned during the proposed PhD (experimental or analytical):

- Animal modelling especially on Type-2 diabetes. Culture of human and mouse islets and related cell-lines. Flow cytometry, immunofluorescence (microscopy) and related immunological methods. Coordination of transcriptome studies and analysis of gene expression.
- Metabolic measurements including glucose and insulin tolerance tests.

**Keywords:** macrophages, insulin, pancreatic islets, type-2 diabetes, obesity
**Supervisor(s)**

**Primary Supervisor**
Name of Supervisor: Yusuf Ali  
Designation: Assistant Professor  
Email: yusuf.ali@ntu.edu.sg  

**Co-Supervisor** *(need not be determined at this time)*
Name of Supervisor: Christiane Ruedl  
Designation: Professor  
Email: Ruedl@ntu.edu.sg

**Main Location of Research Work** *(Please indicate as appropriate)*
- ☐ LKCMedicine Experimental Medicine Building @ Yunnan Campus
- ☒ LKCMedicine Clinical Sciences Building @ Novena Campus
Others *(Please specify)*:

**Other Information**

1. Does the proposal need IRB’s approval?  
   ☒ Yes  ☐ No
   If “Yes”, is the IRB’s approval in place?  
   ☒ Yes  ☐ No
2. Does the project involve contact with patients?  
   ☐ Yes  ☒ No
3. Is there a potential for overseas academic exchange as part of this research project?  
   ☐ Yes  ☒ No
   If “Yes”, please specify:

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