Project proposal template
Graduate School studentships
March 2015

Project title	Oral delivery of insulin for diabetes therapy: Development and evaluation of insulin loaded polymer/lipid based carrier systems
First Supervisor	Dr — Anil Vangala
Second Supervisor	Mark Carew
School	Pharmacy and Chemistry
Other member of supervisory team (no more than three KU supervisors in total)	Dr Jean Christophe Nebel, Prof Raid Alany
Specific requirements beyond 2:1 degree	

Project summary

(max 4,000 characters)

Diabetes is a chronic metabolic disorder that affects nearly 500 million people worldwide. Its hallmark feature, hyperglycaemia is caused due to insulin deficiency and/or resistance. Poor patient compliance of subcutaneous insulin injections warrants development of a formulation for alternative non-invasive administration. The current study aims to develop a polymer/lipid based carrier system for oral delivery of insulin. Specific objectives of this study include formulation of polymer/lipid based micro/nanoparticles followed by a critical evaluation of their characteristics i.e. particle size, surface properties, loading-efficiency, computational modelling of molecular interactions etc. Evaluation of the release profile of insulin following the loading of micro/nanoparticles into enteric-coated gelatin capsules; their protection efficiency in simulated-gastrointestinal media would also be carried out. Morphological analysis of the micro/nanoparticles using electron microscopy, evaluation of the toxicity of these formulations and permeation of insulin across epithelial cell monolayer (e.g. Caco-2 cells) would be undertaken. The in vivo hypoglycaemic activity of formulated insulin would also be investigated following its administration via oral route using a rat model. It is anticipated, based on the previous evidence, that the micro/nanoparticulate system once released from the capsule would enhance insulin absorption through the intestinal barrier, presumably by opening up the epithelial tight-junctions thus enhancing insulin bioavailability. This project entails mastering of a variety of analytical techniques by the student during the course of the project which include HPLC, LC-MS (liquid chromatography coupled with a mass spectrophotometer), NMR (nuclear magnetic resonance spectroscopy), ELISA (Enzyme-linked immunosorbent Assay), molecular modelling, cell-culture techniques to name a few. The supervisory team brings in a range of expertise into the project which gives a multi-disciplinary approach to the project.