Project proposal template
Graduate School studentships
March 2015

Project title	Formulation and characterisation of antiretroviral nanoparticles for Human Immunodeficiency virus (HIV) treatment and prevention strategies
First Supervisor	Dr — Dhaya Perumal
Second Supervisor	Dr Hossein Ashrafi
School	Pharmacy and Chemistry
Other member of supervisory team (no more than three KU supervisors in total)	Professor Raid Alany; Professor Robin Shattock, Imperial College, UK (External supervisor)
Specific requirements beyond 2:1 degree	Research project experience will be an advantage

Project summary

(max 4,000 characters)

Since the Human Immunodeficiency virus was first clinically described in 1981, almost 39 million people have died worldwide as a result of the epidemic. It is currently estimated that about 35 million adults and children world-wide were living with HIV at the end of 2013 (UNAIDS/WHO, 2014). Almost 1 in every 20 adults in Sub-Saharan Africa are infected, accounting for nearly 71% of the people living with HIV worldwide. At least 7000 individuals are newly infected with HIV each day, with 10% occurring in young persons under 15 years (http://www.unaids.org). http://www.who.int/gho/hiv/en/

Currently, no cure exists but highly active antiretroviral therapy (HAART) remains the most effective means of delaying progression to AIDS. Twenty seven drugs from different classes act in various stages of the viral life cycle to block reverse transcriptase, integrase, protease, co-receptor binding and fusion to host cells. The inability of HAART drugs to reach HIV reservoirs in the body, their low oral bioavailability, short half-lives and reduced patient compliance all contribute to the development of viral resistance.

Recently, it has been shown that injection of long-acting HIV drugs can completely prevent infection of monkeys by improving efficacy. This study combines pharmaceutics and cellular biology and proposes to continue our current work to explore the formulation and characterisation of nanoparticulate dosage forms that specifically target immune cells infected by HIV. These nanoparticles engineered with ligands will, due to their nano-size, allow crossing of biological barriers whilst simultaneously protecting the drug molecule. They will target specific immune cells, and enhance cellular uptake and permeation to result in the attainment of efficacious concentrations in bodily tissues where HIV infects or remains dormant to re-infect later. The anti-retroviral nanoparticulate strategy, once formulated and characterised, will also be tested in a prevention of virus transmission as well as in and HIV infection model.