Project: Systems biology approach to elucidate the mechanisms of T cell development and homeostasis.

Primary supervisor name: Dr Reiko Tanaka
Email: r.tanaka@imperial.ac.uk
Laboratory website: http://www.bg.ic.ac.uk/research/r.tanaka/welcome.html/Welcome.html

Secondary supervisor name: n/a
Email: 
Laboratory website: 

Project background

This project uses a combined approach of experiments and mathematical modelling to reveal molecular- and systems-level mechanisms on how T cells are generated and maintained.

T cells are a specialised subset of lymphocytes that coordinate the activities of other immune cells, and generate specific and rapid responses to pathogens. Some viruses, such as HIV, target T cells and thereby cause the major symptoms of acquired immune deficiency syndrome (AIDS). T cells randomly rearrange their T cell receptor (TCR) gene in the thymus to achieve their specificity and diversities to antigens, so that any antigens can be recognised by some of the T cell repertoire.

The T cell system which regulates immunity to pathogens and on vaccination is controlled mainly by memory T cells (Tmem) and regulatory T cells (Treg). However, research on how Treg and Tmem interact and coordinate to achieve appropriate immune regulation has been technically difficult. Using a combination of multiple approaches, including immunology, molecular biology, and computational biology, this project aims to reveal the dynamic regulation mechanisms of the T cell system, especially the roles of TCR signal and other key signals in the regulation of different T cell populations.

We already have transgenic animal models and a preliminary mathematical models. The model analysis will be conducted using Matlab. This challenging project is appropriate for students who have very strong mathematical skills.