The adaptive immune system consists of B-cells and T-cells

1) B-cells produce antibody to both detect and destroy bacteria
2) T-cells detect bacteria indirectly via a "T-cell receptor", which identifies bacterial proteins on the outside of infected cells
3) T-cells attack by releasing other soluble proteins ("cytokines")

Epithelial cells in the thymus filter out non-functional, and potentially harmful T-cells

- The thymus is divided into two regions, cortex and medulla
- Each region is home to specialized epithelial cells; cortical cells (red), and medullary cells (blue)

1) Non-functioning T-cells receive death signals from cortical cells
2) Potentially autoimmune cells receive death signals from medullary cells

Thymic epithelial cells may be a useful treatment target in cancer and autoimmunity

1) If we remove medullary epithelial cells, we increase the production of T-cells which protect against cancer and infection

1) What happens if we increase the number of medullary epithelial cells?
   - Can we increase the production of regulatory cells?
   - This could be used to treat autoimmune diseases

Introduction and Overview
The thymus is the unique site of production of T-cells, an essential arm of the adaptive immune system which is targeted by vaccinations as a defense against infectious diseases. In generating a potent cohort of pathogen-clearing T-cells, small numbers of cells capable of attacking tissues within the body are also produced. Under normal conditions these are kept in check by "regulatory" cells, however if the balance of "auto-immune" and regulatory cells is altered, it has the potential to trigger autoimmune diseases, such as rheumatoid arthritis and diabetes.

Using mouse models, we aim to investigate the potential to manipulate thymic production of anti-inflammatory T-cells to aid treatment of autoimmune disease.