# What Is Immunology?

Immunology is the study of the immune system, which is responsible for protecting the body from foreign cells such as viruses, bacteria and parasites. Immune system cells called T and B [lymphocytes](http://www.joslin.org/about/immunology_research.html#Lymphocytes) identify and destroy these invaders. The lymphocytes usually recognize and ignore the body’s own tissue (a condition called immunological self-tolerance), but certain autoimmune disorders trigger a malfunction in the immune response causing an attack on the body’s own cells due to a loss of immune tolerance.

## **Immunology and Diabetes**

Type 1 diabetes is an [autoimmune disease](http://www.joslin.org/about/immunology_research.html#Autoimmune%20disease) that occurs when the immune system mistakenly attacks insulin-producing [islet cells](http://www.joslin.org/about/immunology_research.html#Islet%20cells) in the pancreas. This attack begins years before type 1 diabetes becomes evident, so by the time someone is diagnosed, extensive damage has already been done and the ability to produce insulin is lost.

It is unknown how and why diabetes causes a loss of immunological self-tolerance, but solving this mystery is important:

* Understanding this problem could lead to new prevention methods and reveal a way to intervene and rebuild immune tolerance early in the disease process.
* Islet transplantation and stem cell therapy hold great promise, but the success of both methods is limited by the need for immunosuppressive drugs to protect the new islet cells from immune attack.

## **Joslin Researchers Are Searching for Answers**

* How does the immune system usually maintain immune tolerance and prevent autoimmune attack?
* How are molecular and cellular processes different in people with diabetes, and how do these differences trigger the disease?
* How can autoimmune attack and type 1 diabetes be detected early on? Is there a way to observe damage in the pancreas through advanced technology?
* Is it possible to prevent the autoimmune attack that triggers diabetes? Can immunological tolerance be restored?

## **Most Commonly Used Terms**

**Autoimmune disease**:disorder of the body’s immune system in which the immune system mistakenly attacks and destroys body tissue considered foreign.

**Islet cells:** cells found within the pancreas, clustered in formations called islets. These cells make insulin and are also called pancreatic beta cells.

**Lymphocytes:** immune system cells that identify and destroy foreign agents such as viruses, bacteria and parasites.

## **Mechanisms of and Therapies for Type 1 Diabetes**

The major goal of these laboratories is to elucidate the immunological mechanisms underlying type 1 diabetes mellitus and to exploit the resultant knowledge to develop novel disease therapies.

The NOD mouse model, which spontaneously develops an autoimmune disease strikingly similar to human type 1 diabetes, is employed to investigate the immunology and genetics of leukocyte invasion into the pancreatic islets and the consequent destruction of b cells. Engineered mouse models are also used extensively to highlight particular facets of pathophysiology.

Studies on diabetes patients are aimed at developing methods to permit better prediction of disease initiation as well as more accurate monitoring of its progression or reversal. The genetics of human diabetes is also studied to aid dissection of disease mechanisms. A certain number of pilot clinical trials to prevent, halt or monitor type 1 diabetes are currently in progress.

This section’s efforts constitute a broad bench-to-bedside-back-to-bench approach, and exploit a number of cutting-edge technologies.

Genetics, genomics, proteomics, bioinformatics, imaging, immunomodulation, bioenginering, gene-targeted mice, CHIPs, Treg cells and clinical trials are all part of its working vocabulary.