

ADAPTIVE IMMUNITY

Antigen Presentation: Macrophages go around engulfing and “sampling” any foreign particle or cell within the body. Once they have done this, they “present” a fragment of this cell on the surface of the macrophage.

Recognition by a Helper T cell: Meanwhile, helper T cells are circulating throughout the body. Each T cell only recognizes one particular peptide in the whole world. When a T cell encounters a macrophage, the T cell compares all of the antigens on the surface of the macrophage with the sequence that T cell is capable of recognizing. If any of them are a “match” then the T cell becomes activated. Adaptive immunity is underway!

Activated Helper T cells do three main things:

1. **Activate cytotoxic T cells**
 - a. these cells divide into two kinds of offspring:
 - more cytotoxic t cells that kill pathogens or cause sick cells (virally infected cells or cancerous host cells) to undergo apoptosis (programmed cell death).
 - memory cells that will continue circulating for many years after the initial exposure, ready to fight again.
2. **Activate B cells**
 - a. these cells divide into two kinds of offspring:
 - called plasma cells that produce antibodies
 - memory cells that continue to circulate long after the initial exposure.
3. **Further stimulate inflammation**

Regulatory (Suppressor) T cells have two primary functions:

1. **Inhibit further immune function after a threat has been eliminated**
2. **Encourage tolerance of self-antigens to prevent autoimmunity**

Why would adaptive immunity fail?

*If there is no helper T cell in the body that is capable of recognizing a peptide on the pathogen, adaptive immunity will fail.

* The process of recognizing a pathogen and developing antibodies to it takes approximately 7 days. If the pathogen makes the person so sick they die sooner than that, adaptive immunity has failed.

Allergies: Helper T cells that recognize a peptide that is part of the diet (wheat gluten is a very common example that results in celiac disease) or the environment (e.g. pollen).

Autoimmunity: Helper T cells that recognize a peptide that exists on healthy cells within your own body. As you will see, this will ultimately result in the continued destruction of that type of cell. Well-known autoimmune diseases include: lupus, type I diabetes, multiple sclerosis, and rheumatoid arthritis.

***Autoimmunity is often a result of an allergy.** The antibodies made to the allergen (e.g. pollen or gluten) cross-react and bind to a host tissue (e.g. cartilage in a joint, or myelin on a neuron).

What may predispose people to allergies (and therefore autoimmunity)?

*The greater variety of exposure to plants, animals, mud, feces, worms, bacteria, viruses, etc, during the first few years of life is inversely related to the risk of allergies and autoimmune diseases.