

Disease

Disease is a failure of homeostasis. When an organism is working well, as they are meant to, the organism is said to have a homeostatic condition or is in the state of homeostasis.

What are the causes of disease or disruption of homeostasis?

1. **Pathogens** are microbes (microscopic organisms), that cause disease. They can be **bacteria, viruses, fungi, worms**, and **protozoa**. Not all microbes cause disease. Humans have beneficial microbes in and on them. However, if a microbe causes disease then it can be called a pathogen.
2. **Toxins/Poisons** - toxins can cause disease by killing cells or interfering with normal chemical reactions
3. **Inheritance** - some diseases can be inherited. Color blindness, hemophilia, etc...
4. **Organ Malfunction** - sometimes organs stop working correctly. Kidneys, hearts, lungs, etc., can fail.
5. **Poor Lifestyle** - bad diet, no exercise, prolonged anger, intoxicants (alcohol, drugs, smoking).
6. **Cancer** - cancer is an uncontrolled division of abnormal dysfunctional cells.

Antigens - any foreign substance.

The immune system can respond to Antigens. The surface of any cell has molecules (antigens) that allow them to be detected as foreign.

The next page has the information on how antigens are dealt with.

The Immune System

What do we need to know about this topic?

1. The parts of the immune system
2. How those parts help prevent and fight disease
3. Medical techniques (vaccinations) that help the immune system
4. Disorders affecting the immune system.

1. Parts of the immune system

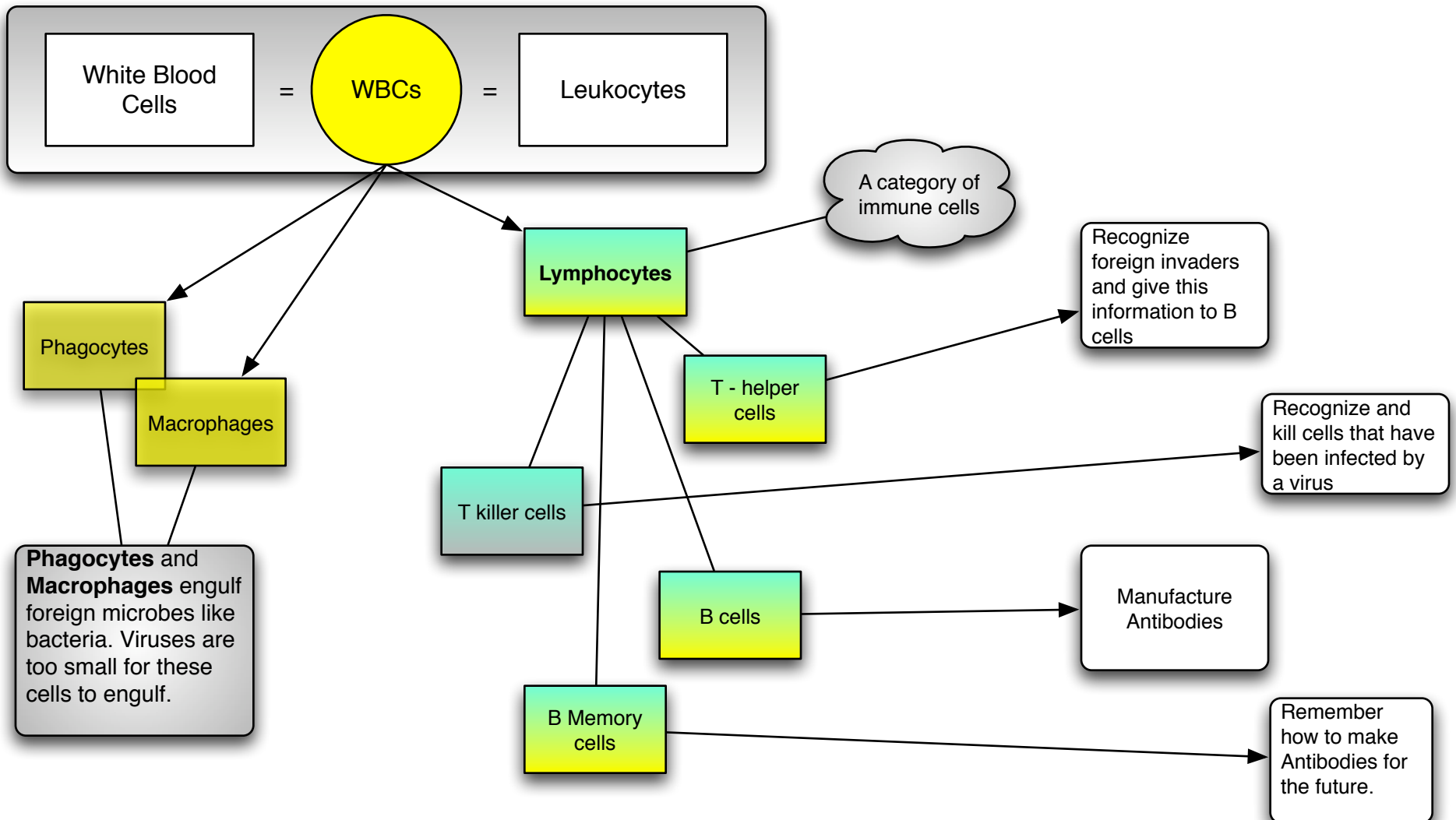
The immune system can be divided into two main divisions the **cellular** aspect and the **non-cellular** aspect.

Cellular

Non-Cellular

1. Parts of the immune system

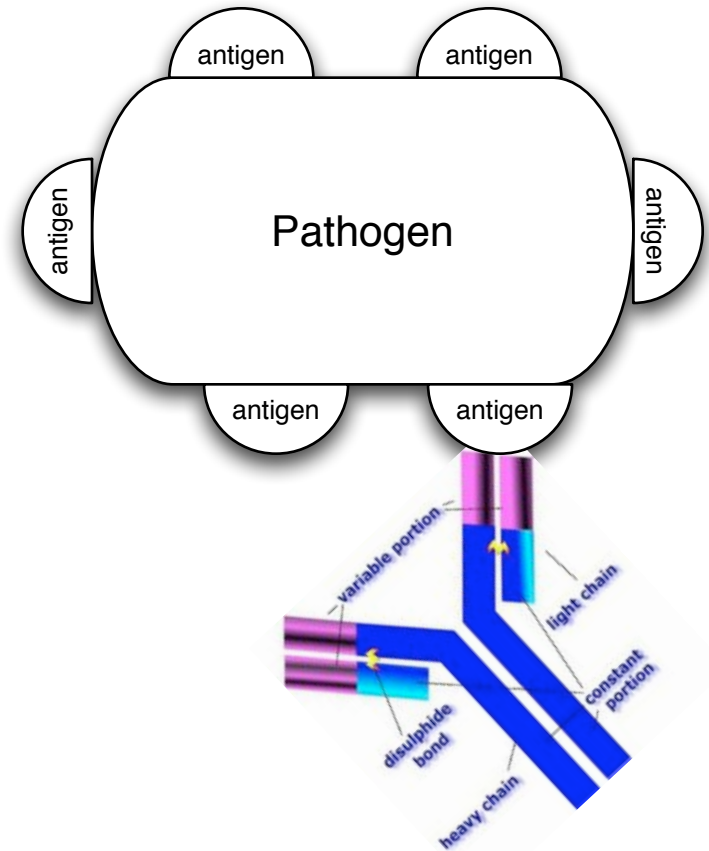
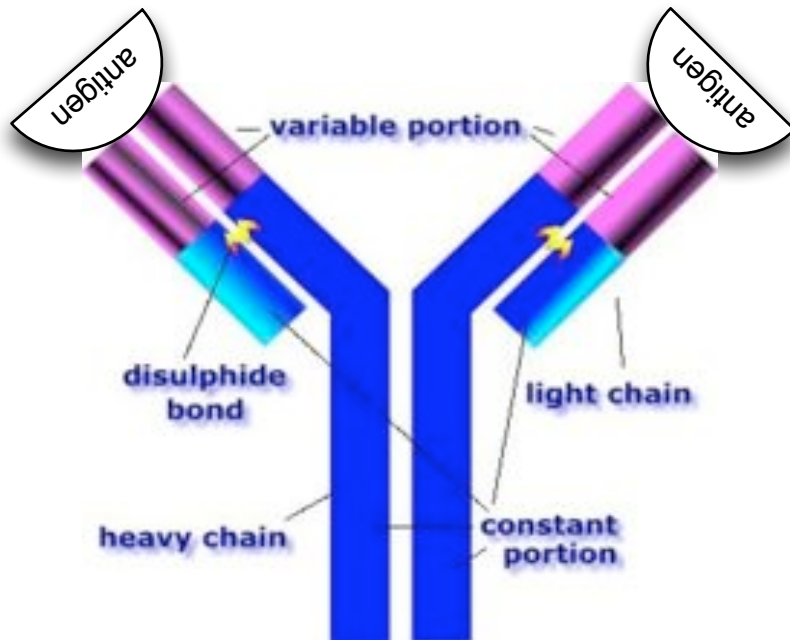
Cellular Parts



1. Parts of the immune system

Non-Cellular

Antibodies



Antibodies are proteins that connect with foreign substances (Antigens)

Summary of the Immune response

The ability of the body to defend itself against pathogens or poisons depends on the immune system. The **T helper cells** have the ability to recognize **antigens** (foreign substance). Once this is done, other cells (**B cells**) must make special molecules out of *protein* that attach to the **antigen**. These special molecules are called **Antibodies**.

This process can take 10-15 days.

Once the immune response has occurred, **B memory cells** can make those exact **antibodies** in the future within hours if the **antigen** is encountered again. This is why many diseases are not usually caught twice.

T killer cells can destroy cells that have been infected by viruses. They are not involved in making antibodies.

Examine the images in the previous pages to become familiar with this summary.

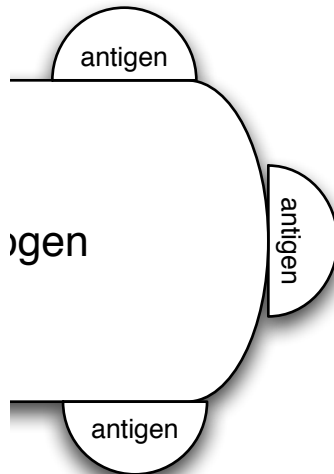
Vaccinations

Vaccination is the process of administering **weakened** or **dead pathogens** to a healthy person or animal, with the intent of offering immunity against a form of a disease.

1.

get a
pathogen

2. weaken or kill the
pathogen



3. Injected into person →

4. Allow
Immune
Response

5.

B memory
cells

React to and defeat →

real
pathogen

Disorders of the Immune System

1. **Immunodeficiencies** - when the immune system is not working well. It can have several causes. malnutrition, old age, cancer treatments, leukemia, and HIV.

HIV - immunodeficiency Virus - this virus infects T - helper cells. This can lead to the condition called AIDS (Acquired Immunodeficiency Disease)

2. **Allergies** - an *overreaction* to common substances such as a particular food. A substance called **histamine** is released by the body when there is a foreign substance. It causes inflammation. This inflammation can cause asthma, skin lesions, excessive itching associated with allergies.

Treatment - a drug called an antihistamine can help or prevent these reactions.

3. **Autoimmune disorders** - sometimes the immune system recognizes "self" as foreign and attacks the body. Lupus is such a disease , it can be deadly.

4. **Rejection** of transplanted organs - organs from another person are foreign (antigens). One must take drugs to stop the immune system from attacking the new organs.

Research and Progress Against Disease

Biological Research of Diseases	
Category of Research	Methods Developed
Diagnosing disease	<p>Culturing (growing) bacteria from the infected person to determine what specific pathogen is responsible for the illness</p> <p>Using X-rays, CAT scans, Ultrasound, Blood pressure monitoring devices, and other methods to determine the cause or extent of the illness</p> <p>Detecting genetic abnormalities that may be present in cells</p>
Preventing and controlling disease	<p>Promoting improved sanitation measures, including frequent hand washing, safe garbage disposal, and sewage treatment</p> <p>Sterilizing surgical instruments and treating wounds with antiseptics and other chemicals</p> <p>Controlling populations of rats, flies, mosquitos, and other disease carrying organisms with pesticides or sanitation measures</p> <p>Treating water, milk, and other foods, to reduce the presence of pathogens</p> <p>Vaccinating to promote the body's immune response to pathogens</p> <p>Identifying the dangers of risky behaviors such as tobacco use</p>
Treating and curing disease	<p>Developing antibiotics and other drugs to kill pathogens</p> <p>Developing medical procedures, including surgical operations and laser techniques, to remove damaged or diseased tissue from the body</p>