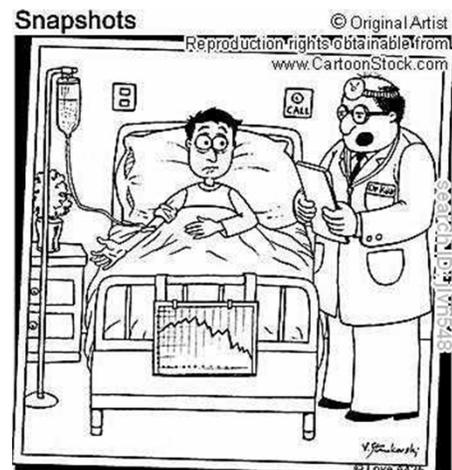


IMMUNE SYSTEM

Biology 2201

What is a disease?

- Other than an injury, any change in the body that interferes with the normal functioning of the body.



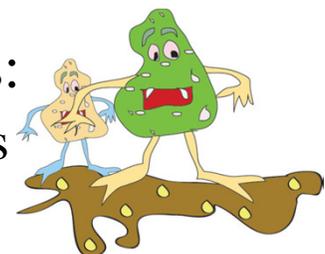
"The good news is that we're going to name the disease after you."

Two Types of Diseases

- | | |
|--|--|
| <ul style="list-style-type: none"> □ <u>Non-infectious</u> <ul style="list-style-type: none"> ■ often called <i>functional diseases</i>, ■ Caused when an organ does not function properly anymore ■ Examples: <ul style="list-style-type: none"> □ cancer, heart disease | <ul style="list-style-type: none"> □ <u>Infectious</u> <ul style="list-style-type: none"> ■ Caused by a pathogen or disease-causing agent <ul style="list-style-type: none"> □ Viruses, bacteria, fungi, prions ■ Are often contagious ■ Examples: <ul style="list-style-type: none"> □ Influenza, measles, AIDS, STI's |
|--|--|

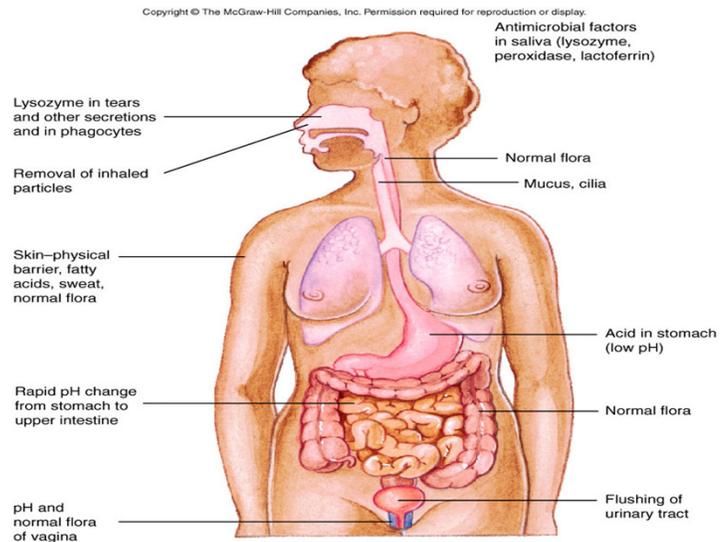
Non-specific Defenses

- These are your first line of defense against pathogens.
- They guard against all foreign organisms and not just any one specific organism.
- Two types of non-specific defenses:
 - Chemical barriers & physical barriers
 - Inflammatory response



Physical and Chemical Barriers

- Physical Defenses
 - skin
 - membrane linings
 - Cilia
- Chemical Defenses
 - Sweat and oils
 - saliva
 - stomach acid
 - urine
 - tears
 - Mucus
 - Interferons *



Inflammatory Response

- It is a reaction that causes redness, swelling, pain, and warmth in the area of infection.
- Cells damaged by the infection release chemicals, that causes an increase in blood flow to the infected area.
- This results in white blood cells called *phagocytes* being transported to the site of the infection.
- The phagocytes ingest the pathogens and damaged tissue, resulting in the formation of puss.
- This usually kills the pathogen, but sometimes the infection gets to the lymphatic system and causes the lymph nodes to swell.

Inflammatory Response

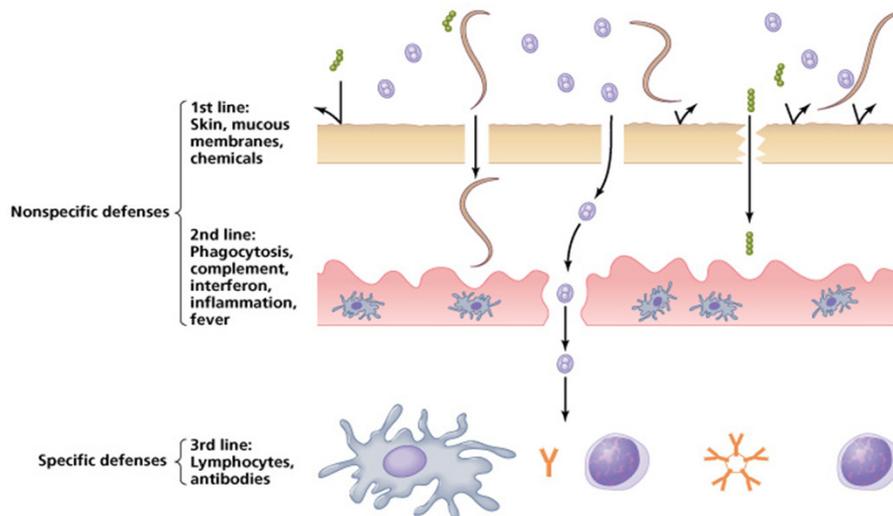
- If the infection is serious, it results in the formation of more phagocytes.
- If this does not finish the infection, chemicals are released that increase the body temperature causing a *fever*.
- A fever serves two major purposes:
 - kills microorganisms that cannot survive the higher temperature
 - slows down microorganisms, giving the white blood cells a chance to destroy them

http://faculty.riohondo.edu/rbethel/videos/micro_inflammation.swf

Interferons

- Recall that viruses infect host cells by taking over their metabolic and reproductive functions in order to replicate virus particles
- Interferons are substances produced by cells that have been infected by a virus.
- It causes non-infected cells to produce an enzyme that blocks reproduction of the virus.
 - This slows the replication of the virus

Non-Specific vs. Specific Defenses



Specific Defenses

- If the pathogen gets past the non-specific defenses, it will encounter the specific defenses.
- At this stage the immune system begins to work
- It provides the body with the ability to fight infection through the production of **antibodies** or cells that inactivate foreign substances or cells.

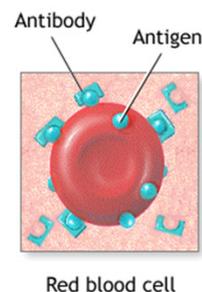


Ready, Aim, FIRE!

- ❑ The immune system includes all parts of the body that are involved in the recognition and destruction of foreign materials
- ❑ The basis of immunity lies in the body's ability to distinguish between its own substances (self) and foreign substances (non-self)
- ❑ Any foreign substance that triggers a specific defense response is called an *antigen*

All about antigens

- ❑ Usually protein, but can be carbohydrates, lipids or nucleic acids located on the surface of bacteria, viruses and other pathogens
- ❑ Antigens trigger a response against foreign substances identified as non-self
- ❑ The response to an antigen is called an immune response



An antigen is a substance that induces the formation of antibodies because it is recognized by the immune system as a threat

Types of Immunity

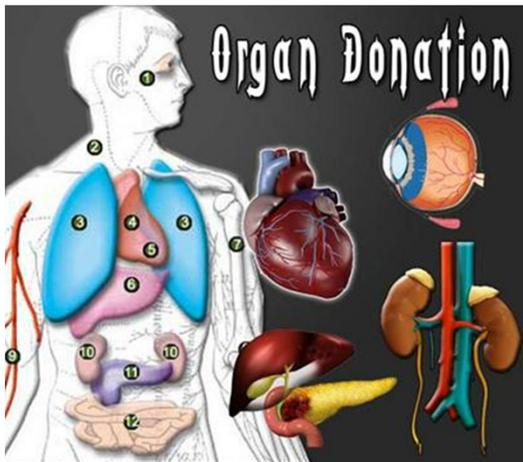
Active Immunity

- ❑ The body produces its own antibodies to attack a specific antigen.
- ❑ Long lasting
- ❑ It develops in two ways:
 - when a person had the disease
 - by vaccination of a weakened or milder form of the pathogen

Passive Immunity

- ❑ This is “borrowed” immunity
- ❑ The person is given antibodies from another person or animal who has been infected by the antigen.
- ❑ Temporary, lasting only 30 days, but faster acting than the active immunity response

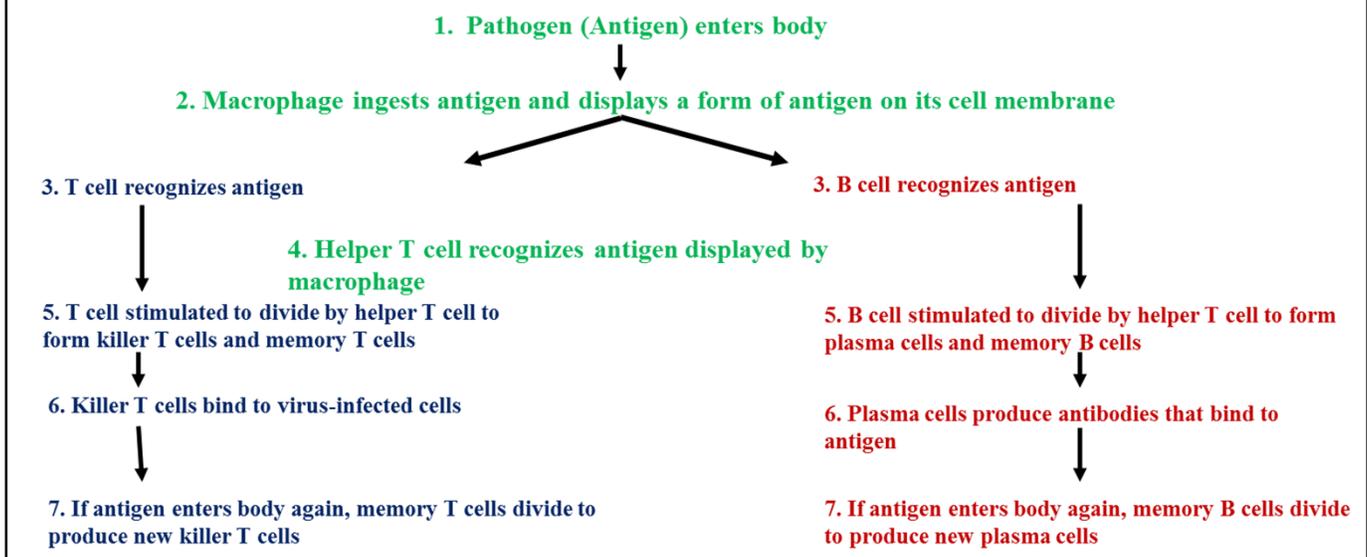
Immune System and Transplants



- ❑ The immune response can result in problems with organ transplants.
- ❑ The body recognizes transplanted organs as foreign (non-self), and tries to fight them as if they were a pathogen.
- ❑ The result would be the destruction of the transplanted organ.
- ❑ This is controlled in two ways:
 - Donor and recipient are closely matched
 - Recipient is given drugs to suppress the immune system

Two Categories of Immune Response

T Cell Reaction vs. B Cell Reaction



Types of Immune Responses

Primary Immune Response

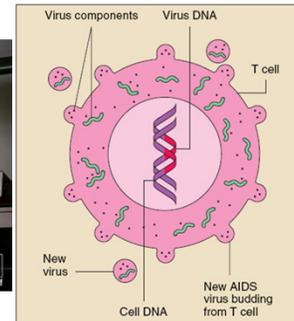
- This occurs when an antigen enters the body for the first time.
- It takes 5 days for the body to recognize the antigen and start production of antibodies.
- It takes another 10 to 15 days for the antibodies to build up.
- Most likely will get sick for a time

Secondary Immune Response

- This occurs if an antigen that has entered the body before
 - Same pathogen enters a second time.
- There is a shorter response time of only 1 to 2 days for antibody production
- May or may not get sick depending on the pathogen

AIDS – Acquired Immune Deficiency Syndrome

- The cause of AIDS is a virus called the human immunodeficiency virus – HIV
- The virus attacks the helper T cells of the immune system.
- The virus enters the T cell and remains within the cells for months or even years without producing symptoms



AIDS' Disturbing Properties

- It is able to mutate giving it the ability to produce different strains.
 - HIV-1;1981, HIV-2; 1985
 - Dozens of subtypes worldwide for each strain
- It causes change in the cell membrane of the T cell causing them to fuse together.
 - This allows the virus to pass from cell to cell without entering the bloodstream and becoming exposed to antibodies present in the blood

What's more?

- When HIV becomes active, the individual develops AIDS. The virus reproduces, spreads, and destroys helper T cells. The T cells become a HIV factory.
- Some possible triggers for HIV activation are:
 - other co-infections
 - contain a gene like a ticking time bomb
- The decrease in helper T cells weakens the immune system. The body loses its ability to fight disease and becomes susceptible to opportunistic infections and malignancies



Spread of AIDS

- Sexually transmitted
- Blood-to-blood contact
- Mother to fetus during pregnancy or at the time of birth
- In rare cases through breast milk



Prevention of AIDS

- ❑ Abstinence from sexual activity
- ❑ Use of a latex condom, plus spermicide nonoxynol-9
- ❑ Avoid sharing of needles during of intravenous drug use

