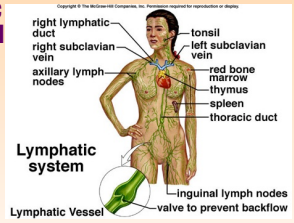
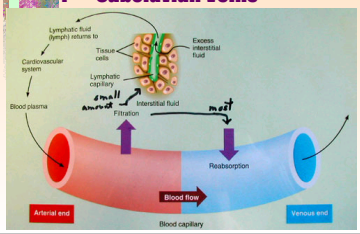
Lymph Transport and Immunity

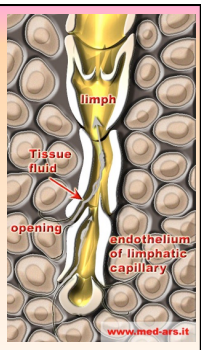
- Lymphatic system consists of lymphatic vessels and lymphoid organs
- 3 main fxns:
  1. Take up excess fluid
  2. Absorb fats
  3. Defend body against disease
- Lymphatic Vessels
- Lymphoid Organs include lymph nodes, spleen, thymus gland, and bone marrow.



Flow of Lymph

1. Capillaries
2. Vessels
3. Either:
   1. Thoracic Duct
   2. Right Lymphatic Duct
4. Subclavian Veins

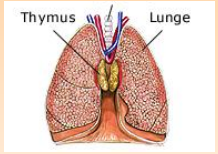




WBC's = Leukocytes

A Phagocytes (3 types)
1. Ordinary Phagocytes
2. Monocytes
3. Macrophages

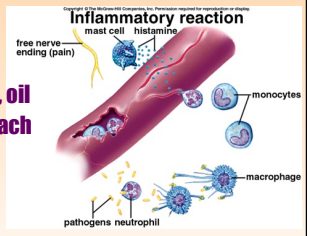
B Lymphocytes (2 types)
1. T-Cells (4 types)
   1. Tk Cells: T-Killer cells
   2. Th Cells: T-helper cells
   3. Ts Cells: T-suppresor cells
   4. Tm Cells: T-memory cells
2. B-Cells (2 types)
   1. Plasma Cells
   2. B-Memory Cells



Nonspecific Defenses

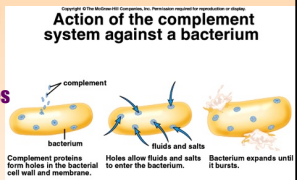
- Barrier to Entry:

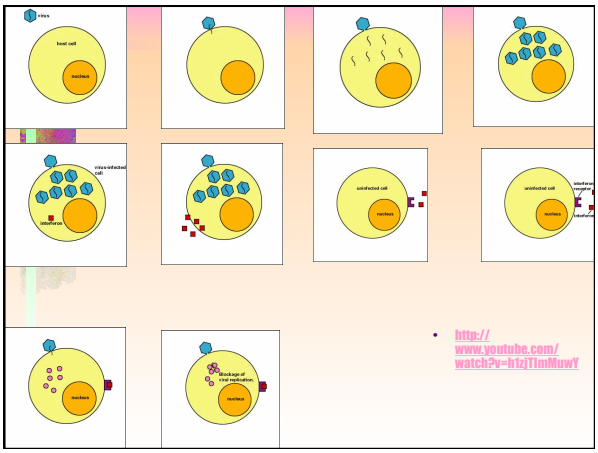
- skin, mucous membranes, oil glands, ciliated cells, stomach pH, symbiotic bacteria



Nonspecific Defenses

- Phagocytic and Natural Killer Cells
  - Neutrophils
  - Monocytes and Macrophages
  - Natural Killer Cells
  - Complement System and interferons
- Inflammatory Response:
  - Histamine
  - Vasodilation





- http://www.youtube.com/watch?v=h1zjTImMuwY

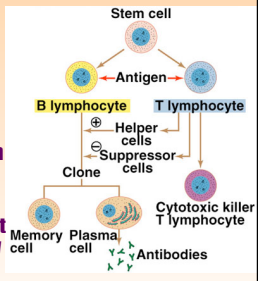
Specific Defenses

- If nonspecific defenses fail, then a specific attack is mounted against a particular antigen.
- Antigen - foreign substance that stimulates an immune system to react
- Pathogens have antigens and it allows our body to recognize self vs. nonself.

Specific Defenses

- Specific Defenses (2 types):

1. The Cell-mediated Immunity System (CMI)
   a. Macrophages activate T-Cells
   b. Activated T-Cells proliferate and form 4 clones of T-cells
   c. Th-cells activate B-cells in lymph glands.
   d. T-killer cells kill cells or germs
   e. As CMI and Humoral response get into high gear, infection is finally overcome
   f. T-suppressor cells slow down the attacks of entire immunity process. Body now immune.



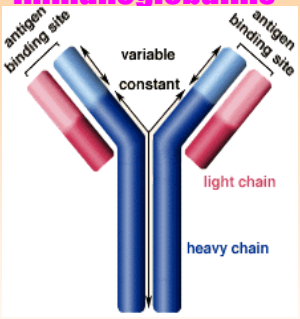
Specific Defenses

- Specific Defenses (2 types):

2. Antibody Mediated System = Humoral Response
   a. T-helper cells are activated by macrophages
   b. Activated Th cells activate B-cells
   c. B-cells proliferate and form 2 clones:
      1. Plasma Cells
      2. B-memory cells
   d. Plasma cells form antibodies
   e. As infection is overcome, the # of plasma cells decrease due to T-suppressor cells
   f. We now have immune condition:
      1. Antibodies present against the 1 antigen that was overcome.
      2. T-memory cells
      3. B-memory cells

Antibodies = Immunoglobulins

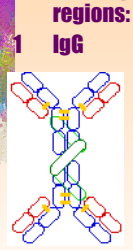
- Antibodies recognize region on surface of antigen
- Comprised of 4 polypeptide chains: 2 identical light and 2 identical heavy.
- All 4 chains have constant region
- All 4 chains have variable region
  - functions as antigen-binding site



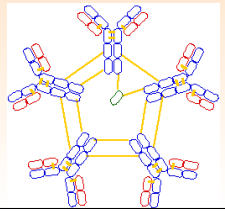
Antibodies = Immunoglobulins

- There are many types (5) of heavy chains constant regions:

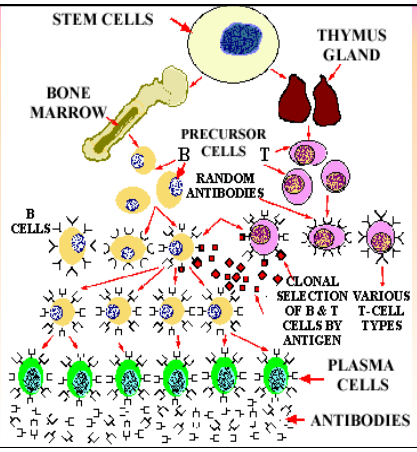
1. IgG



2. IgA

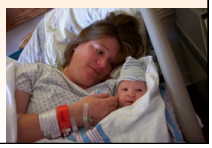


3. IgM



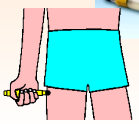
Immunity

- Primary vs. Secondary Immune Response
- Ability to defend against infectious agents
- Active Immunity
  - Naturally after infection or
  - Immunization
- Passive Immunity
  - Short-lived
  - Newborns

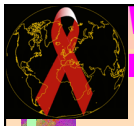


Problems with the Immune System

- Blood Transfusions
- Tissue Rejection
- Autoimmune Diseases
  - Multiple Sclerosis
- Allergies
  - Anaphylactic shock



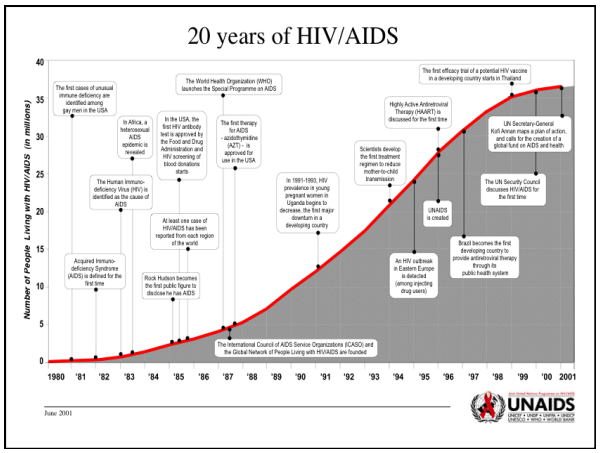
V: Human Immunodeficiency rus

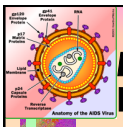


- Total number of AIDS deaths between 1981 and the end of 2003: 20 million.
- Number of children orphaned by AIDS living in Sub-Saharan Africa at the end of 2003: 12 million.
- By December 2004 women accounted for 47% of all people living with HIV worldwide, and for 57% in sub-Saharan Africa.
- In 2003, young people (15-24 years old) accounted for half of all new HIV infections worldwide, more than 6,000 became infected with HIV every day.
- An estimated five million people in low and middle income countries do not have the AIDS drugs which could save their lives.
- Taken from www.avert.org

Some Basic Facts

- HIV attacks the body's immune system.
- Our immune system has no protection against HIV.
- A person can contract HIV and continue a normal healthy life for several years.
- A person can be HIV positive and not be aware that they are a carrier of the virus. There is a period of up to six months after HIV has entered the blood stream that it may not appear in a test for the virus.
- A person may be HIV positive for as many as ten years before HIV goes into full-blown AIDS. It's important to realize that you can contract HIV through a single sexual contact with an HIV positive partner.
- AIDS, which stands for acquired immunodeficiency syndrome, is caused by HIV.
- AIDS develops when the immune system can no longer protect itself from life-threatening diseases.
- There is no known cure for AIDS.
- The life expectancy of an individual with AIDS is three years or less.



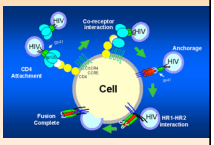


AIDS stands for Acquired Immunodeficiency Syndrome.

- Acquired – means that the disease is not hereditary but develops after birth from contact with a disease causing agent (in this case, HIV).
- Immunodeficiency – means that the disease is characterized by a weakening of the immune system.
- Syndrome – refers to a group of symptoms that collectively indicate or characterize a disease. In the case of AIDS this can include the development of certain infections and/or cancers, as well as a decrease in the number of certain cells in a person's immune system.
- Taken from http://www.cdc.gov/hiv/pubs/faqs.htm

Biology of HIV

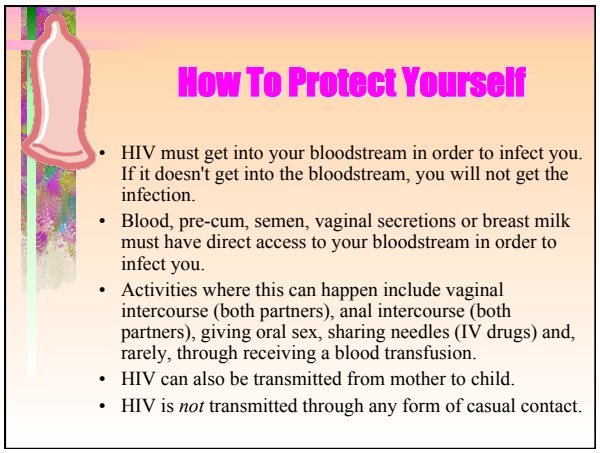
- HIV destroys a certain kind of blood cell (CD4+ T cells) which is crucial to the normal function of the human immune system.
- Loss of these cells in people with HIV is an extremely powerful predictor of the development of AIDS.
- Studies of thousands of people have revealed that most people infected with HIV carry the virus for years before enough damage is done to the immune system for AIDS to develop.
- However, sensitive tests have shown a strong connection between the amount of HIV in the blood and the decline in CD4+ T cells and the development of AIDS.
- Taken from : http://www.cdc.gov/hiv/pubs/faqs.htm



•Reducing the amount of virus in the body with anti-retroviral therapies can dramatically slow the destruction of a person's immune system.

A Natural Immunity

- Viruses have a particular target cell in the host animal or plant they infect.
- The host cells for HIV are those carrying CD4 molecules: macrophages and CD4 T-lymphocytes (CD4 T-cells).
- HIV uses proteins on its surface to attach to the CD4 molecule on cells. Specific antibodies can block the attachment to CD4 molecules.
- In 1996 it was discovered that HIV binds to a second protein on the surface of human cells, called chemokine receptor 5 or CCR5, as part of the process of infecting a cell.
- Most people who die of AIDS have the CCR5 strain.
- The genetic instructions for producing the CCR5 protein are contained in a gene called the CCR5 gene. Everyone has two copies of this gene, but a significant proportion of the population (about one in seven United States whites, and one in 59 United States blacks) have a mutation in one or both of these genes which interferes in the production of the protein.
- People who have two mutant CCR5 genes (so called homozygous) may be partially protected against infection with NSI strains of HIV.
- However, they are not completely protected against HIV infection.
- http://www.aidsmap.com/en/docs/648E0F18-F0E2-4398-BA23-AF28F28FF562.asp


How To Protect Yourself
• HIV must get into your bloodstream in order to infect you. If it doesn't get into the bloodstream, you will not get the infection.
• Blood, pre-cum, semen, vaginal secretions or breast milk must have direct access to your bloodstream in order to infect you.
• Activities where this can happen include vaginal intercourse (both partners), anal intercourse (both partners), giving oral sex, sharing needles (IV drugs) and, rarely, through receiving a blood transfusion.
• HIV can also be transmitted from mother to child.
• HIV is *not* transmitted through any form of casual contact.