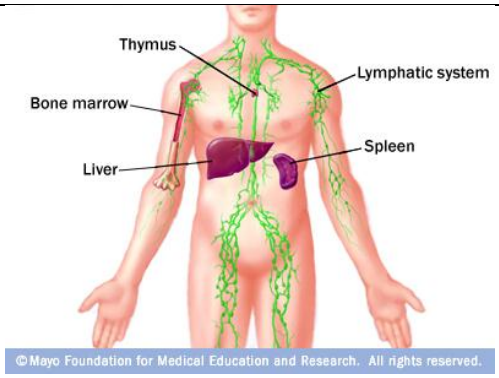
5.3 Lymph and Blood Cells Study Guide by Hisrich

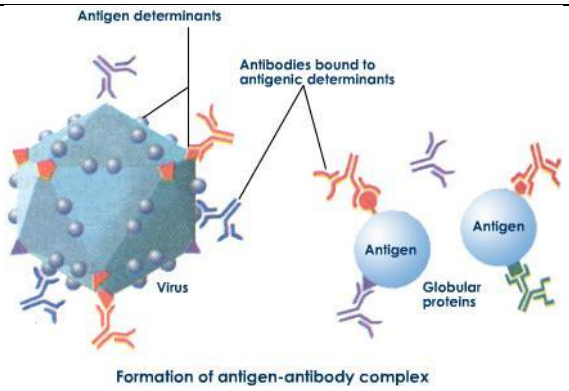
1. What body systems function to protect the human body?

The immune system is the primary system that helps protect the body. The skeletal system supports the immune system by making immune cells within the bone marrow. The cardiovascular system supports the immune system by moving immune components through the body.

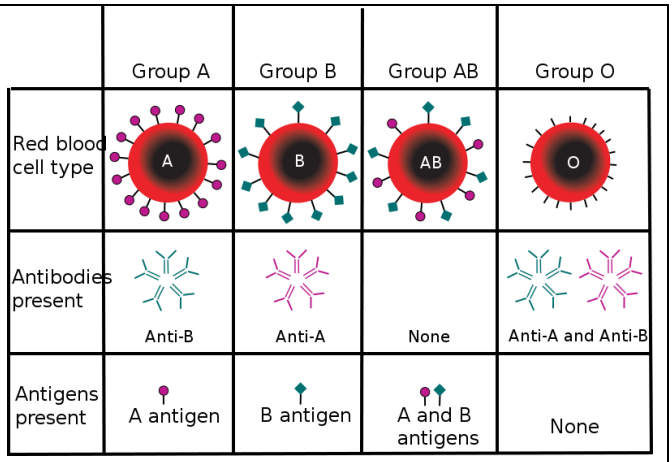
2. How does the structure of the lymphatic system relate to its function?

The lymphatic *("water")* system is part of the cardiovascular system. It's made up lymphatic vessels that carry **lymph** fluid (recycled blood plasma with WBCs) toward the heart. It overlaps with the immune system & contains organs like the lymph nodes & tonsils. It makes and circulates **lymphocytes** (WBCs that are the main cells of the system) & the spleen, thymus and bone marrow are considered parts of the system. There are rounded masses of **lymph** tissue called **lymph nodes** ("water knots") that contain lots of **lymphocytes** and filter the **lymph** fluid. The **lymph** vessels empty into ducts that drain into veins.	

3. What is an **antigen**? 4. What is an **antibody**?

Antigen *("against formation")*		**Antibody** *("against a body")*
Proteins found on the outside of **pathogens** *("disease starters"*—viruses and disease-causing bacteria*)*, unique to each **pathogen**. **Lymphocytes** recognize **antigens** as foreign and produce **antibodies** specific to each antigen	 Formation of antigen-antibody complex	Y-shaped structures produced by **lymphocytes** to fight against **pathogens** by attaching to their **antigens. Antibodies** destroy the **antigen** (and therefore the **pathogen**) and it is then consumed by **macrophages** *("big eaters")*. **Memory cells** remember past **pathogens** and can quickly make the right **antibodies** if attacked again, giving **immunity** in the future.

5. How do circulating **antibodies** protect a person from receiving incompatible blood during a transfusion?

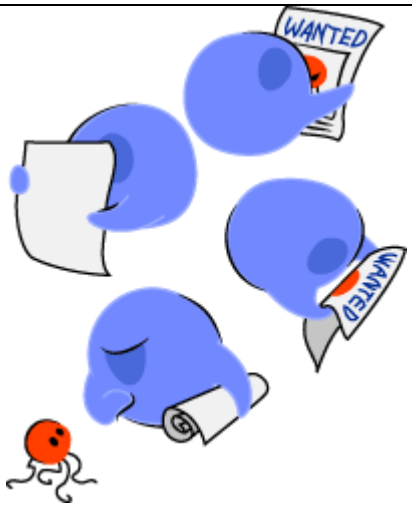
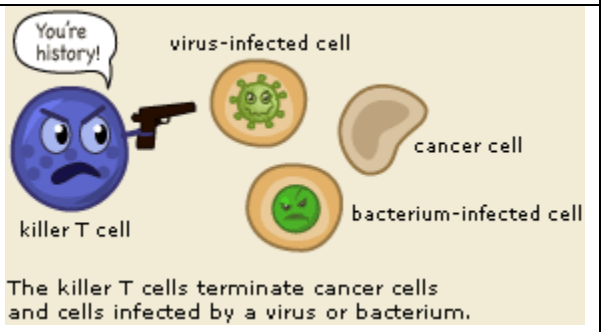
Antigens are found on the surface of blood cells and platelets and if the **antigens** trigger an immune response (happens if blood types don't match), producing **antibodies** to attack the antigens. This results in **agglutination**, which is a clumping of blood cells caused by the **antigen-antibody** interaction. **Agglutination** can be deadly, which is why it is critically important to know a person's **blood type** before performing a transfusion. **Pedigrees**, which show genetic inheritance, can be used to help predict a person's 2 **alleles** for **blood type**. Type O blood does not contain **antigens**, which is why people with type O blood are considered "universal donors"—it won't trigger **agglutination** in others.	

6. What is specific **immunity**? 7. What role do **lymphocytes** play in specific **immunity**? 8. How does your body react the second time it is exposed to a particular **antigen**?

Specific **immunity** is **immunity** against a particular **antigen** (or **pathogen**).

T lymphocytes (**T cells**) and **B lymphocytes** (**B cells**) are the two kinds of **lymphocytes**. All **lymphocytes** begin in the bone **marrow** and then mature into one of these types, with **T cells** maturing in the bone **marrow** and **B cells** maturing in the thymus gland. **B cells** are like military intelligence, seeking out pathogens and sending **T cells** to attack. **B cells** make the **antibodies** that match to each **antigen**. **T cells** are like solders, binging to **antigens** and then releasing a protein that punctures the pathogenic cells, destroying them. Once produces, **antibodies** stay in a person's body, so if the same **pathogen** shows up again, the **antibodies** to attack it are already present and the person doesn't usually get sick (hence the beauty of a vaccine!).

A cool analogy (thanks **http://askabiologist.asu.edu/memory-b-cell**)

Memory Cell	B-Cells	T-Cells
		

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