BIOLOGICAL FRAMEWORKS FOR ENGINEERS

Session #9 [nm: Immunology]

General Objectives:

- ✓ Introduction to components of the immune system
- ✓ Identify and discuss the basis for mutations

Central Framework:

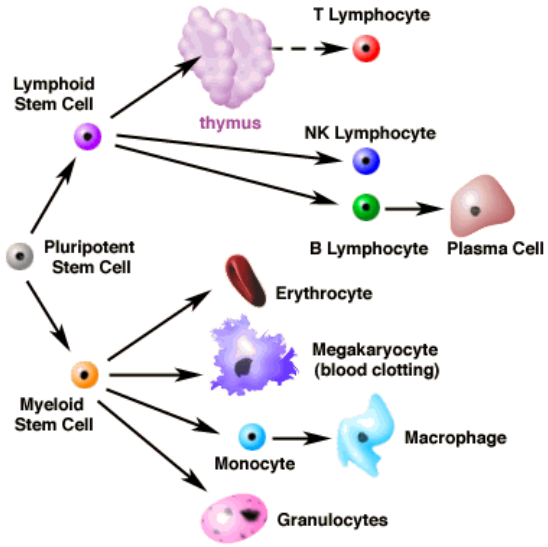
- ✓ The immune response is a coordinated defense action consisting of identification, targeting and removal of foreign materials or organisms

Interactive Activity:

- ✓ Worksheet on blood type

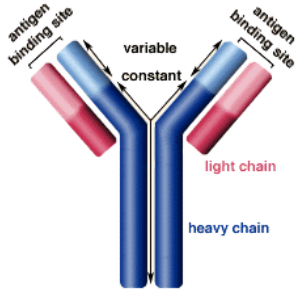
Session Outline:

I. Cells of the Immune System

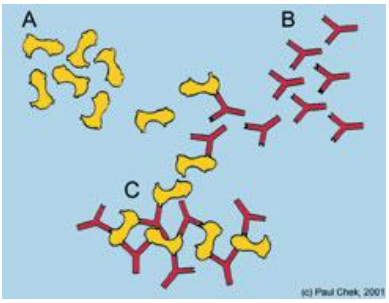


http://www.drstandley.com/bodysystems_immune.shtmll

II. Antibodies

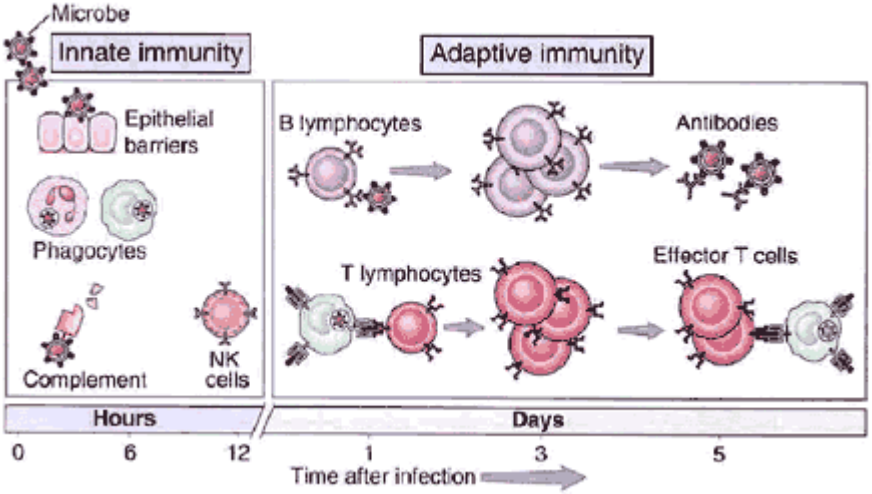


III. Antigens

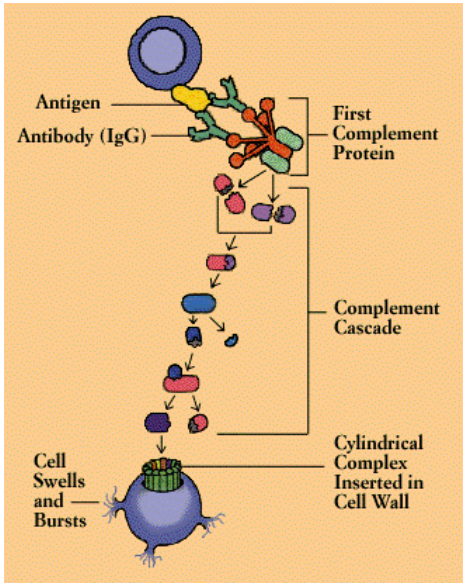


http://www.chekinstitute.com/articles.cfm?select=66

IV. Immune Response



http://www.actagainstallergy.com/aaa/_images/system_01.gif



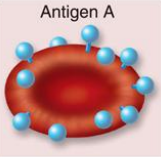
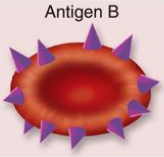
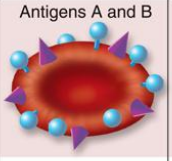
http://www.immunecentral.com/immune-system/iss11.cfm

BLOOD TYPE EXERCISE

Mixing blood from two individuals can lead to blood clumping or *agglutination*, which is especially dangerous during blood transfusions. The differences in human blood types are due to the presence or absence of certain protein molecules called antigens and antibodies (see table below). The antigens are located on the surface of the red blood cells and the antibodies are in the blood plasma.

Not shown in the table are the Rh antigen and antibody. Presence of the Rh antigen is known as "positive" and absence is known as "negative". Once exposed to the Rh antigen, the individual will produce the matching antibodies, known as Anti-D. Individuals have different blood types based on the combinations of antigen molecules: A+, A-, B+, B-, AB+, AB-, O+, O-.

ABO Blood Types

	Antigen A	Antigen B	Antigens A and B	Neither antigen A nor B
Erythrocytes				
Plasma	Anti-B antibodies 	Anti-A antibodies 	Neither anti-A nor anti-B antibodies	Both anti-A and anti-B antibodies 
Blood type	**Type A** Erythrocytes with type A surface antigens and plasma with anti-B antibodies	**Type B** Erythrocytes with type B surface antigens and plasma with anti-A antibodies	**Type AB** Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies	**Type O** Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies

(a)

Before a blood transfusion, the patient's blood type must be identified to avoid triggering the immune response. This is done by mixing their blood with immobilized antibodies on a paper test card. Identify whether which of these four patients can give to each other: