**How Does The Body Protect Itself Against Foreign Substances?**

**I. Introduction**

The ABO blood grouping system illustrates the concept of immune response by demonstrating how a living tissue, blood, reacts in the presence of a foreign substance-another blood type.

Blood types are genetically determined. The most common blood grouping system is the ABO system. In this system, blood is classified into four types: A, B, AB, and O.

Differences in blood types are determined in the ABO system by the presence or absence of marker proteins, called antigens, on the cell membranes of the red blood cells. Antigens are chemicals that stimulate an immune response in the blood. The letters A and B stand for the type of antigen present on the red blood cells. Thus, blood type A has A antigens; blood type B has B antigens; blood type AB has both A antigens and B antigens; and blood type O has no antigens.

In addition to antigens, blood also contains proteins called antibodies. These antibodies destroy or neutralize foreign substances, such as pathogens, that enter the body. Antibodies are located in blood plasma, or the liquid part of blood. They recognize and react to the presence of foreign antigens by locking onto them like matching pieces of a jigsaw puzzle.

Each type of blood contains antibodies for the antigens it does not have itself. Thus, type A blood has B antibodies; type B blood has A antibodies; type AB blood has no antibodies; and type O blood has both A and B antibodies.

Knowing which blood types are compatible is critical before giving blood transfusions. If a person receives an incompatible blood transfusion, an immune response is triggered. The antibodies in the recipient´s blood destroy the foreign red blood cells. The red blood cells clump together, cutting off blood flow through the blood vessels and capillaries.

In this Virtual Lab you will examine how the body protects itself against foreign substances. You will prepare a slide of patient´s blood and add Anti-A and Anti-B serum to determine which blood types in the ABO blood grouping system are compatible for transfusions.

**II. Procedure**

1. Start the activity by going to the following website :

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS27/LS27.html> .

2. Click the arrow to scroll through the poster and examine the blood types.

3. Click the View Immune Response button to learn how incompatible blood transfusions cause

an immune response. Click the hand pointing right to advance through the steps of the

immune response. Click the hand pointing left to go back a step. Click the Show Blood

Types button to return to the poster of blood types.

4. Choose a test tube of patient´s blood to identify its blood type as A, B, AB, or O. Click the

pipette bulb in the test tube to transfer two drops of blood to the microscope slide. (If blood is

already on the slide and you want to start over or examine the blood of another patient, click

the Clean Slide button.)

5. To determine the type of antigens and antibodies present in the blood, add serum to the slide.

Click the pipette bulb in one of the flasks of serum. Repeat this step using the other type of

serum.

6. Observe the results and use the poster of blood types to determine which types are compatible

with the serum that was added. If the drop of blood on the slide clots, then the blood and the

serum are incompatible. If nothing happens to the drop of blood on the slide and there is no

clotting, then the blood and the serum are compatible.

7. Given the results of adding both types of serum to the blood, determine the patient´s blood

type. Click and drag the appropriate test tube label-A, B, AB, or O-to the test tube of

patient´s blood. (Note: You can only label the test tube containing the blood that is currently

on the slide.

8. Click the Check button. If you incorrectly determined the patient´s blood type, the test tube

label will be highlighted. Use the poster of blood types, examine the data on the microscope

slide, and try again. If you correctly determined the patient´s blood type, a small microscope

slide of the data will appear below the test tube of blood. Record the data in your Table.

9. Repeat this procedure to determine the blood types of the other patients.

10. Click the Reset button to get a different set of blood samples.

**III. Data**

1. Record the data in the Table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Patient** | **Reaction When**  **Anti-A Serum Added** | **Reaction When**  **Anti-B Serum Added** | **Blood Type** |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

**IV. Analysis & Conclusions**

**1. Why is it important to know a person's blood type before giving him or her a transfusion?**

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**2. What are antigens and antibodies?**

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**How are they involved in the body's response to incompatible blood?**

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**3. Describe the immune response that occurs when an individual receives a transfusion of**

**incompatible blood.**

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**4. People with blood type O are considered to be universal donors. That is, they can**

**donate blood to all other blood types. Using your knowledge of blood types and the**

**immune system, explain why this is true.**

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**5. People with type AB blood are considered to be universal recipients. That is, they can**

**receive blood from all other blood types. Explain why this is true using your knowledge**

**of blood types and the immune system.**

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