TITLE:
Antibodies and Blood Typing

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DCPS STANDARDS:

6.5.1
Explain how different regions receive different amounts of solar heating because of their latitude, clouds, surface water ice, and other variables. Understand that this results in large-scale convective air flow and weather patterns

GOALS:

Activity One:

1. Scholars will learn the definition of antibodies and antigens.
2. Scholars will understand what allows visualization of antibody-antigen binding

Activity Two:
1. Scholars will learn the common red blood cell antigens
2. Scholars will understand blood types and how they are named

OBJECTIVES:

Activity One:
1. Scholars will demonstrate the binding of antigens and antibodies by linking arms with their corresponding molecule
2. Scholars will predict the visualization of various antigen – antibody bindings

Activity Two:
1. Scholars will perform blood typing using “safe” blood and antibody solutions.
2. Scholars will predict blood types by analysis of their data

INTRODUCTION: (GLOBAL PREREQUISITE KNOWLEDGE)

Blood Types: What's Your Type?

In some ways, every person's blood is the same. But, when analyzed under a microscope, distinct differences are visible. In the early 20th century, an Austrian scientist named Karl Landsteiner classified blood according to those differences. He was awarded the Nobel Prize for his achievements.

Landsteiner observed two distinct chemical molecules present on the surface of the red blood cells. He labeled one molecule "A" and the other molecule "B." If the red blood cell had only "A" molecules on it, that blood was called type A. If the red blood cell had only "B" molecules on it, that blood was called type B. If the red blood cell had a mixture of both molecules, that blood was called type AB. If the red blood cell had neither molecule, that blood was called type O.

If two different blood types are mixed together, the blood cells may begin to clump together in the blood vessels, causing a potentially fatal situation. Therefore, it is important that blood types be matched before blood transfusions take place. In an emergency, type O blood can be given because it is most likely to be accepted by all blood types. However, there is still a risk involved.

A person with type A blood can donate blood to a person with type A or type AB. A person with type B blood can donate blood to a person with type B or type AB. A person with type AB blood can donate blood to a person with type AB only. A person with type O blood can donate to anyone.

A person with type A blood can receive blood from a person with type A or type O. A person with type B blood can receive blood from a person with type B or type O. A person with type AB blood can receive blood from anyone. A person with type O blood can receive blood from a person with type O.

Because of these patterns, a person with type O blood is said to be a universal donor. A person with type AB blood is said to be a universal receiver. In general, however, it is still best to mix blood of matching types and Rh factors.

How are blood types related to the six genotypes?

A blood test is used to determine whether the A and/or B characteristics are present in a blood sample. It is not possible to determine the exact genotype from a blood test result of either type A or type B.

If someone has blood type A, they must have at least one copy of the A allele, but they could have two copies. Their genotype is either AA or AO. Similarly, someone who is blood type B could have a genotype of either BB or BO.

Blood type	Possible genotypes
A	AA AO
B	BB BO

A blood test of either type AB or type O is more informative. Someone with blood type AB must have both the A and B alleles. The genotype must be AB. Someone with blood type O has neither the A nor the B allele. The genotype must be OO.

Blood type	Possible genotypes
AB	AB
O	OO

ESSENTIAL QUESTIONS:

- Activity One: What are blood types and how do we inherit them?
- Activity Two: How do we distinguish blood types using a clinical test?

GLOBAL RATIONALE:

Understanding the mechanism of antibodies and antigens and their relationship to blood types serves as a basis for understanding many of the immunological health issues that plague our society.

RESEARCH ACTIVITIES:

- **Activity One: Antibodies and Antigens**
- **Activity Two: Determining a Blood Type**

GLOBAL EVALUATION AND ASSESMENT:

- Students should explain the relationship between antigens and antibodies.
- Students should explain the genetic basis for blood type inheritance.
- Students should list the for most common blood types and their possible genotypes

SUGGESTED RESOURCES AND WEBSITES AND MEDIA:

http://www.fi.edu/learn/heart/blood/types.html
http://www.biology.arizona.edu/Human_Bio/problem_sets/blood_types/Intro.html