

Blood Type Simulation using Milk and Vinegar

Human Anatomy and Physiology Textbook: John Hole's Anatomy and Physiology, Chapter 14

Lesson Topic: Determining blood types

Lesson Title: Blood Type Simulation using Milk and Vinegar

Lesson Overview: This lab will allow the student to explore the events of laboratory testing of blood types using non-virulent samples. The samples are milk, vinegar and distilled water used to simulated acceptance and rejection in blood donation. Milk reacts with vinegar, causing an “agglutination” of the “antigen” and “antibodies.” Student will work in groups of two to determine the blood type of their unknown sample.

Behavioral Objectives:

At the end of the lesson, the students will be able to:

1. describe a test to determine the blood type from their sample patient (application),
2. identify and describe the various blood types (comprehension),
3. define operationally antigen and antibody (knowledge),
4. discuss the different blood types according to antigens and antibodies present (classification), and
5. analyze the “samples” population for frequency of blood type in a population (analysis).

Concepts/Generalizations/Process Skills:

The following concepts will be introduced:

1. Antigen - a protein on the surface of the red blood cell (for this purpose),
2. Antibody - a protein made in response to exposure to a foreign antibody,
3. Blood Type “O” - 43% of the population; neither “A” nor “B” antigens on the surface of the RBC; antibodies “A” and “B” in plasma,
4. Blood Type “A” - 40% of the population; “A” antigens on the surface of the RBC; antibody “B” in plasma,
5. Blood Type “B” -12% of the population; “B” antigens on the surface of the RBC; antibody “A” in plasma, and
6. Blood Type “AB” - 5% of the population; “A” and “B” antigens on the surface of the RBC; neither antibody “A” nor “B” in plasma.

The following generalizations will be introduced:

1. Blood types are assigned according to antigens and antibodies, and
2. Blood types occur in the population in average percentages.

The following process skills will be incorporated:

1. cooperating in groups, and
2. analysis of individual and group samples..

Materials:

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wall charts of the general blood types percentages in a population
unknown sample packets for students
student guide

Advance preparation:

Make copies of student guide.

Prepare Student Packets - each packet will include:

- 2 vials unknown
- 1 vial anti-A (vinegar)
- 1 vial anti-B (milk)
- 4 disposable pipettes
- 1 petri dish with lid

Prepare Unknowns (all colored with red food coloring as in demonstration)

- #1 - fill vials with water to simulate Type O Blood
- #2 - fill vials with milk to simulate Type A Blood
- #3 - fill vials with vinegar to simulate Type B Blood
- #4 - fill one vial with milk and the other with vinegar to simulate Type AB blood
(repeat these combinations so the each group gets a different unknown number)

For a class of 15 groups, you can make the unknowns reflect the percentage of population having these blood types. Make 7 Type O unknowns, 5 Type A unknowns, 2 Type B unknowns, and 1 Type AB unknown.

Procedure:

Follow the student guide for instruction for the activity.

Motivation:

1. Discuss the occurrence of blood types by introducing the topic with the following questions:
 - a. Do you know your blood type?
 - b. Is your blood type the same as your parents' blood types?
 - c. From whom could you receive a transfusion? To which blood types could you donate blood?
2. Why do we have blood types anyway?

Concept Introduction:

1. Ask the motivational questions listed above.
2. Briefly discuss the history of blood typing including names like Landsteiner and Drew.
3. Demonstrate a positive and negative reaction in agglutination samples on the overhead projector (using method described in American Biology Teacher 1994 - attached to this lesson plan).

Concept Application:

1. Divide the students into groups of two.
2. Hand out one sample packet to each group and give directions as follows:
(Insert directions from other computer).
3. After the students have completed their task with their sample, have them record their sample on the board in the appropriate blood type category to assist in gathering group data. When all data is recorded, the students will then calculate the percentages of each blood type sampled. (This should reflect the given percentages, and samples will be prepared with that in mind.)

Closure:

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Develop a chart reflecting blood type percentages for the samples tested.

Discuss the role of genetics in determine blood type. This is a teaser for the next lesson.

Evaluation:

Objectives 1,2, 3 ,4 and 5 will be evaluated using the following rubric:

Project Grade Determination

Key: Y = yes (10 points for each yes)

N = no (no points)

- _____ 1. Followed procedures appropriately.
- _____ 2. Organized data in an orderly manner.
- _____ 3. Communicated clearly in writing.
- _____ 4. Communicated clearly orally (if this does not apply, give credit automatically).
- _____ 5. Determined blood type of sample correctly.
- _____ 6. Calculated blood type percentages in population adequately.
- _____ 7. Completed the assignment.
- _____ 8. Cleaned the work area adequately..
- _____ 9. Contributed to the group task.
- _____ 10. Answered each discussion question at the end of the activity.

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1. Mark the underside of one half of the petri dish "anti-A" and mark the other part "anti-B".
(one way to do this is to label a piece of paper under the dish.)
2. Pipette one unknown sample into dish "1" and using a new pipette transfer the other sample into dish "2." Dispose of your pipettes properly.
3. Pipette anti-A into dish "1" and mix with sample. Dispose of your pipette.
4. Pipette anti-B into dish "2" and mix with sample. Dispose of your pipette.
5. check each dish for agglutination and mark the chart below for positive (agglutination) and negative (no agglutination) reactions. Determine the blood type of your unknown sample.

unknown # _____	reaction (+ or -)
anti-A in dish 1	
anti-B in dish 2	

Blood type of Unknown # _____ is _____.

Answer the following discussion items:

1. Comparing your sample to those of your classmates, in which percentage category does your sample fall?

2. Make a graph representing the occurrence of the blood types in this population.