

# Blood-Typing

Through an experiment with Kool-Aid, students follow the steps of the scientific method to learn about the experimental procedure of blood typing.

**Grade Level:** 5th

## Objectives:

- Students will discuss steps of the Scientific Method
- Students will experiment with different blood types
- Students will evaluate the results of blood transfusions

## Materials:

Each group of students will need:

- 1 test tube filled with red Kool-Aid labeled Type A
- 1 test tube filled with blue Kool-Aid labeled Type B
- 1 test tube filled with purple Kool-Aid labeled Type AB
- 1 test tubes filled with water labeled Type O
- Plastic page protector, 1 pipette
- A worksheet for each student
- Blood type labels for assessment activity

## Appendixes:

- Student worksheet: Page 5
- Worksheet key: Page 6
- Blood type labels: Page 7

## Time Considerations:

Preparations: 25-30 minutes

Lesson Time: 45-55 minutes

*Introduction: 10-15 minutes*

*Activity 1: 5 minutes*

*Activity 2: 20 minutes*

*Conclusion: 10-15 minutes*

## Related Lesson Plans:

Flubber, Yellow/Blue Switcheroo, Mentos Super Fountain, Eggs-plosion, H<sub>2</sub>Olympics, Mystery Box



## Next Generation Science Standards

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

## Science and Engineering Practices (SEP):

Engaging in Argument from Evidence

## Disciplinary Core Ideas:

Structure and Function

## Background

Even though all human blood may look alike, there are potentially life-threatening differences among blood types. The main red blood cell groups are A, B, AB and O. The letters stand for two antigens - chemical substances that can be targeted by one's immune system. Group A blood only has the A antigen, group B blood only has the B antigen, group AB has both, group O has neither. A person cannot receive or donate blood to just anyone because blood groups need to be matched. Mixing incompatible blood groups leads to blood clumping, or agglutination, which is extremely dangerous.

Blood type is inherited. It is passed from parents to children. Whether your blood type is A, B, AB or O, it is based on the blood types of your mother and father.

## Crosscutting Concepts:

Systems and System Models

## Excellence in Environmental Education Guidelines

## Strand 1—Questioning, Analysis and Interpretation Skills

C) Learners are able to locate and collect information about the environment and environmental topics.

Human blood type is determined by co-dominant alleles. An allele is one of several forms of genetic information that is present in our DNA at a certain location on a specific chromosome. Each of us has two ABO blood type alleles, because we each inherit one blood type allele from our biological mother and father. A description of the pair of alleles in our DNA is called the genotype.

Each biological parent donates one of their two ABO alleles to their child. A mother who is blood Type O can only pass an O allele to her son or daughter. A father who is blood Type AB could pass either an A or a B allele to his son or daughter. This couple could have children of either blood Type A (O from mother and A from father) or blood Type B (O from mother and B from father) (*University of Arizona*).

Almost 40 percent of the population has O+ blood. Those patients with Type O blood must receive Type O blood, such as in a blood transfusion. Type O blood is the universal blood donor and is the only blood type that can be transfused to patients with other blood types. (*American Red Cross*).

## Preparation

Mix Kool-Aid with water to create the different blood types. Pour the Kool-Aid into test tubes so that they are about half full and label: red Type A, blue Type B, purple Type AB and water Type O.

Fill the rinse cups with plain tap water.

Set up students work stations with test tube holders containing one of each of the four test tubes of blood types, one rinse cup, a plastic page protector to mix blood types on and one pipette.

## Doing the Activity

### Introduction

Have students brainstorm what they know about blood. Why is blood important? (Blood is important for the movement of oxygen, minerals and vitamins to all the organs in the body. It also helps fight off infection in open cuts.)

Introduce blood types to the class and ask them if they know what the different types are. Review with the students the four blood types that will be the focus of the lesson: Type A, B, AB, O. To make it easier for the students to understand this

concept, you can compare the types to eye color. Your own eye color is dependent on what genes your parents carry. Even one parent with blue eyes and the other with brown eyes can have a child with blue eyes. As in your eye color, your blood type is based on what genes are passed on to you from your parents.

Tell the students that there are times when a person might need to receive a blood transfusion (receive another person's blood to replenish their own). Ask the class for examples. (a bad accident in which a lot of blood was lost, surgery, etc) These people may need blood to replace what they have lost and to keep the oxygen supply to the body at a healthy level.

Ask the students what they think would happen if two different blood types are mixed together. If the blood types are not compatible, the blood cells may begin to clump together in the blood vessels. This could cause a potentially fatal situation.

Introduce the two important words associated with blood type and blood transfusion: receiver and donor. A receiver is someone who can safely receive a certain blood type. A donor is someone who gives their blood for someone else to use.

Tell the students that there is a universal donor and a universal receiver. Ask them what they think these terms mean. The universal donor can donate blood to any of the blood types. The universal receiver can receive blood from any of the blood types.

### Activity 1: Scientific Method

Today, we will be conducting an experiment on blood types. While doing our experiment we will be following the certain steps.

Ask students if they have ever conducted an experiment before. What did you do?

Whenever scientists do experiments they follow certain steps to ensure they are finding quality results. Does anyone know what this group of steps or process is called?

Put the steps on the board and go over what each one entails.

1. Question: When scientists do experiments, they always begin with a question.

2. Hypothesis/Prediction: After asking the question scientists then try to guess the answer.

3. Research: Randomly combining things from around the house is dangerous so scientists have to do some research by reading, looking on the internet or asking other scientists.

4. Experiment: This is generally the fun part. Scientists do an experiment by following the directions and they have fun! But they are always safe and careful.

5. Results: Scientists keep accurate records of results of their experiment.

6. Conclusion: Examine the meaning of your results; speculate why certain data resulted from your experiment.

Tell the students during today's lesson they are going to be scientists and follow the scientific method (*Science Buddies*).

### **Activity 2: To Type or Not to Type**

Put students in groups of two or three and give each student a worksheet.

Before the students begin, model the experiment the way you would like the students to perform it. Go over the materials needed and the correct procedure for mixing the "blood types".

Based on the experimental materials used, ask the students to come up with hypotheses about what they think they will find out as a result of the experiment. They can also make hypotheses about which type they think is the universal donor and which type is the universal recipient.

All the students are trying to find out what is the universal donor and what is the universal recipient.

#### **Experimental Procedure**

Fill the pipette with just one squeeze of a blood type, (this standardizes the amount of blood taken up in the dropper) and then squeeze the liquid onto the plastic page protector.

Rinse the dropper in the rinse cup.

Add the same amount of

another blood type on the plastic page protector. Stir and look for any color change.

#### **Key**

If there is **NO color change**, the blood types are **compatible**.

If there **is a color change**, the blood types are **NOT compatible**.

Have students record all their results in the table on their worksheet. For example, if type a blood "receives" Type A blood, no color change takes place. In the A/A cell, circle the "yes" for no color change, or meaning it is OK to give Type A blood to someone with Type A blood; if Type A blood "receives" Type B blood, a color change would occur. Circle the "no" for color change, meaning it is not OK for Type A blood to receive Type B blood.

### **Conclusion**

When students have completed the table, have them answer the questions below the table.

Ask the students what their results were. Put a larger version of the table students completed on the board. Ask if anyone had different results. Based off their results, work as a class to come to a consensus as to what blood types are the universal donor and the universal recipient. Review this concept with questions about what type of blood each blood type can receive.

Provide class with a specific blood type. Have students use their completed tables to help them determine if their assigned blood type would be able to provide or receive the transfusion depending on a

certain scenario and questions asked. For example: Someone needs a transfusion. They have Type A blood. Who can donate blood to them?

### **Assessment**

Staple the students' worksheets into their science journals to review for completeness of work, correct spelling and grammar, and ability to follow the scientific method.

### **Extensions**

Have students find out their own blood type.

With this new information, have students write a report about whether or not their blood type is the universal donor or receiver, what blood types they could receive in a blood transfusion and if they were to donate blood what blood types could receive their blood.

## Vocabulary

**Blood Donor:** somebody who gives blood for use in transfusion

**Conclusion:** a decision or answer, based on facts

**Donor:** somebody who voluntarily gives blood, a body organ or tissue for the medical treatment of someone else

**Hypothesis:** an educated guess

**Materials:** the tools and other things needed to perform a particular task

**Receiver:** (recipient) a person that receives blood, tissue or an organ from a donor

**Results:** the outcome(s) of a certain task or procedure

**Scientific Method:** the system of advancing knowledge by formulating a question, collecting data about it through observation and experimentation, and testing a hypothetical answer

**Universal Donor:** somebody with group O blood who can potentially donate blood to anyone, regardless of the recipient's blood group

**Universal Receiver:** (universal recipient) a member of the AB blood group who can receive transfusions of blood from any ABO group

## Sources

- American Red Cross. (2003). *Blood Type*. Retrieved Dec. 8, 2010, from Northern Ohio Blood Services Region: <http://chapters.redcross.org/br/northernohio/info/bloodtype.html>
- Science Buddies. (2010). *Steps of the Scientific Method*. Retrieved Aug. 26, 2010, from [http://www.sciencebuddies.org/science-fair-projects/project\\_scientific\\_method.shtml](http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml)
- University of Arizona. (1997). *Blood Types Tutorial*. Retrieved Dec. 8, 2010, from The Biology Project: [http://www.biology.arizona.edu/human\\_bio/problem\\_sets/blood\\_types/Intro.html](http://www.biology.arizona.edu/human_bio/problem_sets/blood_types/Intro.html)

NAME: \_\_\_\_\_

A donor is someone who is **giving** blood to a person  
A receiver is someone who is **getting** blood from a person

Circle YES if the blood is a “good” match

Circle NO if the blood is a “bad” match

|                  | <u>Donors</u> |    |     |    |     |    |     |    |
|------------------|---------------|----|-----|----|-----|----|-----|----|
|                  | A             |    | B   |    | AB  |    | O   |    |
| <u>Receivers</u> |               |    |     |    |     |    |     |    |
| A                | Yes           | No | Yes | No | Yes | No | Yes | No |
| B                | Yes           | No | Yes | No | Yes | No | Yes | No |
| AB               | Yes           | No | Yes | No | Yes | No | Yes | No |
| O                | Yes           | No | Yes | No | Yes | No | Yes | No |

### RESULTS

What blood type is the “universal donor”?

What blood type is the “universal receiver”?

A person is in a car accident and loses a lot of blood. This person has Type B blood. What type of blood can this person receive?

A person is donating blood at a blood drive. The nurse tells this person that their blood is important because it is the universal donor. What blood type is this?

NAME: ANSWER SHEET

A donor is someone who is **giving** blood to a person  
A receiver is someone who is **getting** blood from a person

Circle YES if the blood is a “good” match

Circle NO if the blood is a “bad” match

|                  | <u>Donors</u> |        |        |        |
|------------------|---------------|--------|--------|--------|
|                  | A             | B      | AB     | O      |
| <u>Receivers</u> |               |        |        |        |
| A                | Yes No        | Yes No | Yes No | Yes No |
| B                | Yes No        | Yes No | Yes No | Yes No |
| AB               | Yes No        | Yes No | Yes No | Yes No |
| O                | Yes No        | Yes No | Yes No | Yes No |

**RESULTS**

What blood type is the “universal donor”? **Type O**

What blood type is the “universal receiver”? **Type AB**

A person is in a car accident and loses a lot of blood. This person has Type B blood. What type of blood can this person receive? **Type B & Type O**

A person is donating blood at a blood drive. The nurse tells this person that their blood is important because it is the universal donor. What blood type is this? **Type O**

**Type AB**

**Type AB**

**Type O**

**Type O**