Science Experiment: Blood Type and Transfusion

Project: Health, Community Service

Supplies:

- 4 small plastic cups of water
- 4 small empty plastic cups
- Blue, green, and yellow food coloring
- Sharpie Pen

Time: 20-30 minutes

What to Do:

1. Make a small cup of yellow water, label "Blood Type A"
2. Make a small cup of blue water, label "Blood Type B"
3. Make a small cup of green water, label "Blood Type AB"
4. Pour a small amount of plain water into a cup, label "Blood Type O"
5. Pour a small amount of "Blood Type A" into an empty cup (recipient).
   Add a second blood type to it (donor), simulating a "blood transfusion."
   Repeat this until you have 4 different transfusions in the 4 empty cups.
6. Notice the results and record on the data table. A color change indicates that the transfusion failed. (In a real blood transfusion, this failure would be evidence by agglutination of the red blood cells.)

Reflect:

1. What happened when you added different types together?
2. What transfusions were successful? How do you know?
3. Did all of the colors always create a reaction? Did one color fail to create a reaction?
   a. What does the color change indicate? (A color change indicates that the transfusion failed.)
   b. What would a lack of color change indicate? (A lack of color change indicates the transfusion was a success.) (The plain water "Blood Type O" is a universal donor – it does not change any of the other colors because anyone can accept that blood.)

Apply:

Why is it important to know an individual's blood type? *Could knowing your own blood type impact your health?* Why might someone need a transfusion? What are some reasons why transfusions may need to happen in our communities (natural disasters, cancer, etc.) How do health care professionals and hospitals get the blood that they use for transfusions? Can you make a difference in your community by donating blood?

Donating blood and organizing blood drives is a great way to support your community. Find out more about organizing a blood drive here: http://www.redcrossblood.org/hosting-blood-drive.

Science Experiment: Bones and Tendons

Project: Health

Supplies:

- **Craft Foam**
- **Paper Straws**
- **Tape (or glue)**
- **Pony Beads**
- **Twine or Yarn**
- **Scissors**
- **Chopsticks (optional)**
- **Pen**

Time: 30-40 Minutes

Preparation: Discuss with students that they have bones and tendons in their hand that help them move their hands. Ask students to feel their hands and try to determine how many bones are in each finger and in the palm area of their hands. *For our experiment we will be creating the phalange bones in the fingers and the metacarpal bones in the hand. There are 3 phalanges in each finger and 2 in the thumb. There is also one metacarpal bone in the palm that connects to each finger.*

What to Do:

1. Trace your hand on craft foam and cut it out.
2. Cut paper straws into pieces for the bones in your fingers and in your hand. Use the cut out of your hand to help determine the size of each bone. In order to help your hand model work the best, be sure to leave a large space between each "bone."
3. Attach the bones to the foam hand using tape or glue.
4. Cut 5 pieces of twine or yarn. They should be at least 12in long each (make them longer than you think as you can always trim them later).
5. Tie a bead to the end of each piece to twine.
6. Run your twine or yarn through each of the finger bones and down to the metacarpals. Tie a bead on the other end of the string once it is through the bones.
7. Optional: tape a chopstick to the palm to act as a handle.

Reflect:

1. With this model, how did you move the hand?
2. What body part are the strings imitating? (*tendons*)
3. Does the model simulate how a hand moves exactly? Why or why not?

Apply:

The tendons cause the fingers to move when stress is placed on them. How does your body place stress on your tendons? *The muscles in your forearm actually cause your fingers and thumb to move. The tendons are long flexor tendons that extend from these muscles*. If you were to cut one of your tendons down by the metacarpals, how would it affect the rest of that finger? *It would be difficult for the rest of that finger to operate correctly because the tendon is one long strand that connects the entire finger*. What else helps your hand to operate? Could you make a model of other parts of your skeletal system?

Science Experiment: Dental Health

Project: Health

Supplies:

- **5 cups or jars**
- **4 containers or plates with lips***
- **1 cup soda**
- **1 cup vinegar**
- **1 cup juice**
- **1 cup water**
- **1-4 toothbrushes**
- **Baking soda or toothpaste**
- **4 hardboiled eggs and/or 4 ceramic tiles***
- **Paper towel**
- **4 egg holders (optional)**

***For younger participants, it may be easier to use the ceramic tiles with the plates for the experiment. They do not move around as easily when brushing. Otherwise you do not need these items for the experiment.**

Time: 15 minutes, overnight for observation

What to Do:

1. Place the eggs in the cups or jars.
2. Pour the chosen liquid over each egg until they are completely submerged.
3. Make an index card or chart to show which liquids are in which containers.
4. Have participants right down their predictions for what will happen to the eggs when left in the liquid.
5. Leave the cups to soak overnight. (If you leave them soaking too long, the shells will start to dissolve). If you are not able to meet back with a group the next day, you can do a sample of the experiment ahead of time to show participants what will happen.
6. Take out the eggs one at a time and observe the changes in each egg.
7. Students can try to brush off any residue on the eggs, first with water and then with tooth paste or baking soda, to see if it comes off easily or is more difficult.

Reflect:

1. What did you notice about the eggs when you took them out of the solution?
2. What did each solution do to the eggs?
3. Were the eggs easy to clean?

Apply:

1. What part of your body is the egg shell like?
2. Can you determine from this experiment what types of drinks are good for your teeth or not good for your teeth?
3. How are the egg shells different from your teeth?
4. What can you do to prevent your teeth from looking like some of the egg shells that you saw today?

Science Experiment: Outbreak! Investigating Epidemics

Project: Health

Supplies:

- **Coffee Filters**
- **Scissors**
- **Paperclips or small envelopes**
- **Baking soda**
- **Water**
- **Measuring Cup**
- **Red Cabbage**
- **Pot**
- **Kitchen knife**
- **Jar or test tubes or paper cups**
- **Paper (1 per participant or pair)**
- **Pen or pencil (1 per participant or pair)**

Time: Approx. 1 Hour (Prep); 1 Hour (Activity)

Preparation:

1. Make the baking soda solution for "infected" strips.
    a. Add a couple of tablespoons of baking soda to one cup of water.
    b. Stir the baking soda so that it dissolves.
    c. Keep adding baking soda until it does not fully dissolve and collects at the bottom of the cup. At that point the solution is saturated. Now dip five strips into the solution for a few seconds.
2. Cut up enough filter paper (approx. 1" by 3") so that each participant will have five strips of paper.
3. Group five strips together using a paper clip or envelope.
4. Randomly select one group of 5 strips and dip them in the saturated baking soda solution for a few seconds. For a large group you may want to select more than one group of strips to be "infected." You can also have participants work in pairs if needed.
5. Allow the strips to dry on a clean surface. This will take about an hour.
6. Regroup the infected strips so they look like all of the other strips in our pile.
7. Prepare the red cabbage pH indicator.
    a. Cut a head of red cabbage in half. Cut the cabbage halves into small pieces with a kitchen knife.
    b. Place pieces of cabbage into a large pot and add enough water to cover the shredded cabbage.
    c. Bring the water to a boil and boil for 30 minutes.
    d. Drain of the cabbage pieces and allow the cabbage juice to cool. (You can store the solution in the refrigerator for a number of weeks.)
    e. On the day of the simulation, place the cabbage juice in a jar in a central location to serve as the "microbe testing station." Alternatively, you can pour small amounts of the cabbage juice into plastic test tubes or paper cups, so that student groups have their own testing station.

What to Do:

1. Discuss that epidemiology works to uncover and explain the factors that determine disease frequency and distribution. Epidemiologist identify infectious agents; determine how they are spread, who gets infected, and the results of infection.
2. Tell the participants that they will be receiving five strips of paper that represent an unknown pathogen (germ) that can be passed from person to person through methods such as tough or the exchange of bodily fluids. Distribute the strips of paper.
3. Instruct the students to write their initials or names on each of their five strips.
4. Begin the simulation by telling students to trade one strip with another student. On a sheet of paper, they should write down who they traded with (the name on the strip that they gave out and the name on the strip they received).
5. On the first trade they must give away one of their strips, on the following trades they may give away any strips that they have in their possession, but still only give away one strip per trade.
6. The leader of the activity should decide how many trades they should make. (8-12 trades is a good range to consider)
7. Once all the trading has stopped, ask them to use the indicator solution (red cabbage juice) to see who is holding the "infected" strips. They should dip each strip in the indicator solution one at a time to get an accurate reading. If the strip turns GREEN, it is one of the infected strips.

Reflect:

1. Can you determine who the original source of the epidemic was?
2. How many people in the group were exposed to the microbe?
3. Was it easy or difficult to trade?

Apply:

1. What factors might have increased the chance of exposure to the microbe?
2. It was possible to trade with an infected person but not get the disease. How do you think this relates to real life situations?
3. What factors affect the amount of exposure to a microbe in real life? (ex. Washing hands)
4. Can you think of any examples of epidemics that you know about?

Science Experiment: Growing Bacteria

Project: Child Development, Health, Foods, Microwave

Supplies:

- **Microwave**
- **Hot Water**
- **Petri Dishes**
- **Beaker or Microwave Safe Plastic Cup**
- **Nutrient Agar**
- **Clorox Wipes**
- **Zip Lock Bags**
- **Cotton Swabs (Q-tips)**

Preparation Time: 1-2 hours (If you have time to meet with youth several times they can help to prepare the agar solution, or you can prepare it ahead of time to allow youth to spend more time collecting samples and observing).

Before the Session:

1. Mix ½ teaspoon agar (about 1.2 grams) with ¼ cup (60 mL) of hot water in a clean, microwave safe container and stir. (a quart-sized bowl works great). Pour the mixture between two Petri dishes.
2. Place the container in the microwave and bring to a boil for three minutes to completely dissolve the agar. The mixture should be clear with no particles floating around in the solution. Allow the mixture to cool for 3 to 5 minutes before moving on.
3. Fill the bottom half (smaller half) of the Petri dish with the warm agar solution and cover loosely with the top half of the petri dish (it may be necessary to set the lid ajar to allow moisture to escape). Allow the solution to cool and harden for at least an hour.
4. At this point, the petri dish is ready for youth to begin their experiment.

Experiment Time: 30 minutes
Observation Time: 12 hours after samples are collected, up to 5 days of observation

What to Do:

1. Roll a clean cotton swab in your mouth and then lightly draw a squiggle over the gelled agar in the petri dish. Be sure to wipe the end of the cotton swab all over the surface to be tested and cover the entire end of the swab with invisible bacteria.
2. You can test other surfaces like your phone, TV remote, toilet seat, door handles, your hands, under your fingernails, the top of a table, computer keyboard, pencil or pen, calculator, etc. If you test a dry surface, lightly dampen the cotton swab with water.
3. Lift the top off the Petri dish and LIGHTLY draw a squiggly line in the agar with the end of the cotton swab.

4. Cover the Petri dish with the top half and use a piece of paper or tape to label the dish with the name of the item you tested. Be careful that when you replace the top of the Petri dish, that there is not excessive moisture. You can place the Petri dish upside down if moisture would drop on your sample.
5. After you have complete the sample and labeled the dish, place your Petri dish in a sealed Ziploc bag.
6. Place Petri dishes with samples in a dark and warm place to allow them to grow. You will see growth usually within one day.
7. If you want, track the growth of each sample over several days. You can also clean the surface that you previously tested and try the experiment again. Was the cleaning solution you used successful? How do you know?

NOTE: Do NOT open the dishes once things begin to grow. You don't know exactly what is in the cultures, so just be careful!

Reflect:

1. Look at your samples. Do they all look the same? What about smell? Note some of the differences (shape, size, color, smell, amount of bacteria).
2. Are you surprised by the amount of growth in your sample?
3. How do you think the bacteria grew in such a short time? (*Bacteria reproduce using binary fission. A bacteria will grow to twice its size and then split into two "daughter" bacteria with the same genetic code. Some bacteria can reproduce once every 20 minutes.*)
4. What would adding hand sanitizer to your sample do? Make a hypothesis and try it out. You can add hand sanitizer drops during the initial collection or after bacteria have started growing.

Apply:

Bacteria may seem gross and like something that we don't want around very much. However, there are several helpful types of bacteria that are helpful in our lives and some we simply can't live without. Can you think of ways that bacterial are helpful? *Good bacteria comes in many different types. Bacteria helps you digest your food (probiotics) and is used to make some dairy products and some types of medicines.* Bacteria are also some of the best decomposers meaning that they break down dead and decaying organic matter from leaves to insects. What other things could bacteria be used for? *Bacteria are now being used for environmental cleanup, especially for oil spills.*

Science Experiment:
It's all in the Eye: Color and Motion
Project: Health

Supplies:

- **White Poster board, standard size (28"x22") must be flexible**
- **Meter stick (yard stick, 3 foot stick) or 12 inch ruler**
- **Sharpie**
- **Foot long piece of balsa wood or wood stick (chopsticks will also work)**
- **Tape**
- **3 colors of construction paper**

***You may want to have these supplies for each group of 3-5 students, especially if you are working with a group of more than 10-15 participants**

Time: 1 hour

What to Do:

1. Mark the center of the poster board (when displayed horizontal) with "0 degrees." Do this near the top of the board. Also, mark a small "X" in the center of the board below the 0 mark, this is your fixation point.
2. Draw a line from the 0 degree mark, going left and right.
3. Next, using a ruler, mark 10 degrees then 20 degrees all the way to 120 degrees on both sides of the 0 degrees mark. Every 10 degrees should measure out to 1 inch.
4. Cut out Nickel size circles, one from each construction paper color.
5. Use the tape to attach one circle to the end of one stick and do this for all three.
6. Pick one person to act as the first subject. They should hold the center of the poster board so that fixation point is level with their eyes and about 1 foot away from their face. They should bend the rest of the board around them so that the ends of the board line up with their ears.
7. The test subject should focus on the black dot in front of them (fixation point).
8. Someone else chooses one of the sticks. Do not tell the test subject which color you chose. Starting at the 120 degree mark, slowly move the stick toward the 0 degree center. Stop when the test subject notices the stick. Make a mental note angle and continue moving the stick until the subject tells you the color they see.
9. Write down both results.
10. Repeat starting at the opposite side (left or right) and use a different color stick.
11. Switch roles and complete the experiment again. Remember the test subject should never know what color you are using.
12. Repeat the experiment for each subject. Be sure to record your results.

Reflect:

1. Was there a difference between when subjects noticed the stick and when they could see the color?
2. Were the results the same for each test subject?
3. What would make this experiment more difficult or different?

Apply:

Your eye is made up of different parts that help you see. One place your vision starts is with photoreceptors that line your retina, the rods and cones. Rods are great at sensing movement, especially in dim light situation but aren't good at sensing color or focusing well. Cones, however, have high color acuity and focus very well especially in bright conditions. Most of your cones are in the center of the retina, rods are around the cones. *So, with this knowledge, why would it make sense that you saw the stick before you saw the color of the circle?* Why do you need both rods and cones? If cats and other animals can see well in the dark, what might be better developed in their eyes than in human's eyes?

Science Experiment: Just Breathe!

Project: Health

Supplies:

- **Plastic Bottle (1L Pop Bottle works well)**
- **Straw**
- **Rubber Band**
- **Scissors**
- **2 balloons**
- **Playdough/clay**

Time: 20 minutes

What to Do:

1. Carefully cut off the bottom of your bottle.
2. Tie a knot in the neck of the first balloon. Cut off the opposite end of the knot so that the balloon is open with the knot keeping the bottom sealed.
3. Stretch the end that you cut around the bottom of the bottle.
4. Put the straw in the neck of the other balloon and secure it with the rubber band. Be careful not to crush the straw when you secure the balloon. Blow through the straw to make sure it is sealed with the balloon.
5. Put the balloon and the straw in the neck of the bottle (so that the second balloon is inside the bottle with the straw sticking out).
6. Secure the straw with the playdough, making sure that it does not let air in or out.
7. Pull down on the knot of the balloon at the bottom. Watch what happens inside the bottle as you do this.

Reflect:

1. Can you describe what part of the body you made? What does the inside balloon represent? What is the straw? What body part is the bottom balloon?
    a. The diaphragm is a skeletal muscle that extends across the bottom of the heart and lungs
2. What happened when you pulled on the bottom balloon? What happened when you released the knot?
3. Take a deep breath. Can you feel your lungs expand?

Apply:

Think about the bottom balloon. Do you need the bottom balloon to make the experiment work without forcing air through the straw? *The bottom balloon represents the diaphragm. When you breathe, your diaphragm contracts, increasing the volume of the thoracic cavity, to allow your lungs to fill with air.* Discuss why it is important to keep your lungs healthy. What kind of things should you avoid that can damage your lung? Can you think of a way to simulate those damages with the experiment?