

Topics: Anatomy,
Circulatory System

Materials List

- ✓ 6 one liter bottles with caps or larger sized bottles that can be sealed
- ✓ Red food coloring
- ✓ Green food coloring
- ✓ Cocoa powder
- ✓ Tennis or racquet ball
- ✓ Water
- ✓ Measuring cup and spoons
- ✓ Optional - corn syrup

This activity can be used to teach:

- Body structures and systems
(Next Generation Science Standards: Grade 4, Life Science 1-1; Middle School, Life Science 1-3)

Heart size, Blood Volume, and Flow

Make fake blood for life science estimation activities



Learn about the size of the human heart, how much blood is in the average child and adult, and how much is pumped by the heart per minute by using bottles of “blood”.

Assembly

1. Add a drop (and **only a drop**) of green food coloring to an empty container that can hold at least 1 liter (~1 quart) of water. (If too much is added then add a liter (quart) of water to the bottle pour ½ of the liquid into another bottle and continue)
2. Add 5 ml (1 teaspoon) of red food coloring to the bottle.
3. Fill the bottle with water until 1 liter (~1 quart) of liquid is in the bottle. Use the measuring marks on the bottle, if present, or fill another identically shaped bottle with 1 liter (~1 quart) of water to use as a comparison standard.
4. Add a small amount, less than 1 ml (1/4 teaspoon), of cocoa powder to the liquid in the bottle. Cap, seal, and shake the bottle to mix the food colorings.
5. For darker colored “blood”, if needed, add small amounts of extra cocoa powder.
6. The “blood” will be watery, which is not a problem for these activities, but the “blood” could be made thicker by adding corn syrup as a thickening agent.
7. Repeat steps 1 to 5 and fill 5 more one liter (~1 quart) bottles with the “blood”.

To Do and Notice (Note the bottles may need to be shaken since the cocoa powder will settle to the bottom of the bottle over time) (Please, do not drink the “blood”!)

1. Ask students to use their hands to show how big they think their heart is.
2. Ask students to clench a fist and note how big the fist is. Tell them that a person’s heart is about the size of that person’s clenched fist. Adults have a bigger fist and an equally bigger heart. A diseased heart can be up to twice the normal size.
3. Ask students to squeeze a tennis or racquet ball. The effort needed to squeeze the ball is comparable to the work done by the heart in pumping blood.
4. Ask students to find their pulse at the wrist and to count the beats in 15 seconds to calculate how often their heart beats at rest and after exercising. A pulse of 60 beats a minute means the heart is pumping 60 times a minute, **every minute**.
5. Ask students to estimate how much blood (how many bottles) is in their bodies.
6. Say that a child’s body contains about 4 liters (~4 quarts of blood) and an adult contains about 5 to 6 liters of blood. Ask, “Estimate much blood is pumped by the heart in a minute when a person is at rest and how much when active?”

The Science Behind the Activity

The constantly beating heart is the most active muscle in the body. When a body is at rest the volume of blood pumped by the heart in a minute is about equal to the total amount of blood in the body! During strenuous activity the heart of an endurance athlete can pump over 5 times as much blood each and every minute!

Taking it Further

Students could be asked to research or experiment with other recipes for fake blood.

Web Resources (Visit www.raft.net/raft-idea?isid=574 for more resources!)

- Fake blood recipes - http://www.halloween-website.com/fake_blood.htm