Lub Dub (Valves)

Objective
Students will investigate the source of the sounds of the heart.

Key Question
What does the Lub-Dub sound represent?

Materials
For each student
• 1 film canister with a hole in the top and bottom
• 1 straight pin
• small piece of paper
• small piece of tape
For the class
• artificial valve
For the teacher only
• drill
• drill bit
• small block of wood
• masking tape
Advance Preparation
Collect empty film canisters from a local camera store.
Using the drill and drill bit, drill a hole in the bottom of each film canister and lid.
Using the masking tape, label each canister with a student's name.

Procedure
Describe the sound of the heart. What causes the sound?
To help understand the source of the sounds of the heart, do the following investigation.

1. Blow through one end of the film canister. What do you hear?
   Now suck air through the hole. What do you hear? Was air able to move through the canister in both directions?

2. Cut a small piece of paper, about 1.5 cm square. Center this square over the hole at one end of the canister and secure one edge with a small piece of tape. This makes a flap over the hole.

3. Blow air through the hole in the uncovered end, causing the flap on the other end to open.

4. Suck air back through the canister with enough force to close the paper flap.
5. Repeat the blowing and sucking of air through the canister.

6. Does the flap allow air to go both ways through the canister?  
   (Answer: The flap acts like the one-way valves in the heart which allow the blood to 
   flow in only one direction.)

7. Listen to the sound of the flap opening and closing and describe the sound of 
   each action. (Answer: There is a swishing when it opens and a thumping sound 
   when it closes. The heart has four valves that act like the paper squares. They 
   open and close allowing blood to flow through the heart in only one direction. The 
   Lub-Dub sound heard with a stethoscope is the heart valves closing.)

8. If there were a hole in the flap how might the sound be affected? 
   Investigate this by making a small hole in the flap with the straight pin and 
   repeating step 5. Gradually increase the size of the hole and listen to the sound. 
   How did the sound change? Was the integrity of the valve affected?
Notes to the teacher: Lub Dub
There are two sounds heard during each heart beat. These are called Lub-Dub noises by doctors. When the valves between the upper chambers (atria) and lower chambers (ventricles) close, a "lub" sound is heard. When the valves in the pulmonary and aortic arteries leaving the heart close, a "dub" sound is heard followed by a longer pause: Lub-Dub...Lub-Dub. The paper flap on the canister creates a sound similar to that made by heart valves.
If the valves do not close properly and leak, the sound will not be clear but blurred. This sound is more of a Lub-Shhh-Dub or Lub-Dub Rumble. Medical professionals call this a murmur.
Rheumatic fever is a disease that can damage the heart valves. Accumulated fat deposits in the heart can also affect the function of the valves. If the valves become too small or leaky due to either of these conditions, they can be surgically replaced with artificial valves.
The heart contains valves which direct the flow of blood in one direction. Blood is forced through the flexible membranes which form the valves. Once the blood passes through the membranes, the valves collapse into a barrier, preventing the blood from flowing backwards. A turkey baster represents an open system; the water does not circulate back to the reservoir in the baster. Likewise, the balloon pump and the bike pump force air into a chamber. After explaining open and closed systems, ask for examples of open and closed systems. An example of an open system is household plumbing. Examples of closed systems include the refrigeration units of refrigerators and hot water heating systems in houses. The human circulatory system is a closed system.