

# Exploring Polio – Student Instructions



## Create a Lung Model

### Tools of the Trade

Your model will give viewers an idea of how the respiratory system works. You will need these parts to construct your model:

- Plastic bottle (20oz or larger)
- 2 plastic straws
- 3 balloons
- Tape
- String or yarn (optional)
- Scissors
- Utility knife
- Hot glue gun

**Safety First!** If you feel unsure or uncomfortable with any of these instructions, ask an adult for help!

**1 Cut the bottle into two pieces horizontally with your scissors.**

Use a utility knife to make a small cut in the side of your plastic bottle, 4–5 inches (10–13 cm) above the bottom. The incision should be horizontal. Insert one of the scissor blades into the incision that you made. Hold the bottle firmly and cut all the way around the side of the bottle with your scissors so that you end up with two halves—one half with the bottle cap and one half with the base. You can recycle the bottom half of the plastic bottle.



**2 Use your utility knife to cut an opening in the bottle cap for the straw.**

Hold the bottle cap in place and carefully puncture the top of the bottle cap with the tip of your utility knife. Carve a small circle into the cap by holding the knife at an 80-degree angle. Take a plastic straw and try to squeeze it through your bottle cap. If the straw fits and doesn't fall out of the opening, your bottle is ready to go. It's okay if the straw is a little snug inside the hole. A tighter fit is going to be easier to work with than a looser fit. *Tip: You may also use a drill bit to puncture your hole if the bottle cap is too thick for a utility knife.*



**3 Cut a plastic straw into thirds with your scissors.**

Cut the straw into even thirds. Cut at an angle that's perpendicular to the straw so that the places where you cut are even and flat. Then use your scissors to cut one end of two of the straw sections at a 45-degree angle to make them pointy.



**4 Slide the pointed edges of two pieces of straw into the bottom of a larger straw.**

Squeeze the tip of each straw and slide each inside the same opening at the bottom of an uncut straw. The two smaller sections that you already cut will rely on the tension inside the opening to keep them in place. Make sure the sections of straw are at a 45° angle to one another and are symmetrical. Glue the junction where your three straws meet with a hot glue gun. This will ensure that no air escapes when you're using your lung. Wait 2-3 minutes to let the hot glue dry.

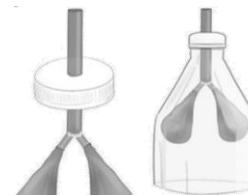


**5 Add hot glue to the inside lip of two balloons and put them on the straws.**

Put a drop of hot glue inside each balloon near the top of each balloon's opening. Slide them over each of the branching straws so that the longer length of straw is still open. Squeeze the section where you added hot glue against each straw for 15-30 seconds so that they're sealed over the opening of each straw. Blow into the open end of your straw to test it. If the balloons expand, you're ready to continue. If you hear air coming out, identify the leak and cover it with hot glue. You can also use tape to help with leaks.



**6 Slide the open end of your straw through the bottle cap.** You may need to pinch the opening of your straw to fit it through the hole as you slide it up through the bottle cap. Slide it until each balloon is inside the case of your bottle. Screw the bottle cap tight and seal the area where your length of straw and bottle cap meet with hot glue. *Optional: Cut a 12" long piece of string or yarn. Fold it in half and dangle the 2 ends into the hole before inserting your straw. This represents the **phrenic nerve**, which starts in the neck and runs down to the diaphragm to control breathing.*



**7 Stretch another balloon over the bottom of the bottle.**

Cut the balloon about 1.5 inches (3.8 cm) from the top near the section where the balloon's neck begins to get wider. Slide the balloon that you cut over the bottom of your bottle. Stretch it evenly over the bottom of the bottle. It may take a couple attempts since the plastic and the balloon are both flexible. Use a rubber band or tape to tightly secure the balloon to the bottle by wrapping it around the area where they meet.





## Conduct a Breathing Demonstration

The diaphragm is a muscle located beneath the lungs. As it expands and contracts, the pressure inside your lungs changes, causing respiration to occur. In the model you built, the balloon on the bottom of the bottle represents the diaphragm. Pull on the skin of the balloon at the bottom of the bottle to use your lungs and observe the changes that occur.



Record your demonstration. Be sure to explain the importance of the diaphragm for respiration and how pressure changes the size of the lungs. Explain why people with **polio** who are **paralyzed** in this area of the body need an iron lung to help them breathe. There is space to write your script on the data collection sheet.



## Share Your Findings

CDC plays a critical role in eradicating **polio** by providing scientific leadership and guidance at the global, regional and country level to implement evidence-based strategies. Since 1988, CDC, ministries of health, and Global Polio Eradication Initiative (GPEI) partners have worked together across these areas to reach every community and vaccinate every last child.

CDC's Center for Global Health (CGH) works 24/7 around the globe to stop health threats at their source. As a citizen scientist, you can help CDC's CGH by sharing your demonstration on their Twitter or Facebook pages to show the importance of **polio** vaccination using **@CDCGlobal**.

The David J. Sencer CDC Museum uses award-winning exhibits and innovative programming to educate visitors about the value of public health and presents the rich heritage and vast accomplishments of CDC. Your demonstration could be a valuable contribution! Share your demonstration with the CDC Museum on Instagram using **@CDCMuseum**.