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# **Smelly Balloons**

# **Diffusion Through a Membrane Demonstration**

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# Introduction:

Seeing is believing, but molecules are hard to see. However, sometimes we can smell them!

#### Concepts

- Diffusion
- Molecular movement
- Semipermeable membrane

#### **Materials**

Balloons, large, latex, various colors

Flavor extracts, various-peppermint, vanilla, strawberry, orange, lemon, etc.

Beral-type pipets, one for each extract

String

# Safety Precautions

Any food items used in the laboratory setting are to be considered laboratory chemicals. Care should be taken not to bring the bottles of food extracts into the classroom unless they will stay in the stockroom as laboratory chemicals. There are no other special precautions for this activity except the care in inflating the balloons. Safety goggles should be worn in case the balloon breaks during inflating.

# Preparation

- 1. Select balloons of a variety of colors. Use a different color for each extract.
- 2. Stretch each balloon several times with your hands before inflating. Inflate each balloon completely and then let the air out. This will also help to stretch out each balloon.
- 3. Add about 2 mL of a food extract to each balloon with a Beral-type pipet. (Food extracts can be purchased at nearly all grocery stores.) Insert the pipet tip well inside the balloon before squeezing the pipet to add the extract to the balloon.
- 4. Record which extract is placed in each balloon.
- 5. Blow up the balloons and tie them shut. Fill one balloon with air only to serve as a control.

### Procedure

- 1. Pass the balloons around the class.
- 2. Have students record the "odor" of each balloon.
- 3. Have students compare results.
- 4. Discuss the following concepts as appropriate:
  - a. Differences in results and perceptions of smells.
  - *b*. How do "smells" get out of the balloon?
  - c. Molecular motion
  - d. Diffusion
  - e. Semi-permeable membranes

#### Discussion

The balloon is a semi-permeable membrane, i.e., it allows "selective" molecular movement through its apparent boundary. Molecules small enough to fit through the "holes" in the membrane will diffuse through the membrane both into and out of the balloon. The flavor extract molecules are small enough to "fit" and thus, they diffuse through the balloon membrane. Eventually, the diffusing molecules reach the smell sensing areas of the human nose and the molecules are detected as "smell" outside of the balloon. Stored patterns of previous smells in our brain are used to interpret the recent and usually recognizable smells. The diffusing food extract molecules make it through the balloon to our nose, and thus are "smelly balloons."

### Disposal

Balloons can be deflated and tossed in the solid waste trash can.

#### Extensions

- Time each extract to see if one balloon allows all of its extract to escape faster than another.
- Compare the rate at which air escapes and the balloon deflates to the rate at which the smells escape.
- Does stretching the balloon before inflating it change the size of the "holes" and thus the rate at which the molecules escape? *Hint:* Try one balloon that has been inflated several times versus a new, uninflated balloon.
- Compare a latex balloon to a mylar balloon. Explain any differences.

# **Connecting to the National Standards**

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Process: Grades K-12 Evidence, models, and exploration
Content Standards: Grades 5-8 Content Standard A: Science as Inquiry Content Standard B: Physical Science, properties and changes of properties in matter Content Standard C: Life Science, structure and function in living systems
Content Standards: Grades 9-12

Content Standard A: Science as Inquiry Content Standard B: Physical Science, structure and properties of matter

#### Materials for Smelly Balloons are available from Flinn Scientific, Inc.

Catalog No.	Description	Price/Each
AP1900	Balloons, Latex, Assorted Colors	Consult Your Current <i>Flinn</i> <i>Catalog/Reference</i> <i>Manual.</i>