

Heat Keepers



Objectives

Students will investigate how the shape and volume of body forms affect heat loss.

Materials

one per student:

- three cups hot oatmeal
- two thermometers
- shallow baking sheet or pan
- five 10" square sheets of wax paper
- measuring cup
- large spoon

Background

In the arctic environment, temperatures often drop below -70°C (-94°F). Warm-blooded mammals have many ways of keeping warm. A larger body size and a smaller amount of surface area exposed to the cold is one way to conserve body heat. For example, the ear flaps of an arctic fox are much stubbier, shorter, and more rounded than the ears of a prairie-dwelling kit fox. When resting, small animals curl into a round ball, tucking feet and nose under fur.

Action

1. Place 1/2 cup of oatmeal each on two sheets of wax paper.
2. Quickly record the temperature of each lump. The temperatures should be similar.
3. Using the wax paper as a wrapping, shape one lump of oatmeal into a round shape. Use the large spoon to flatten the other lump out to about 1/2" thickness.
4. Record the temperatures of the oatmeal every minute. Which shape cools faster? Why? (More surface area per volume dissipates heat faster.)
5. Once oatmeal lumps cool to room temperature, begin another experiment using two new sheets of wax paper. Place one-half cup of oatmeal on one sheet and one cup of oatmeal on another.
6. Quickly record the temperatures of each lump. The temperatures should be similar.
7. Using the wax paper as a wrapping, shape both lumps of oatmeal into a ball. The one-cup lump will be larger.
8. Record the temperatures of the oatmeal every minute. Which shape cools faster? Why? (Once again, more surface area per volume dissipates heat faster.)
9. Using the results of this experiment, have students hypothesize the best body shape for a warm-blooded animal to conserve body heat in the cold Arctic. (large and round)