

Cool Shapes



Objective

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

Materials

- three cups cooked oatmeal
- crock pot to keep oatmeal warm
- two thermometers
- shallow baking sheet or pan
- five 10-in.-square sheets of wax paper
- measuring cup
- large spoon

Background

Warm-blooded mammals and birds have a variety of ways to regulate body temperature. A larger, rounder body size reduces the ratio of body mass to surface area. A smaller amount of surface area exposed to air or water is one way to conserve body heat. Animals living in cold weather environment generally have rounder body shapes and shorter, smaller ears, tails, feet and noses (all areas that lose heat rapidly). For example, polar bears have small ears compared to those of other bears -- an adaptation that enables them to conserve body heat.

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 one-half inch thickness.
4. Record the temperatures of oatmeal every minute. Which shape cools faster? (More surface area per volume dissipates heat faster.)
5. Once the 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. Using the wax paper as wrapping, shape both lumps of oatmeal into a ball. The one-cup lump will be larger.
7. Record the temperatures of the oatmeal every minute. Which shape cools faster? Why? (Once again, more surface area per volume dissipates heat faster.)
8. 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.) The best shape to dissipate body heat in tropical waters (small and flat.)