



Lab 21: Endothermic Animal

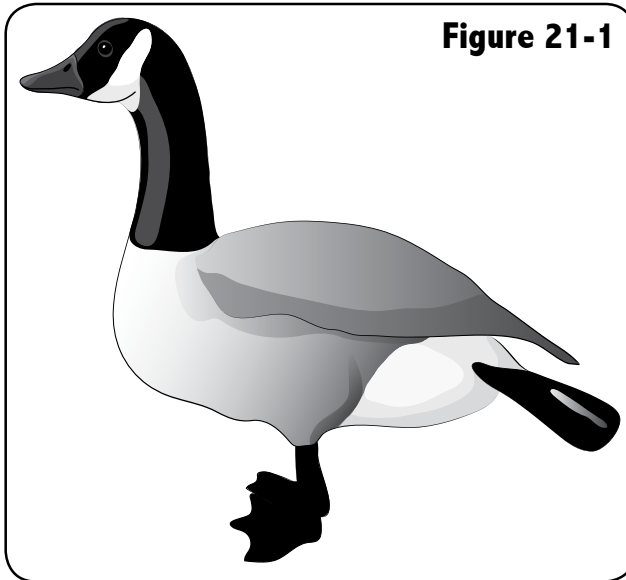


Figure 21-1

with their environment. However, God designed birds and mammals to be the only group of animals that are endothermic. Endothermic animals are able to regulate their body temperature internally and are not dependent on their environment. Although these animals are able to control their body temperature by controlling the amount of heat the body produces, God has given many birds and mammal additional adaptations to assist them in keeping cool on hot days or staying warm in cold environments. Among these adaptations are feathers, fur, layers of fat, and sweat glands.

Goals

1. To explore different adaptations endothermic animals have to assist them in maintaining proper body temperature in cold environments

Materials and Equipment

Thermometers (4)
2 plastic zipper bags
Down feathers in a bag
Wool in a bag

Material Not included

Lard or shortening

Introduction

Birds and mammals often live in climates that undergo extreme temperature changes. These temperature changes could be detrimental to the animal if their internal body temperature changed

Devotional

"Considered it pure joy, my brothers, whenever you face trials of many kinds, because you know that the testing of your faith develops perseverance. Perseverance must finish its works so that you may be mature and complete, not lacking anything." James 1:2-4

Principle: Being stretched by difficulties can make you stronger.

Our bodies have special mechanisms to keep the temperatures uniform. When the climate changes, our bodies actually can adjust to the changes. Such changes stress the body, but they are not necessarily destructive.

Difficulties in life are common. These difficulties may make us feel horrible and hurt on the inside. But for Christians, the difficulties can actually be quite helpful. The verse in James tells us that difficulties test our faith to ensure that it is genuine. They produce perseverance, and even maturity.

In the book of Hebrews, it tells us that God disciplines those he loves. The discipline, which is a kind of difficulty will produce righteousness and peace.

So you can see that difficulties can actually be very helpful, for they allow us to develop in ways we could not achieve otherwise. Through all the difficulties we can remember that God will never give us more than we can handle. Our way of escape is likely into God's capable hands. It is there that we will find help in times of need.

Procedure

Note: You can use an ice chest with ice in it if you don't have access to a freezer. Be sure to lay each bag on top the ice so it will have equal access to the cold ice.

1. Label the two empty zipper bags as Bag 1 and Bag 2.
2. Place a thermometer in Bag 1. Remove the air and seal the bag.
5. Put lard in Bag 2 and position the thermometer in the center of the lard. Seal the bag.
4. Label the bag with wool as Bag 3. Position a thermometer in the bag so the bulb of the thermometer is in the center of the wool. Remove the extra air without squishing the wool and seal the bag.
3. Label the bag with the down feathers as Bag 4. Position the thermometer so the bulb of the thermometer is centered in the down. Remove the extra air without squishing the down feathers and seal the bag.
6. Record the temperature on all four thermometers.
7. Place all 4 bags in the freezer.
8. After 5 minutes, record the temperatures of the thermometers.

9. Record the temperatures again after 10 minutes, 15 minutes, and 20 minutes.

Lab 21

Questions for Endothermic Animals



	Bag 1	Bag 2	Bag 3	Bag 4
Insulator	None	Lard	Wool	Feathers
Initial Temperature				
5 Minutes				
10 Minutes				
15 Minutes				
20 Minutes				

1. Calculate the temperature change for each bag.
2. Make a bar graph showing the resulting temperature change for each insulator.
3. Which material acted as the best insulator?

4. While bag #1 acts as a control to show how quickly the temperature changes if there is no insulator, it is also a good representation of a species like humans that have little or no natural insulation. What did God give humans to overcome this that also allows humans the ability to survive in vastly different climates. In what ways would this be an evidence for God that extends to all regions and cultures, even places where they don't believe in God?

5. Explain how animals that live in climates that are warm in the summer and cold in the winter may use insulators to adapt to their environment.