

Homeostasis in Animals

A Carolina Essentials™ Activity

Student Worksheet



Overview

An animal's survival depends on its ability to maintain an internal environment that will enable individual cells to function properly. The maintenance of internal "normal" or steady state conditions is called homeostasis. In most animals, an internal transport system plays a major role in **homeostasis**. The circulatory system of animals delivers nutrients, oxygen, and hormones to the interstitial fluid (fluid between cells) and removes waste. The circulatory system provides cells the raw materials to perform their functions while ridding themselves of by-products that would be toxic in high concentrations. Like other body systems, the circulatory system is influenced by **negative and positive feedback**. In negative feedback, homeostasis is achieved as the nervous system responds to a stimulus by signaling the circulatory system to minimize or reverse the effects of the stimulus.

Muscle tissue uses oxygen from the blood to produce energy required for muscle contraction. When we exercise vigorously, our muscles use more oxygen than normal. Heart rate must speed up to accommodate the increased need for oxygen. However, as the body recovers from periods of strenuous exercise, mechanisms within the body work to return the heart rate back to its resting **set point**, or normal range of physiological values. The body uses self-correcting actions (known as **negative feedback mechanisms**) to stabilize a body system, returning internal conditions to a steady state after a disturbance is detected, illustrating homeostasis.

MATERIALS

Timer (stopwatch, smartphone, or access to a clock with a second hand)

Essential Question

How do feedback mechanisms maintain homeostasis in animals?

Activity Objectives

1. Determine set point, or normal resting heart rate.
2. Using student data, identify and explain negative feedback mechanisms and the role they have in maintaining homeostasis.

Activity Procedures

1. Lab partners will take turns as test subject and observer to determine the set point for the test subject's resting heart rate.
2. For each person in the lab group, determine the set point for resting heart rate by taking each person's pulse 3 times for 15 seconds.
3. Average the three 15-second values.
4. Run in place for 2 minutes.
5. Determine pulse rate for 15 seconds immediately after running.
6. Take the pulse rate again for 15 seconds, at intervals of 1 minute, for a total of 5 minutes.
7. Record data for each person in the group.

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Data

Resting Heart Rate

Resting Heart Rate 1 (beats/15 sec)	Resting Heart Rate 2 (beats/15 sec)	Resting Heart Rate 3 (beats/15 sec)	Average Heart Rate (beats/15 sec)

Post-Exercise Heart Rate

Immediately After Exercise (beats/15 sec)	1 Minute (beats/15 sec)	2 Minutes (beats/15 sec)	3 Minutes (beats/15 sec)	4 Minutes (beats/15 sec)	5 Minutes (beats/15 sec)

Analysis and Discussion

1. Compare the set point heart rate for each group member.
2. On the same axes, graph every group member's average set point heart rate and post- exercise heart rates. Color code or label each line. On the graph, identify the set point, where exercise is taking place, and where corrective mechanisms are activated. Remember to title the graph, label the axes, include units, and include a key.
3. Using the concepts of homeostasis and negative feedback mechanisms, explain each segment of the graph.
4. If you collected data for a positive feedback mechanism, how would the graph change?
5. Convert your heart rates to beats/minute. Compare your heart rate to the normal range of 60 to 100 beats/minute.