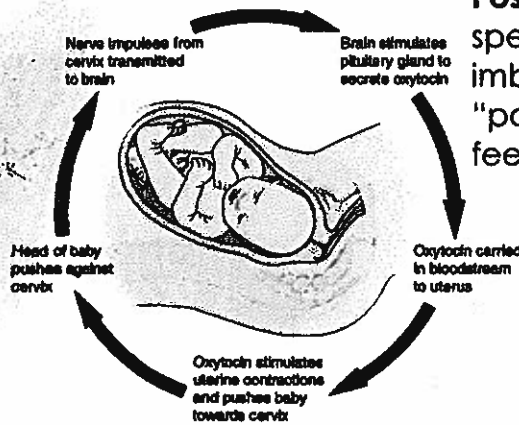


Homeostasis and Diagnostic Tests

Homeostasis & Feedback Mechanisms

Imagine drinking three bottles of water every day for a week, and not being able to excrete any of the water from your body? What do you think might happen? Bloating, pain, illness, nothing? In actuality, it would cause death! Balancing substances, even a substance as simple as water, is crucial to keeping the body healthy. This balancing act of substances is known as **homeostasis**. Examples of substances and/or conditions that need to be balanced include temperature, energy, pressure, calcium, pH, sugar, fats, iron, water, oxygen, carbon dioxide, blood, and even sleep. How does the body maintain homeostasis? It uses **feedback mechanisms** or **loops**. Feedback mechanisms respond when imbalance occurs by attempting to correct the balance, and returning the body to homeostasis.

Positive Feedback – Rare and most commonly occurs in illness or special circumstances, such as labor. In positive feedback the imbalance continues to increase, hence the use of the word "positive" to describe the feedback. An example of positive feedback is contractions during labor.

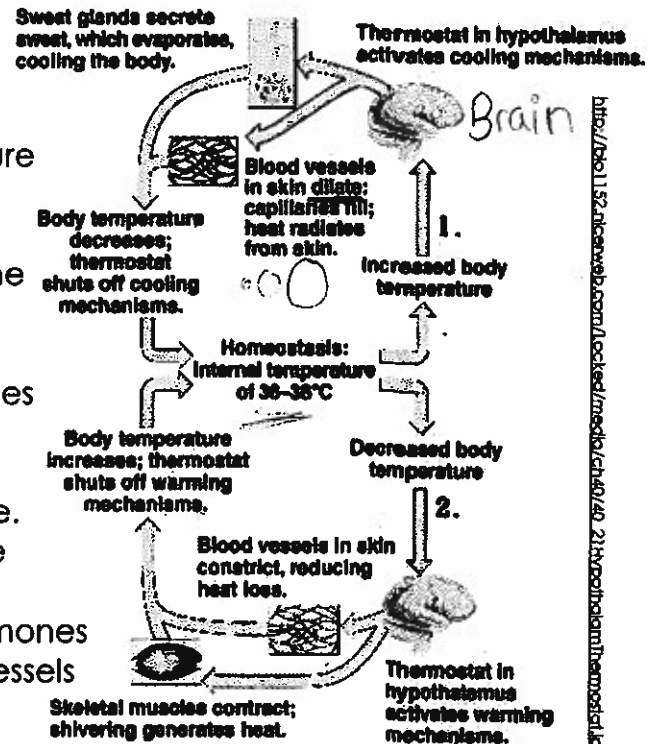


1. During labor the pressure of the baby's head on the cervix initiates the brain to start producing a hormone called oxytocin.
2. Oxytocin stimulates the uterus to contract and push the baby, placing more pressure on the cervix.
3. The pressure on the cervix initiates the brain to produce more oxytocin, and the cycle continues until the pressure is relieved when the baby is delivered.

http://cnx.org/content/m45989/latest/104_Pregnancy_Positive_Feedback.jpg

Negative Feedback – The most common type of feedback in the body. In negative feedback the imbalance is corrected back to its normal value. An example of negative feedback is regulating temperature in the body, called **thermoregulation**. The normal core human body temperature is 36-38° C.

1. When the external temperature is warmer than the body temperature, the body warms slightly.
 - a. An organ within the brain, called the hypothalamus, reacts by releasing hormones that increase sweating and dilate blood vessels allowing heat to be released.
 - b. This results in a body temperature decrease.
2. When the external temperature is colder than the body temperature, the body cools slightly.
 - a. The hypothalamus reacts by releasing hormones that cause shivering and constrict blood vessels allowing heat to be conserved.
 - b. This results in a body temperature increase.



An inability of the body to maintain homeostasis is known as **homeostatic imbalance**, and can lead to disease or even death. Conditions such as kidney failure, diabetes, and dehydration are all symptoms of homeostatic imbalance. In many cases, medical intervention can correct the imbalance.

How Does the Body Maintain Homeostasis in Response to Exercise?

BY MICHELLE FISK SEPT. 11, 2017

When you sweat, breathe heavily and feel your heart pounding, it doesn't just mean you are having a good workout. These physiological factors are also vital to your body maintaining a state of homeostasis. Homeostasis is defined as a constant, steady environment despite external changes, such as exercise. Exercise affects your body temperature, blood oxygen levels, sugar levels and hydration – all properties necessary for your survival. Your body uses an automatic feedback system to preserve normal temperature and water levels, so you can keep exercising. Eat properly and drink plenty of fluids to help your body maintain homeostasis.

Exercise and Breathing Rate

During exercise, your body needs to maintain a constant supply of oxygen in your cells to support your working muscles, which might need 15 to 25 times more oxygen than when they are resting, according to Williams Sport Training. Consequently, you breathe faster during exercise. The harder you exercise, the more rapid your breathing rate becomes. This also helps release carbon dioxide, a by-product of energy metabolism. Excess carbon dioxide can lead to a buildup of lactic acid, which may impair your performance. For every extra breath of oxygen in, you exhale out excess carbon dioxide.

Exercise and Heart Rate

Your cardiovascular system is in charge of delivering blood and nutrients to your working muscles and keeping your body temperature within a normal range. During a workout, the muscles you're exercising need more oxygen. Your body responds by increasing the amount of blood your heart is pumping and moving that blood from inactive organs to working muscles. Hormones are released to signal your heart rate to increase so you can deliver more oxygenated blood and nutrients to where you need them most. As your blood vessels dilate, you will also experience an increase in blood pressure.

Exercise and Body Temperature

As your body converts food into energy during exercise, it produces heat as a waste product. This extra heat can elevate your body temperature above the typical 98.6 degrees. To maintain homeostasis, the blood vessels in your skin dilate to allow more blood flow to the surface of your body where it disperses the heat. You won't feel the vasodilation, but you certainly will feel yourself sweating. The evaporation of sweat and breathing out warm air also serve to help cool your body and thereby maintain a steady temperature.

Maintaining Homeostasis of Fluid Levels

If you don't eat and drink properly, you will impair your homeostatic response. Your body needs water to maintain a normal temperature and blood volume, but sweating can dehydrate you. Dehydration decreases your blood volume, which can halt blood flow to your skin and cause you to become overheated. Consequently, you will experience impaired muscular strength and endurance, decreased alertness and increased risk of injury. According to Montana State University, drink 16 ounces of fluids 2 hours before exercise. Consume fluids regularly during exercise, and drink 16 ounces of fluid for every pound lost during your workout.

Maintaining Homeostasis of Blood Glucose Levels

Your body breaks down carbohydrates into glucose to meet immediate energy needs. It stores extra glucose as glycogen in your liver and muscle cells. When blood glucose levels drop during exercise, you can experience weakness and dizziness, so you rely on glycogen stores to increase your blood glucose levels. You can maximize your glycogen stores by eating a high carbohydrate diet, which is about 60 percent of your total calories. Focus on consuming more fruits, vegetables and grains. The Academy of Nutrition and Dietetics recommends a snack after a moderate- to- high-intensity workout. Consume foods with easily-digested carbohydrates and a little protein, such as Greek yogurt and berries, a banana with peanut butter or a glass of chocolate milk.