Feedback Mechanisms for Maintaining Homeostasis
Homeostasis

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• Greek “staying the same” or “standing still”

• Homeostasis refers to the body’s attempt to adjust a fluctuating external environment (the outside changes constantly, but the inside tries to stay the same).
• Homeostasis is achieved by adaptive mechanisms in the body, ranging from control centers in the brain to chemical substances called hormones.

• Homeostasis is also known as “dynamic equilibrium”, because the body changes to keep things in balance.
• Some functions controlled by homeostatic mechanisms are blood pressure, body temperature, breathing and heart rate.

• In order for a body to stay healthy, a chemical balance must be carefully maintained inside and outside cells. The fluid outside of cells, extracellular fluid, must maintain fairly constant.
Extracellular fluid circulates throughout the body and many materials are passed into and out of the cells by way of the fluid. Thus, this fluid is key in helping the body’s systems maintain optimal temperature and pressure levels, as well as proper levels of acids and bases, carbon dioxide and oxygen and the concentrations of water, nutrients and many chemicals found in the blood.
Homeostasis and Feedback

- Hormones are regulated by feedback mechanisms that control their release.
- Feedback occurs whenever the body receives input from its sensors about a change in its internal condition, and as a result makes a positive or negative adjustment.
- Mechanisms that make adjustments to bring the body back to an acceptable range are referred to as negative feedback (think of a thermostat).
- Sweating and shivering, which produce a response opposite the initial stimulus are examples.
• **Positive feedback** is less common.
• Negative feedback resists change, but positive feedback reinforces change.
• Example: If blood glucose levels decrease, the response of the positive feedback is to lower it further (in hopes of getting a faster response, but sometimes can be deadly)
Examples of Feedback

• When levels of thyroxine in our body drop below normal values, negative feedback causes the pituitary gland to start producing TSH (thyroid stimulating hormone). TSH stimulates the thyroid to start producing more thyroxine. When thyroxine levels return to normal, the pituitary stops producing TSH, and the thyroid lowers its production of thyroxine.
Regulation of Calcium

• The thyroid gland and parathyroid glands work together to regulate blood calcium. Calcium is needed for strong bones and teeth and for proper functioning of the nervous system.

• When calcium in the blood is high, the thyroid produces calcitonin. This causes calcium in the blood to be absorbed. This lowers blood calcium.
When calcium levels are too low, the parathyroid glands secrete parathyroid hormone. This increases blood calcium by: removing calcium in our bones, causes kidneys to absorb more calcium from waste fluid (urine) and activates Vitamin D that was absorbed during digestion.