

Homeostasis and Control Systems

- The human body works best at a temp of 37°C, a 0.1% blood sugar level and a blood pH of 7.35
- The environment, however, does not remain stable and external conditions can vary considerably beyond the optimal level
- Homeostasis refers to the body's attempt to adjust to a fluctuating external environment
- It is often referred to as a dynamic equilibrium because conditions remain stable within fluctuating limits (each condition has its own acceptable range, see Fig.2, p. 335)
- The body does this through a series of monitored internal adjustment
- This system requires constant monitoring and feedback
- Ex/if the external temperature goes up: hypothalamus gland regulates changes, sweat will be produced, kidneys maintain water balance, skeletal muscles contract to release heat, blood distributes heat throughout the body

- All homeostatic control systems have three functional components: a monitor, a coordinating centre, and a regulator
- Special sensors (monitors) located in the organs of the body signal a coordinating centre once an organ begins to operate outside its normal limits
- The coordinating centre relays the information to the appropriate regulator, which helps to restore the normal balance
- Ex/ when CO₂ levels increase during exercise, chemical receptors in the brain stem are stimulated
- Nerve cells from the brain then carry impulses to muscles that increase the depth and rate of breathing
- The increased breathing movements help flush excess CO₂ from the body

Homeostasis and Feedback

- Mechanisms that make adjustments to bring the body back within an acceptable range are referred to as negative feedback systems
- The thermostat in your home is an example of a negative feedback system (see Fig.3, p. 336)
- The coordinating centre (thermostat) also contains the monitor (thermometer)
- When the room temp falls below a set point (like 20°C) the thermostat switches on the regulator (furnace)
- When the thermometer detects a temperature above the set point, the thermostat switches off the furnace
- This is called negative feedback because a change in the variable being monitored triggers the control mechanism to counteract any further change in the same direction
- Negative feedback mechanisms prevent small changes from becoming large

- Positive feedback systems, which reinforce change, are less common in the body
- Positive feedback systems move the controlled variable even further away from a steady state
- Positive feedback systems are useful in extreme conditions where something major has to happen quickly (ex. Hormone levels during childbirth)

- When the event is over, the feedback system stops

Homework

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