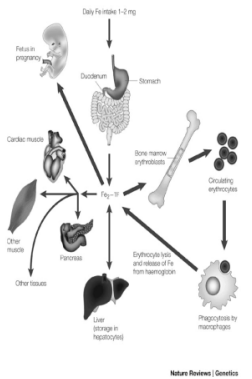


Homeostasis

Review!

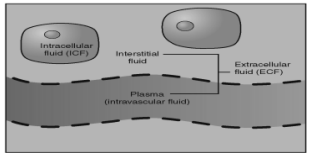
1. Which level of organization focuses on different types of tissue working together to perform a specific function?
2. Which basic life process is the sum of all the chemical processes that occur in the body?
3. Name one system of the human body

1.4 Homeostasis

- Homeostasis is the condition of equilibrium in the body's internal environment due to the constant interaction of the body's regulatory systems/processes
  - Equilibrium can shift within a narrow range compatible with maintaining life
    - Each structure contributes to this balance

Homeostasis & Bodily Fluids

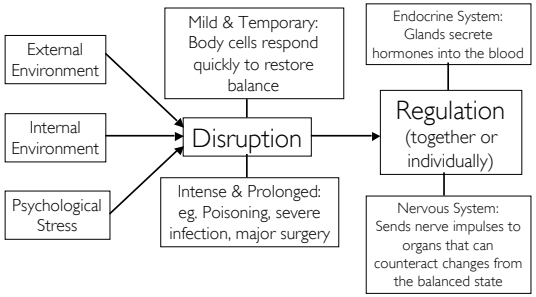
- Bodily Fluids: dilute, watery solutions containing dissolved chemicals found in cells and surrounding them
  - Intracellular Fluid (ICF): fluid within cells



  - Extracellular Fluid (ECF): fluid outside cell bodies
    - Interstitial Fluid: fills spaces between cells of tissue
    - Blood Plasma: ECF within blood vessels
    - Lymph: ECF within lymphatic vessels
    - Cerebrospinal Fluid: ECF around the brain and spinal cord
    - Synovial Fluid: ECF in joints
    - Aqueous Humor & Vitreous Body: ECF of the eyes

- Interstitial fluid is often called the body's internal environment
  - Requires precise regulation of composition
  - Constant change and movement
  - Exchange of materials in the blood capillaries

Control of Homeostasis



Feedback Systems

- Cycle of events in which the status of a body condition is monitored, evaluated, changed, remonitored, reevaluated, etc.
  - Controlled Condition: monitored variable
  - Stimulus: disruption that causes change in the controlled condition

Three Basic Components

- 1. Receptor
  - Body structure that monitors changes in a a controlled condition and sends input to a control center
  - Afferent Pathway: information travels towards the control center
  - Input is in the form of nerve impulses or chemical signals

- 2. Control Center
  - Sets the range of values within which a controlled condition should be maintained (set point), evaluates the input it receives from the receptors, and generates output commands when they are needed
  - Efferent Pathway: information travels away from the control center
  - Output in the form of nerve impulses, hormones, and chemical signals

- 3. Effector
  - Body structure that receives output from the control center and produces a response of effect that changes the controlled condition
  - Organs and tissues can act as effectors

- A feedback system involves a group of receptors and effectors communicating with their control center to regulate a controlled condition

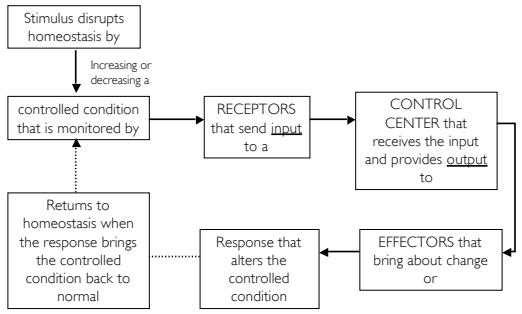


Figure 1.2 - Operation of a Feedback System

Negative Feedback Systems

- Reverses a change in a controlled condition
- Activity of the effector negates the original stimulus
- Will slow and stop as the controlled condition returns to its normal state
- Regulates conditions that remain fairly stable over long periods of time

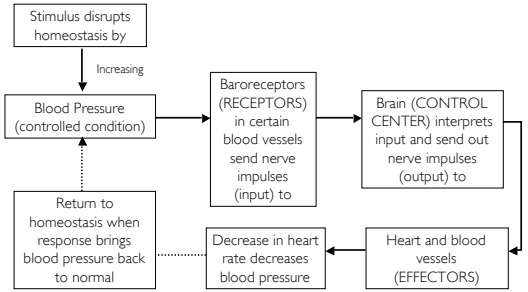


Figure 1.3 - Negative Feedback System

Positive Feedback System

- Strengthens or reinforces a change in one of the body's controlled conditions
- Activity of the effector produces a physiological response that adds to or reinforces the initial change in the controlled condition
- Will continue until it is interrupted by a mechanism (an event outside the system must shut it off)
- If not stopped it can "run away" and even produce life threatening conditions
- Reinforces conditions that do not happen very often

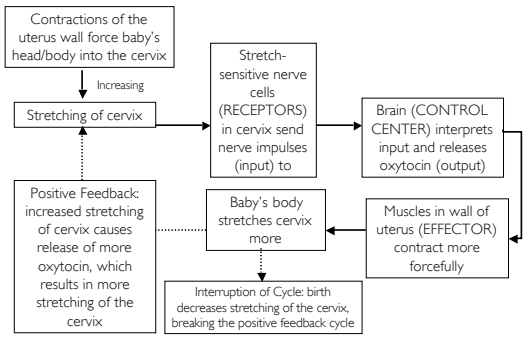


Figure 1.4 - Positive Feedback System

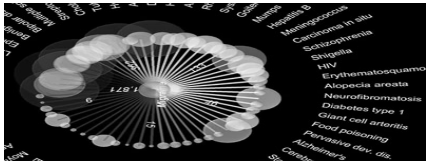
Homeostatic Imbalances

- The physiological processes responsible for maintaining homeostasis are also responsible for good health
- Factors that affect this balance include:
  - Environment/Behavior
  - Genetics
  - The air you breathe, food you eat, even the thoughts you think
- The way you live your life can either support or interfere with your body's ability to maintain homeostasis and recover from stress

- Many diseases are the result of poor health behavior that interferes with the body's natural drive to maintain homeostasis
- Need to develop a lifestyle that supports your body's homeostatic processes
  - Maximize your potential for optimal health and well-being
- If one or more components fail to contribute to homeostasis, the normal balance is disturbed

- Moderate imbalances can lead to disorder or disease
  - Disorder: abnormality of a structure or function
  - Disease: illness characterized by a recognizable set of signs and symptoms
    - Local Disease: affects one part or a limited region of the body
    - Systemic Disease: affects the entire body or several parts
    - Sign: (objective) changes that a clinician can observe and measure
    - Symptom: (subjective) changes in function that are not apparent to an observer
- Severe imbalances can result in death

- Epidemiology: study of when, why, and where diseases occur and how they are transmitted among individuals in a community
- Pharmacology: study of the effects and uses of drugs in the treatment of disease



Clinical Connection

- Autopsy (necropsy)
  - Post-mortem examination of a body and dissection of its internal organs to confirm or determine the cause of death.
    - Detect diseases not discovered during life
    - Evaluate the extent of injuries and how they contributed to death
    - Reveal genetic conditions
    - Determine ultimate cause of death