CHAPTER 19

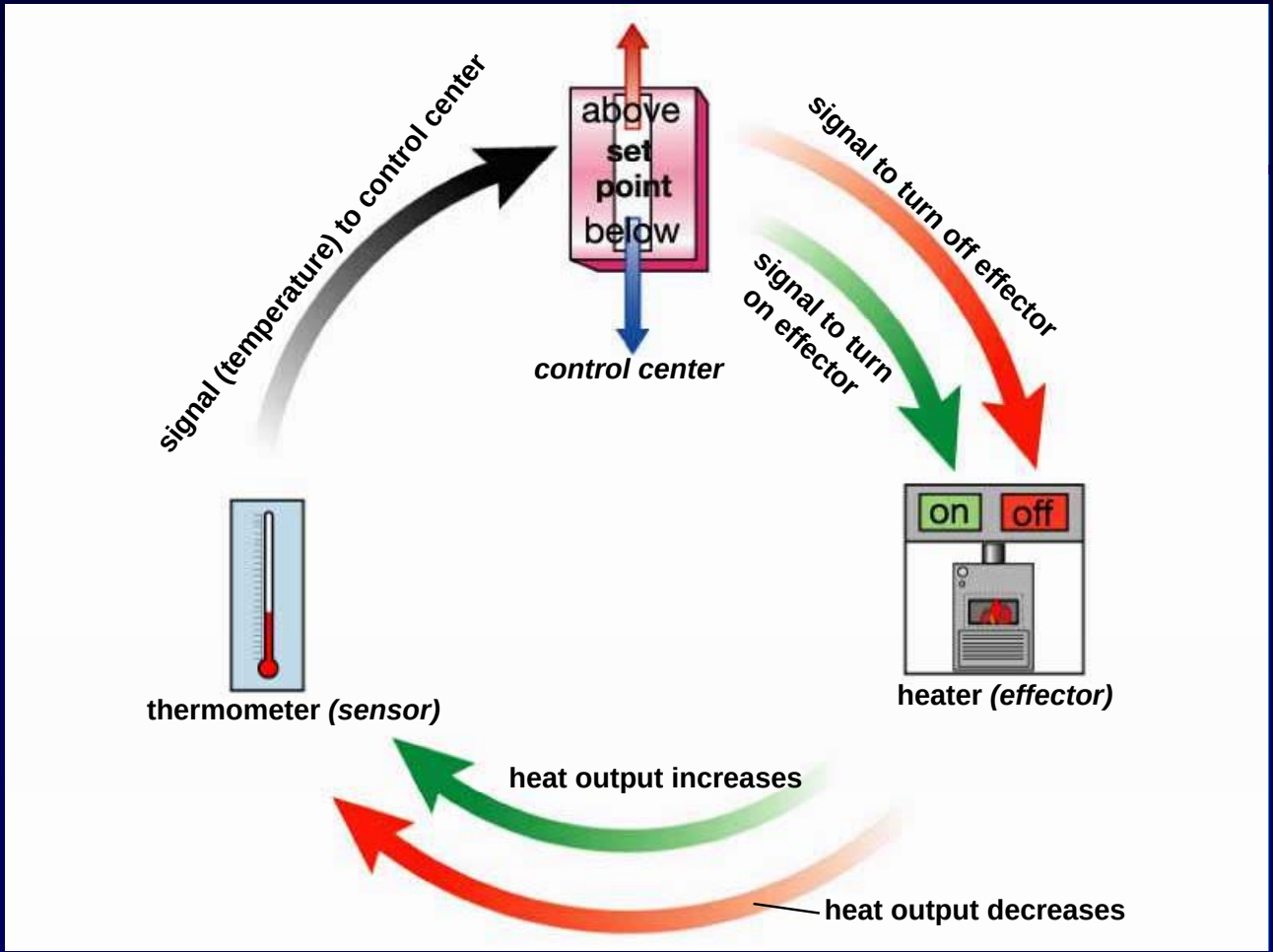
How Animals Maintain Internal Constancy

- Body continuously adjusts to internal/external changes
  - Examples: Body temperature, blood glucose
- termed: Homeostasis

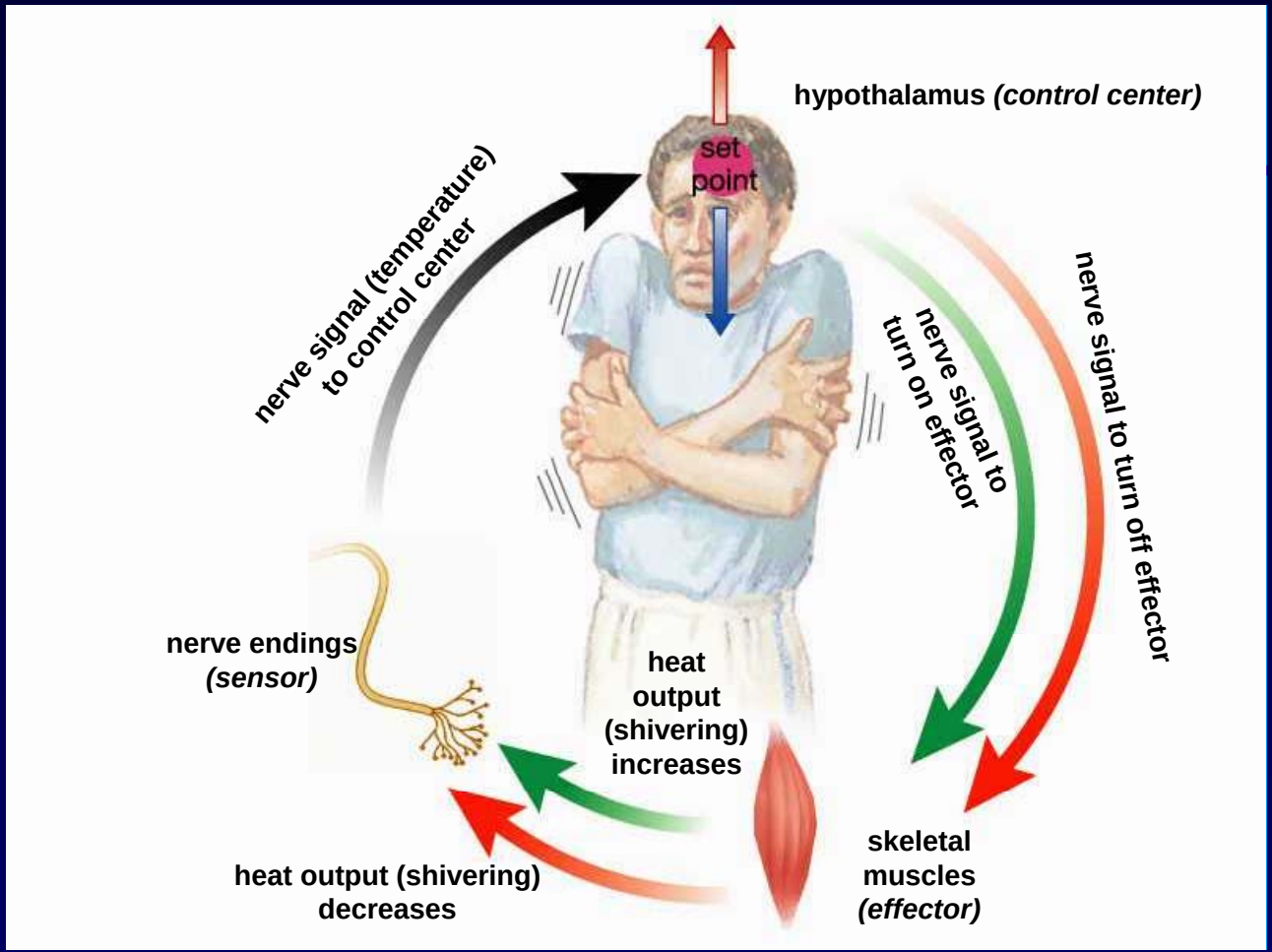
A. Negative feedback

- Most important & common mechanism maintaining homeostasis
- Input signal causes an output response that reverses the effect & returns system to its original condition

Negative feedback

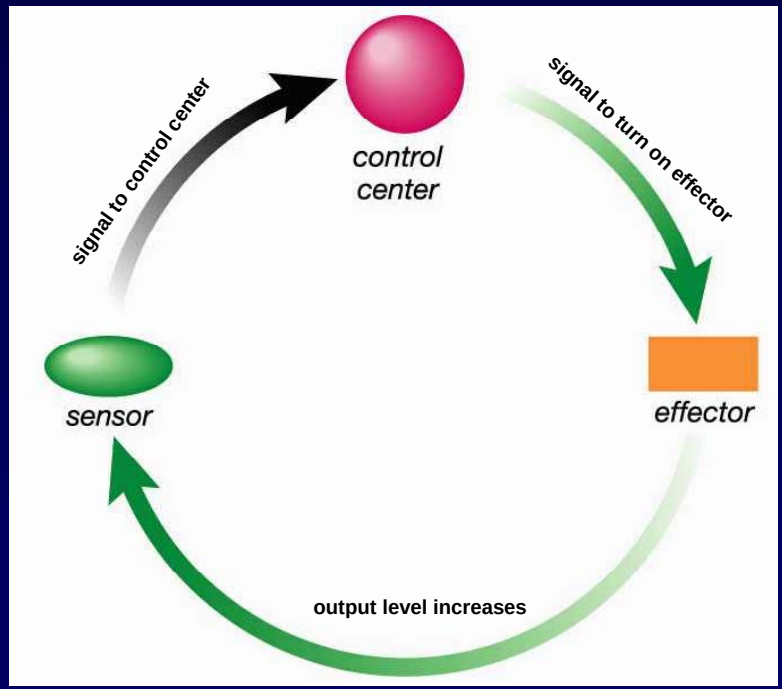


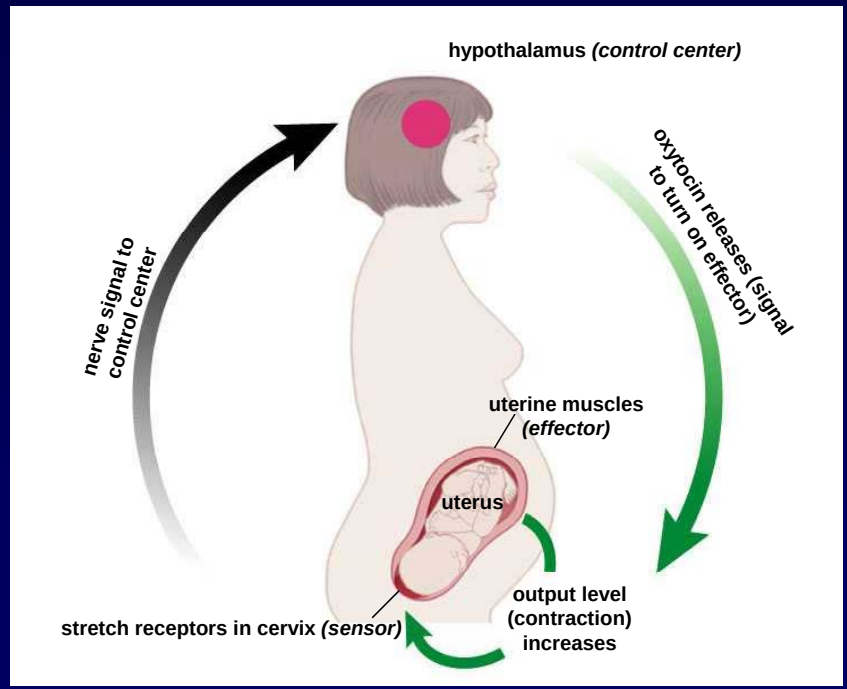
Negative feedback

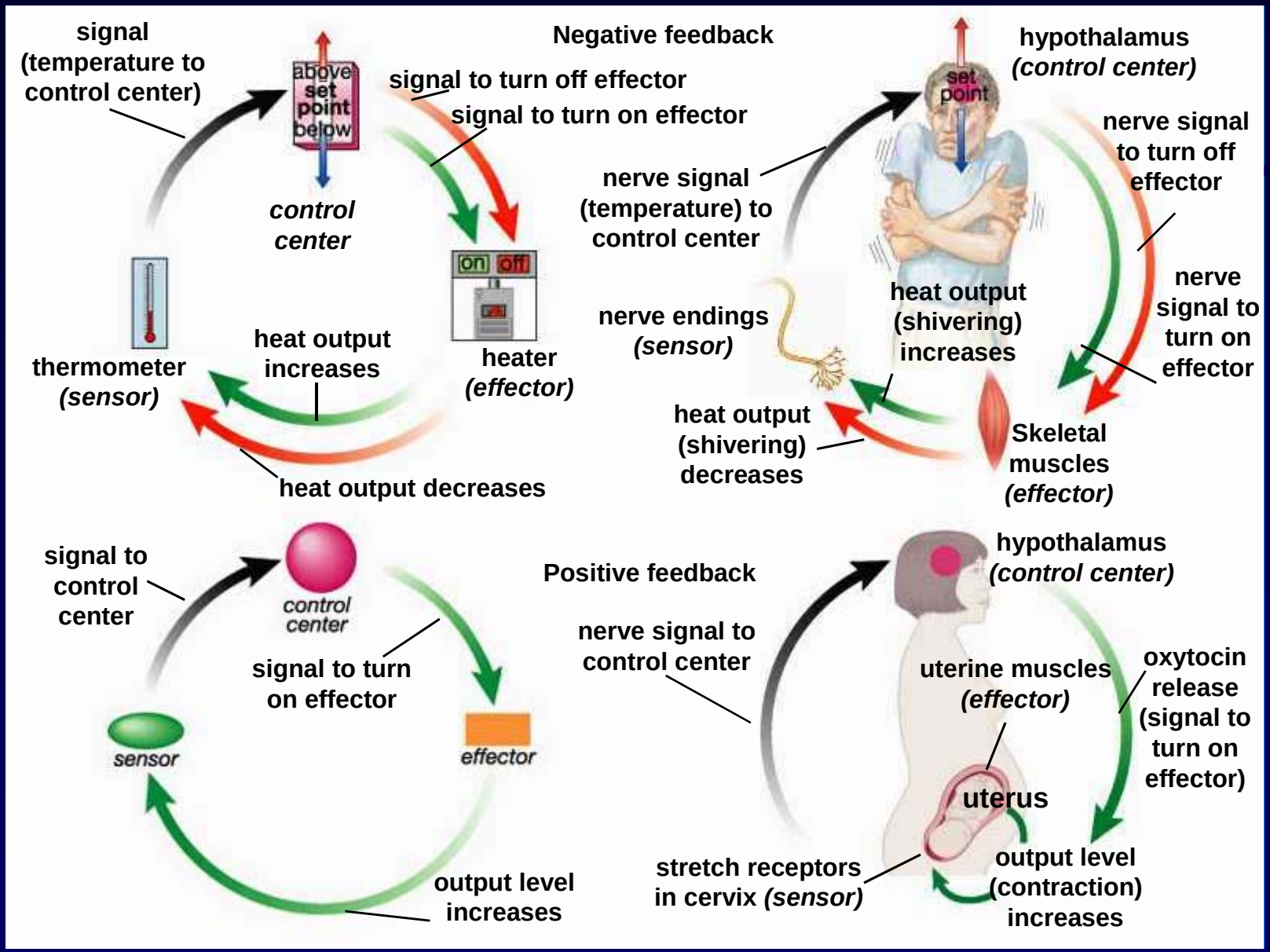


Positive feedback

B. A change in the system (input message) produces a (output) response the intensifies the original change






Negative feedback
signal (temperature to control center)
above set point
below
control center
signal to turn off effector
signal to turn on effector
on
off
heater (effector)
thermometer (sensor)
heat output increases
heat output decreases
hypothalamus (control center)
set point
nerve signal (temperature) to control center
nerve signal to turn off effector
nerve signal to turn on effector
nerve endings (sensor)
heat output (shivering) increases
heat output (shivering) decreases
Skeletal muscles (effector)
Positive feedback
signal to control center
control center
signal to turn on effector
sensor
effector
output level increases
hypothalamus (control center)
nerve signal to control center
uterine muscles (effector)
oxytocin release (signal to turn on effector)
uterus
stretch receptors in cervix (sensor)
output level (contraction) increases

How is the animal body organized?

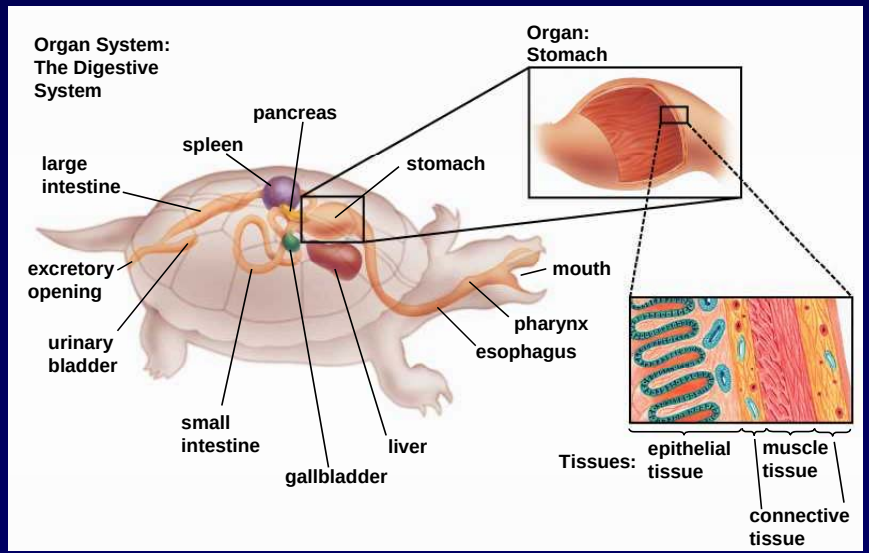
Tissues: structurally similar cells working together to perform a particular function

Organs: similar tissues form an organ

- Stomach, kidneys, skin

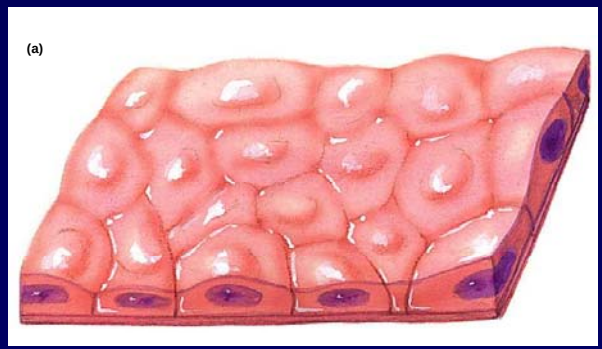
Organ systems: organs working together for a particular function

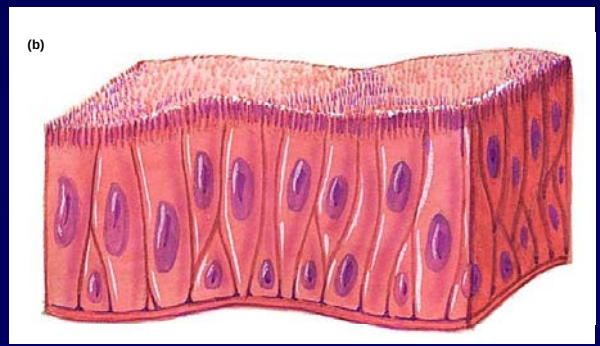
- Digestive system



How do tissues differ?

- 4 tissue types:
  - Epithelial, connective, muscle, nerve
- Epithelial tissue (a.k.a. epithelium)
  - Forms sheets that cover the body & line body cavities (ex., mouth, stomach, bladder)
  - Barrier to protect against substances moving ⇄
  - Cells continuously lost & replaced by mitotic cell division



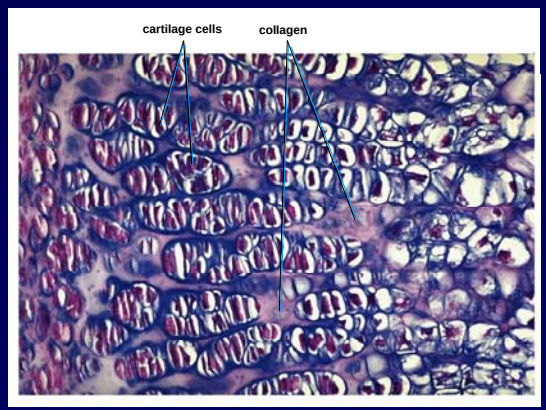


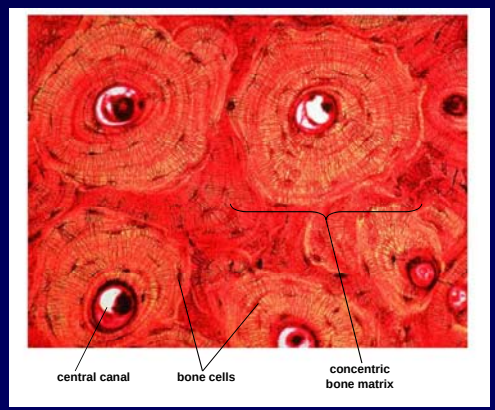
Tissue types (cont.)

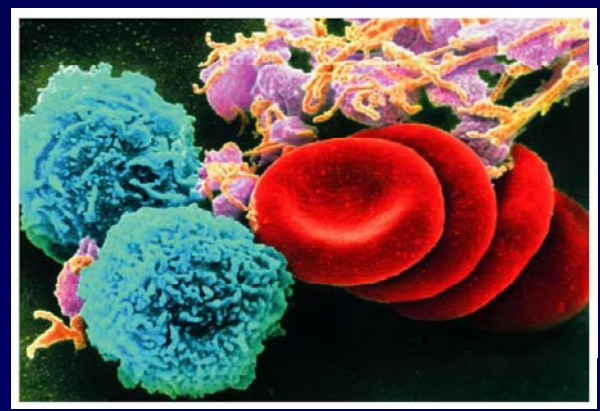
- Epithelial (cont.)
  - Glands: clusters of specialized cells that secrete substances
  - Two types of glands
    - Exocrine glands: remain connected to the epithelium by a passageway or duct
      - Sweat, sebaceous (oil), salivary, & mucus-producing glands of the stomach
    - Endocrine glands: separated from epithelium
      - Most produce hormones that are secreted into extracellular fluids

Tissue types (cont.)

- Connective tissue
  - Serves to support & bind other tissues
  - Most tissues contain large portions of extracellular substances, often secreted themselves
  - Cartilage, bone, tendons, ligaments, dermis, adipose tissue, blood, lymph







Tissue types (cont.)

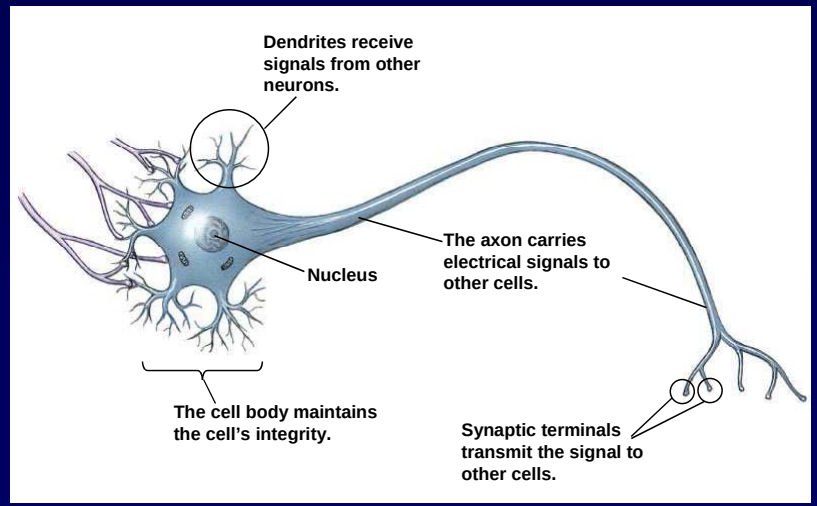
- Connective tissue (cont.)
  - Cartilage: flexible tissue consisting of widely spaced cells surrounded by thick, non-living matrix
  - Bone: hardened by calcium phosphate deposits
  - Tendon (muscle to bone), ligament (bone to bone)
  - Dermis: beneath epithelial tissue of skin, nourishes epethelium
  - Adipose: long-term storage & insulation
  - Blood: red, white, and platelets in plasma
  - Lymph: fluid transported by the lymphatic vessels….similar to blood plasma

Tissue types (cont.)

- Muscle tissue (3 types)
  - Skeletal
    - Voluntary control; moves skeleton & maintains posture
  - Cardiac (heart muscle)
    - Involuntary control; electrical impulses rapidly spread across heart tissue, stimulating cells to contract
  - Smooth
    - Involuntary control; tissue cells lack arrangement of fibrous proteins seen in skeletal and cardiac
    - Walls of digestive track, uterus, bladder, large blood vessels
    - Slow, sustained contractions

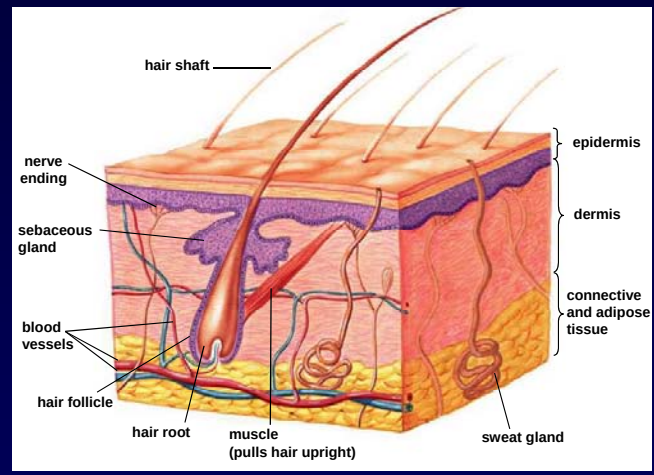
Tissue types (cont.)

- Nerve tissue
  - Brain, spinal cord, nerves of body
  - 2 types of cells: neurons & glial cells
  - Neurons are specialized to generate electrical signals & to conduct these signals to other neurons, muscles, or glands
  - 4 components:
    - Dendrites
    - Cell body
    - Axon
    - Glial cells



How are tissues combined into organs?

- Skin: organ containing all 4 tissue types
  - Epidermis (epithelial)
  - Dermis (connective)
    - Blood, lymph, glands
  - Nerve
  - Muscle



- Organ systems = 2 or more interacting organs
  - Integumentary system = skin, hair, nails
- List of organ systems in text