### Outline

I. Cell to cell contact  
II. Body cavities  
III. Membranes  
IV. Homeostasis  
V. Integumentary System (includes: skin, hair, nails)

### Cell Junctions

- The cells that make up tissues are held together by three types of junctions:
  1. Tight junctions  
  2. Adhesion junctions  
  3. Gap junctions

### Tight Junctions

- **Function**: Prevent substances from leaking across tissues  
- **Locations**: Urinary tract, digestive tract

### Adhesion Junctions

- **Function**: Hold adjacent cells together and allow tissues to be flexible  
- **Locations**: Skin, opening of the uterus

### Gap Junctions

- **Function**: Open channels between cells allowing rapid communication due to quick transfer of ions and small molecules between neighboring cells  
- **Location**: Heart and smooth muscle

### Cell Junctions

- Allows cells to communicate by allowing small molecules and ions to pass from cell to cell. Found in epithelia in which the movement of ions coordinates functions, such as the beating of cilia, found in excitable tissue such as heart and smooth muscle.
Which junction allows rapid communication between neighboring cells

1. Tight  
2. Adhering  
3. Gap

Which junction prevent substances from leaking across tissues

1. Tight  
2. Adhering  
3. Gap

Body Cavities

- We have two main body cavities
  - Dorsal cavity (posterior)
  - Ventral cavity (anterior)

Body Cavities

- Dorsal cavity
  - Cranial cavity
  - Spinal cavity

Ventral Body Cavity

- The ventral cavity is divided into two cavities:
  - Thoracic cavity
  - Abdominal cavity.

- The diaphragm is a broad sheet of muscle that divides the two cavities

Thoracic Cavity

- The thoracic cavity is further subdivided into:
  - The pleural cavities — contains lungs
  - The pericardial cavity — contains heart

Abdominal Cavity

- The abdominal cavity contains the digestive system, the urinary system, and the reproductive system

Dorsal Cavity

- Dorsal cavity is divided into two cavities:
  - Cranial — contains brain
  - Spinal — contains spinal cord
Membranes

- Body cavities and surfaces of organs are covered with membranes
- Membranes are sheets of epithelium supported by connective tissues
- Membranes protect tissues and organs

Mucous Membranes

- Mucous – line passages to the exterior world, including those of the respiratory, digestive, reproductive, and urinary systems in the body.
- Secrete mucus

Serous Membranes

- Serous – line thoracic and abdominopelvic cavities and the organs contained in them.
- Secrete lubricating fluid

Synovial Membranes

- Synovial – line cavities of freely movable joints
- Secrete a lubricating fluid
Cutaneous Membranes

- Cutaneous: skin, lines the outside of the body, thick, dry

Organs and Organ System

- An organ is a group of tissues that work together to perform a specific function
- In turn, organs work together to form an organ system

Organs Stomach as an example

- Epithelium lines the stomach and secretes acid to digest the food.
- Nerve tissue stimulates cells to release the acid.
- Muscles contract to push food through the stomach.
- Connective tissue supports these other tissues

Homeostasis

- Homeostasis – the ability to maintain the body at a relatively stable environment

Feedback

- The body uses the nervous system and the endocrine system to maintain homeostasis.
- Controlled by negative or positive feedback

Feedback Mechanism

- A receptor detects a change in the internal or external environment.
- A control center, such as a part of the brain, integrates the information coming from all receptors and sends out an appropriate response
- The effector carries out the response returning the system to homeostasis again

Hormones

- Hormones – A substance released into the blood, carries a message to other parts of the body
- When hormones are released from one part of the body they cause another part of the body to react
### Feedback

- In general, **Negative Feedback** is used to keep the body in balance, it keeps the status quo.
- **Positive Feedback** is used to change the situation.

### Negative Feedback Example

- **Example:** Calcium regulation.
  - Calcium is stored in the bones and circulates in the bloodstream.
  - Cells in the bones, osteoclasts release calcium from bone.

### Negative Feedback Example Cont.

- **Stimulus:** when calcium levels increase too high in the bloodstream.
- **Sensor:** Parathyroid glands
- **Control center:** the parathyroid gland stops releasing parathyroid hormone
- **Effectors:** Osteoclast cells in bone stop releasing calcium, Kidneys reabsorb less Ca++.  

### Negative Feedback Example Temperature

- **Stimulus:** when calcium levels drop too low in the bloodstream.
- **Sensor:** Parathyroid glands
- **Control center:** the parathyroid gland releases parathyroid hormone
- **Effectors:** Osteoclast cells in bone release calcium, Kidneys reabsorb more Ca++.  

### Negative Feedback Example - Temperature

- **Stimulus:** when calcium levels increase too high in the bloodstream.
- **Sensor:** Parathyroid glands
- **Control center:** the parathyroid gland stops releasing parathyroid hormone
- **Effectors:** Osteoclast cells in bone stop releasing calcium, Kidneys reabsorb less Ca++.  

### Positive Feedback – Example Childbirth

- **Stimulus:** When the baby leaves the uterus, the muscles in the cervix stretch. Nerves in the cervix send a message to the hypothalamus gland
- **Sensor:** Stretch receptors in the cervix
- **Control Center:** Hypothalamus gland causes the pituitary gland to release more oxytocin
- **Effector:** muscles of uterus contract

### Positive Feedback – Example Childbirth

- More pressure stimulates the stretch receptors, which signal the hypothalamus to tell the pituitary gland to release more oxytocin

### Integumentary System

- Components of the integumentary:
  - Skin
  - Nails
  - Hair
  - Exocrine glands (sweat and oil glands)
Integumentary System Functions

1. Provides protection from bacteria, UV radiation, chemicals, physical injury
2. Reduce water loss
3. Temperature regulation
4. Vitamin D production
5. Contains sensors that detect pain, temperature, and pressure.

Skin Layers

- The epidermis has two layers:
  1. **Epidermis** – thin outer layer of stratified squamous epithelial tissue
  2. **Dermis** – thick underlying layer of mainly connective tissue

Epidermis

- **Epidermis** consists of several layers of squamous epithelial cells (stratified)
- Deepest layer contains rapidly dividing cells
- Outer surface is made up of dead skin cells
- Protective properties come from keratin
- **Melanocytes** produce melanin

Dermis

- The **dermis** consists primarily of connective tissue
- Also contains vascular tissue, hair follicles, sweat glands, nerves, sensory receptors
- Collagen and elastic fibers are found in the lower layer, which allows the skin to stretch and return to its original shape

Hypodermis

- The **hypodermis** is a layer of loose connective tissue beneath the dermis and epidermis connecting it to other tissues
- The hypodermis is not a part of the skin, it lays underneath the skin

Accessory Organs of the Skin:

- **Nails** - sheets of hard keratinized cells forming a protective covering for the fingers and toes.
- **Hair follicles** - found in the dermis and where sebum is released to lubricate the hair.
- **Sweat glands** - play a role in modifying body temperature and have ducts that lead to a pore at the surface of the skin.
- **Sebaceous glands** - secrete sebum, an oily substance that lubricates the skin and hair.

Skin Cancer

- Melanin protects against UV radiation
- Three types of skin cancer
  1. **Basal cell carcinoma** – from rapidly dividing cells deep in the epidermis
  2. **Squamous cell carcinoma** - from newly formed cells as they flatten
  3. **Melanoma** - from melanocytes, far more dangerous than other skin cancers.
These cells found in skin produce pigments

1. Chondrocytes
2. Melanocytes
3. Fibroblasts
4. Osteocytes

Important concepts

- How does negative and positive feedback work, be able to describe the examples of negative and positive feedback given in class and in the textbook, identify the sensor, control center, and effector for each example
- What are the three cell-cell junctions and their functions

Definitions

- Tissue, Organ, organ system, Tight junctions, Adhesion junctions, Gap junctions, Exocrine glands, Endocrine glands, Homeostasis, Hormones, hypodermis, diaphragm, sebum, sebaceous glands, keratin, basement membrane, lacunae, voluntary control, involuntary control, hyperthermia, hypothermia, melanin, hypodermis

Melanoma in the United States - 2005 Estimates

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Figure 4.A Three skin cancers

These cells found in skin produce pigments

- Chondrocytes
- Melanocytes
- Fibroblasts
- Osteocytes