

# Skin and Body Membranes

## Body Membranes

- Function of body membranes
  - Cover body surfaces
  - Line body cavities
  - Form protective sheets around organs

## Classification of Body Membranes

- Epithelial membranes
  - Cutaneous membranes
  - Mucous membranes
  - Serous membranes
- Connective tissue membranes
  - Synovial membranes

## Cutaneous Membrane

- Cutaneous membrane = skin
  - Dry membrane
  - Outermost protective boundary
- Superficial epidermis is composed of keratinized stratified squamous epithelium
- Underlying dermis is mostly dense connective tissue

## Cutaneous Membranes

### Mucous Membranes

- Surface epithelium type depends on site
  - Stratified squamous epithelium (mouth, esophagus)
  - Simple columnar epithelium (rest of digestive tract)
- Underlying loose connective tissue (lamina propria)
- Lines all body cavities that open to the exterior body surface
- Often adapted for absorption or secretion

### Serous Membranes

- Surface is a layer of simple squamous epithelium
- Underlying layer is a thin layer of areolar connective tissue
- Lines open body cavities that are closed to the exterior of the body
- Serous membranes occur in pairs separated by serous fluid
  - Visceral layer covers the outside of the organ
  - Parietal layer lines a portion of the wall of ventral body cavity

### Serous Membranes

- Specific serous membranes
  - Peritoneum
    - Abdominal cavity
  - Pleura
    - Around the lungs
  - Pericardium
    - Around the heart

## **Connective Tissue Membrane**

- **Synovial membrane**
  - **Connective tissue only**
  - **Lines fibrous capsules surrounding joints**
  - **Secretes a lubricating fluid**

## **Integumentary System**

- **Skin (cutaneous membrane)**
- **Skin derivatives**
  - **Sweat glands**
  - **Oil glands**
  - **Hair**
  - **Nails**

## **Skin Functions**

### **Skin Structure**

- **Epidermis—outer layer**
  - **Stratified squamous epithelium**
  - **Often keratinized (hardened by keratin)**
- **Dermis**
  - **Dense connective tissue**

### **Skin Structure**

- **Subcutaneous tissue (hypodermis) is deep to dermis**
  - **Not part of the skin**
  - **Anchors skin to underlying organs**
  - **Composed mostly of adipose tissue**

### **Layers of the Epidermis**

- **Stratum basale (stratum germinativum)**
  - **Deepest layer of epidermis**
  - **Lies next to dermis**
  - **Cells undergoing mitosis**
  - **Daughter cells are pushed upward to become the more superficial layers**
- **Stratum spinosum**
- **Stratum granulosum**

### **Layers of the Epidermis**

- **Stratum lucidum**
  - **Formed from dead cells of the deeper strata**
  - **Occurs only in thick, hairless skin of the palms of hands and soles of feet**
- **Stratum corneum**
  - **Outermost layer of epidermis**
  - **Shingle-like dead cells are filled with keratin (protective protein prevents water loss from skin)**

### **Layers of the Epidermis**

- **Summary of layers from deepest to most superficial**
  - **Stratum basale**

- Stratum spinosum
- Stratum granulosum
- Stratum lucidum (thick, hairless skin only)
- Stratum corneum

### **Melanin**

- Pigment (melanin) produced by melanocytes
- Melanocytes are mostly in the stratum basale
- Color is yellow to brown to black
- Amount of melanin produced depends upon genetics and exposure to sunlight

### **Dermis**

- Two layers
  - Papillary layer (upper dermal region)
    - Projections called dermal papillae
      - Some contain capillary loops
      - Other house pain receptors and touch receptors
  - Reticular layer (deepest skin layer)
    - Blood vessels
    - Sweat and oil glands
    - Deep pressure receptors

### **Dermis**

- Overall dermis structure
  - Collagen and elastic fibers located throughout the dermis
    - Collagen fibers give skin its toughness
    - Elastic fibers give skin elasticity
  - Blood vessels play a role in body temperature regulation

### **Skin Structure**

#### **Normal Skin Color Determinants**

- Melanin
  - Yellow, brown, or black pigments
- Carotene
  - Orange-yellow pigment from some vegetables
- Hemoglobin
  - Red coloring from blood cells in dermal capillaries
  - Oxygen content determines the extent of red coloring

### **Skin Appendages**

- Cutaneous glands are all exocrine glands
  - Sebaceous glands
  - Sweat glands
- Hair
- Hair follicles
- Nails

#### **Appendages of the Skin**

- Sebaceous glands
  - Produce oil

- Lubricant for skin
- Prevents brittle hair
- Kills bacteria
- Most have ducts that empty into hair follicles; others open directly onto skin surface
- Glands are activated at puberty

### **Appendages of the Skin**

- Sweat glands
  - Produce sweat
  - Widely distributed in skin
  - Two types
    - Eccrine
      - Open via duct to pore on skin surface
    - Apocrine
      - Ducts empty into hair follicles

### **Sweat and Its Function**

- Composition
  - Mostly water
  - Salts and vitamin C
  - Some metabolic waste
  - Fatty acids and proteins (apocrine only)
- Function
  - Helps dissipate excess heat
  - Excretes waste products
  - Acidic nature inhibits bacteria growth
- Odor is from associated bacteria

### **Appendages of the Skin**

- Hair
  - Produced by hair follicle
  - Consists of hard keratinized epithelial cells
  - Melanocytes provide pigment for hair color

### **Appendages of the Skin**

- Hair anatomy
  - Central medulla
  - Cortex surrounds medulla
  - Cuticle on outside of cortex
    - Most heavily keratinized

### **Appendages of the Skin**

- Associated hair structures
  - Hair follicle
    - Dermal and epidermal sheath surround hair root
  - Arrector pili muscle
    - Smooth muscle
    - Pulls hairs upright when cold or frightened
  - Sebaceous gland
  - Sweat gland

## **Appendages of the Skin**

- **Nails**
  - **Scale-like modifications of the epidermis**
    - **Heavily keratinized**
  - **Stratum basale extends beneath the nail bed**
    - **Responsible for growth**
  - **Lack of pigment makes them colorless**

## **Appendages of the Skin**

- **Nail structures**
  - **Free edge**
  - **Body is the visible attached portion**
  - **Root of nail embedded in skin**
  - **Cuticle is the proximal nail fold that projects onto the nail body**

## **Appendages of the Skin**

### **Skin Homeostatic Imbalances**

- **Infections**
  - **Athlete's foot (tinea pedis)**
    - **Caused by fungal infection**
  - **Boils and carbuncles**
    - **Caused by bacterial infection**
  - **Cold sores**
    - **Caused by virus**

### **Skin Homeostatic Imbalances**

- **Infections and allergies**
  - **Contact dermatitis**
    - **Exposures cause allergic reaction**
  - **Impetigo**
    - **Caused by bacterial infection**
  - **Psoriasis**
    - **Cause is unknown**
    - **Triggered by trauma, infection, stress**

### **Skin Homeostatic Imbalances**

- **Burns**
  - **Tissue damage and cell death caused by heat, electricity, UV radiation, or chemicals**
  - **Associated dangers**
    - **Dehydration**
    - **Electrolyte imbalance**
    - **Circulatory shock**

### **Rule of Nines**

- **Way to determine the extent of burns**
- **Body is divided into 11 areas for quick estimation**
- **Each area represents about 9% of total body surface area**

### **Severity of Burns**

- **First-degree burns**

- Only epidermis is damaged
- Skin is red and swollen
- Second-degree burns
  - Epidermis and upper dermis are damaged
  - Skin is red with blisters
- Third-degree burns
  - Destroys entire skin layer
  - Burn is gray-white or black

### **Critical Burns**

- Burns are considered critical if
  - Over 25% of body has second-degree burns
  - Over 10% of the body has third-degree burns
  - There are third-degree burns of the face, hands, or feet

### **Skin Cancer**

- Cancer—abnormal cell mass
- Classified two ways
  - Benign
    - Does not spread (encapsulated)
  - Malignant
    - Metastasized (moves) to other parts of the body
- Skin cancer is the most common type of cancer

### **Skin Cancer Types**

- Basal cell carcinoma
  - Least malignant
  - Most common type
  - Arises from stratum basale

### **Skin Cancer Types**

- Squamous cell carcinoma
  - Metastasizes to lymph nodes if not removed
  - Early removal allows a good chance of cure
  - Believed to be sun-induced
  - Arises from stratum spinosum

### **Skin Cancer Types**

- Malignant melanoma
  - Most deadly of skin cancers
  - Cancer of melanocytes
  - Metastasizes rapidly to lymph and blood vessels
  - Detection uses ABCD rule

### **ABCD Rule**

- A = Asymmetry
  - Two sides of pigmented mole do not match
- B = Border irregularity
  - Borders of mole are not smooth
- C = Color
  - Different colors in pigmented area

- **D = Diameter**
  - **Spot is larger than 6 mm in diameter**