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

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