4
Skin and Body Membranes

ESSENTIALS OF HUMAN ANATOMY & PHYSIOLOGY
EIGHTH EDITION

ELAINE N. MARIEB

Copyright © 2006 Pearson Education, Inc., publishing as Benjamin Cummings
Components of Integumentary System

- Skin (cutaneous membrane)
- Skin derivatives
  - Sweat glands
  - Oil glands
  - Hairs
  - Nails
Skin Functions

- Protects deeper tissues from:
  - Mechanical damage
  - Chemical damage
  - Bacterial damage
  - Thermal damage
  - Ultraviolet radiation
  - Desiccation (drying out)
Skin Functions

- Aids in heat regulation
- Aids in excretion of urea and uric acid (wastes)
- Synthesizes vitamin D
Skin Structure

- Epidermis – outer layer
  - Stratified squamous epithelium
  - Often keratinized (hardened by keratin)
- Dermis
  - Dense connective tissue
Skin Structure continued

- Hypodermis/Subcutaneous Layer (deep to the dermis)
  - Not part of the skin
  - Anchors skin to underlying organs
  - Composed mostly of adipose tissue
Layers of Epidermis (epithelial tissue)

- **Stratum basale** (bottom)
  - Cells undergoing mitosis
  - Lies next to dermis
- **Stratum spinosum**
- **Stratum granulosum**
- **Stratum lucidum**
  - Occurs only in thick skin
- **Stratum corneum** (top)
  - Shingle-like dead cells
  - $\frac{3}{4}$ of epidermal thickness
Melanin

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

- Collagen & Elastic fibers found throughout dermis

- Two layers
  - Papillary layer
    - Projections called dermal papillae (form fingerprints)
    - Pain & touch receptors
    - Capillary loops
  - Reticular layer
    - Blood vessels (supply oxygen/nutrients & regulate body temp)
    - Sweat & oil glands
    - Nerve receptors (deep pressure)
Skin Structure

Figure 4.4
Normal Skin Color Determinants

- Melanin
  - Yellow, brown or black pigments

- Carotene
  - Orange-yellow pigment from some vegetables

- Hemoglobin
  - Red coloring from blood cells in dermis capillaries
  - Oxygen content determines the extent of red coloring
Appendages of the Skin

- Sebaceous glands
  - Produce sebum (oil & fragmented cells)
    - Lubricant for skin
    - Kills bacteria
  - Most with ducts that empty into hair follicles
  - Glands are activated at puberty
Appendages of the Skin

- Sweat glands
  - 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
  - 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 bulb
  - Consists of hard keratinized epithelial cells
  - Melanocytes provide pigment for hair color

Figure 4.7c
Hair Anatomy

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

Figure 4.7b
Associated Hair Structures

- **Hair follicle**
  - Dermal and epidermal sheath surround hair root
- **Arrector pili**
  - Smooth muscle
- **Sebaceous gland**
- **Sweat gland**

Figure 4.7a
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
Nail Structures

- Free edge
- Body
- Root of nail
- Eponychium – proximal nail fold that projects onto the nail body
Skin Homeostatic Imbalances

- Infections
  - Athletes foot
    - 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%
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
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

- Two types
  - 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

- Squamous cell carcinoma
  - Arises from stratum spinosum
  - Metastasizes to lymph nodes
  - Early removal allows a good chance of cure
Skin Cancer Types

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

- **E = Evolving—changing size, shape, or color**