Skin and Body Membranes

- Integument and derivatives

Integumentary System

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

Skin Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection</td>
<td>Prevents heat loss, heat and cold damage, electrical damage</td>
</tr>
<tr>
<td>Sensory</td>
<td>Evokes sensations of pain and touch</td>
</tr>
<tr>
<td>Thermoregulation</td>
<td>Secretes sweat to cool body, produces heat when cold</td>
</tr>
<tr>
<td>Excretion</td>
<td>Secretes sweat to excrete waste products</td>
</tr>
<tr>
<td>Metabolism</td>
<td>Preserves essential nutrients such as vitamin D and essential fatty acids</td>
</tr>
<tr>
<td>Occlusion</td>
<td>Provides insulation for underlying organs</td>
</tr>
</tbody>
</table>

Skin Structure

- Epidermis—outer layer
  - Stratified squamous epithelium
  - Often keratinized (hardened by keratin)
- Dermis
  - Dense connective tissue
- Hypodermis (not a part of the skin itself)
  - Lies deep to the dermis between skin and underlying organs
  - Areolar and adipose tissues
Skin Structure

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**
  - Cells look spiny when stained

- **Stratum granulosum**
  - Has granules upon staining

- **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**

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
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

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
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

Appendages of the Skin

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

- [Diagram of hair follicle and associated structures]
Appendages of the Skin

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

Figure 4.7b

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