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

Overview

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

- **Cutaneous membrane = skin**
  - Dry membrane
  - Outermost protective boundary
- **Composed of:**
  - Keratinized stratified squamous epithelium
  - Dense connective tissue
Mucous Membranes

- Composition depends on site
  - Stratified squamous epithelium (mouth, esophagus)
  - Simple columnar epithelium (rest of digestive tract)
- Lines all body cavities that open to the exterior body surface
- Often adapted for absorption or secretion
Serous Membranes

- Composed of:
  - Surface is a layer of simple squamous epithelium
  - Underlying layer is areolar connective tissue

- Lines body cavities that are closed to the exterior of the body

- Serous membranes occur in pairs separated by serous fluid to reduce friction between organ and wall of the cavity.
  - Parietal layer lines the wall of the cavity
  - Visceral layer covers the outside of the organ
Serous Membranes

Parietal pleura
Visceral pleura

Parietal pericardium
Visceral pericardium

(d)

Outer wall (comparable to parietal serosa)
Air or water (comparable to serous fluid)
Inner wall (comparable to visceral serosa)

Figure 4.1d
Connective Tissue Membrane

- **Synovial membrane**
  - Connective tissue only
  - Lines fibrous capsules surrounding joints
  - Secretes a lubricating fluid to reduce friction between bones.
Integumentary System

- Skin (cutaneous membrane)
- Skin derivatives
  - Sudoriferous glands
  - Sebaceous glands
- Hair
- Nails
## Skin Functions *p.114*

<table>
<thead>
<tr>
<th>Functions</th>
<th>How accomplished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protects deeper tissues from</td>
<td>Physical barrier contains keratin, which toughens cells; fat cells to cushion blows; and pressure receptors, which alert the nervous system to possible damage.</td>
</tr>
<tr>
<td>- Mechanical damage (bumps)</td>
<td></td>
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<tr>
<td>- Chemical damage (acids and bases)</td>
<td>Has relatively impermeable keratinized cells; contains pain receptors, which alert the nervous system to possible damage.</td>
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<tr>
<td>- Bacterial damage</td>
<td>Has an unbroken surface and “acid mantle” (skin secretions are acidic, and thus inhibit bacteria). Phagocytes ingest foreign substances and pathogens, preventing them from penetrating into deeper body tissues.</td>
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<tr>
<td>- Ultraviolet radiation (damaging effects of sunlight)</td>
<td>Melanin produced by melanocytes offers protection from UV damage.</td>
</tr>
<tr>
<td>- Thermal (heat or cold) damage</td>
<td>Contains heat/cold/pain receptors.</td>
</tr>
<tr>
<td>- Desiccation (drying out)</td>
<td>Contains a waterproofing glycolipid and keratin.</td>
</tr>
<tr>
<td>Aids in body heat loss or heat retention (controlled by the nervous system)</td>
<td><em>Heat loss:</em> By activating sweat glands and by allowing blood to flush into skin capillary beds so that heat can radiate from the skin surface. <em>Heat retention:</em> By not allowing blood to flush into skin capillary beds.</td>
</tr>
<tr>
<td>Aids in excretion of urea and uric acid</td>
<td>Contained in perspiration produced by sweat glands.</td>
</tr>
<tr>
<td>Synthesizes vitamin D</td>
<td>Modified cholesterol molecules in skin converted to vitamin D by sunlight.</td>
</tr>
</tbody>
</table>
Skin Structure

- Epidermis—outer layer
  - Stratified squamous epithelium
  - Often keratinized (hardened by keratin)
- Dermis
  - Dense connective tissue
- 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) – cells undergo mitosis
  - Deepest layer of epidermis
  - Daughter cells pushed upward to become the more superficial layers
- **Stratum spinosum**
- **Stratum granulosum**
- **Stratum lucidum** - Occurs in skin of the palms of hands and soles of feet
- **Stratum corneum** - filled with keratin (protective protein prevents water loss from skin)
  - Outermost layer of epidermis
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
      - Contain capillary loops for blood supply to dermis
      - Contain pain 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
    - Collagen fibers give skin its toughness
    - Elastic fibers give skin elasticity
  - Blood vessels play a role in body temp. regulation.
Normal Skin Color

- 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
Abnormal Skin Color

- **Erythema**: Reddened skin due to blushing, fever, hypertension, inflammation, or allergy.

- **Pallor**: Blanching; pale skin can be due to emotional stress, anemia, hypotension, impaired blood flow.

- **Jaundice**: Yellowish cast to skin; signifies liver damage due to excess bile.

- **Bruises**: Blood loss from vessels into tissue space. Also known as *hematoma*.

- **Cyanosis**: Blue discoloration to skin due to low blood oxygen levels.
Skin Appendages

- Cutaneous glands are all exocrine glands
  - Sebaceous glands
  - Sudoriferous 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

- Sudoriferous glands
  - Produce sweat
  - Widely distributed in skin
  - Two types
    - Eccrine
      - Open via duct to pore on skin surface
      - Produces “sensible” sweat
    - Apocrine
      - Ducts empty into hair follicles in groin and axillary
      - Produces oily sweat
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

- Associated hair structures
  - Hair follicle
  - Arrector pili muscle
    - Smooth muscle
    - Pulls hairs upright when cold or frightened
  - Sebaceous gland
  - Sweat gland
Appendages of the Skin

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