Chapter 6

The Integumentary System
<table>
<thead>
<tr>
<th>Key Terms</th>
<th>Definition</th>
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<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>apocrine</td>
<td>epidermis</td>
<td>melanin</td>
<td></td>
</tr>
<tr>
<td>alopecia</td>
<td>erythema</td>
<td>melanocyte</td>
<td></td>
</tr>
<tr>
<td>arrector pili</td>
<td>exfoliation</td>
<td>scar</td>
<td></td>
</tr>
<tr>
<td>cerumen</td>
<td>hair follicle</td>
<td>sebaceous gland</td>
<td></td>
</tr>
<tr>
<td>cicatrix</td>
<td>integumentary system</td>
<td>sebum</td>
<td></td>
</tr>
<tr>
<td>cyanosis</td>
<td>jaundice</td>
<td>stratum basale</td>
<td></td>
</tr>
<tr>
<td>dermatitis</td>
<td>keloid</td>
<td>subcutaneous layer</td>
<td></td>
</tr>
<tr>
<td>dermis</td>
<td>keratin</td>
<td>sudoriferous gland</td>
<td></td>
</tr>
<tr>
<td>eccrine</td>
<td>lesion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Structure of the Skin

Learning Objectives

1. Name and describe the layers of the skin.

2. Describe the subcutaneous layer.
Accessory Structures of the Skin

Learning Objective

3. Give the locations and functions of the accessory structures of the integumentary system.
Functions of the Integumentary System

Learning Objective

4. List the main functions of the integumentary system.
Observations of the Skin

Learning Objective

5. Summarize the information to be gained by observation of the skin.
Repair of the Integument

Learning Objective

6. Cite the steps in repair of skin wounds and the factors that affect healing.
Effects of Aging on the Integumentary System

Learning Objective

7. Describe how the skin changes with age.
Disorders of the Integumentary System

Learning Objective

8. List the main disorders of the integumentary system.
Learning Objective

9. Using information in the case study and the text, describe the causes, classification and dangers of a burn.
Learning Objective

10. Show how word parts are used to build words related to the integumentary system.
Structure of the Skin

Learning Objectives

1. Name and describe the layers of the skin.

2. Describe the subcutaneous layer.
The Integumentary System

- Composed of two parts
  - Skin
  - Associated structures
Structure of the Skin

- The skin consists of two layers.
  - Epidermis
  - Dermis
- Underneath and supporting the dermis is the subcutaneous layer.
## Structure of the Skin (cont.)

### Epidermis

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outermost portion of skin</td>
<td>Composed mostly of stratified squamous epithelium</td>
<td>Protection from wear and tear, injury, and harmful substances</td>
</tr>
<tr>
<td></td>
<td>Avascular</td>
<td>Melanin protects from UV radiation</td>
</tr>
<tr>
<td></td>
<td>Composed of several layers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stratum corneum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Most superficial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Highly keratinized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Constantly shed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stratum basale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Deepest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Produces new epithelial cells</td>
<td></td>
</tr>
</tbody>
</table>
# Structure of the Skin (cont.)

## Dermis

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneath epidermis</td>
<td>Composed of connective tissue</td>
<td>Protection</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
<td>Nourishment of epidermis</td>
</tr>
<tr>
<td></td>
<td>Contains accessory structures</td>
<td>Skin elasticity</td>
</tr>
<tr>
<td></td>
<td>• Hair follicles</td>
<td>Sensory perception</td>
</tr>
<tr>
<td></td>
<td>• Sebaceous glands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sudoriferous glands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sensory receptors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Blood vessels</td>
<td></td>
</tr>
</tbody>
</table>
# Structure of the Skin (cont.)

## Subcutaneous Layer

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneath dermis</td>
<td>Composed of loose connective tissue with large amounts of adipose tissue</td>
<td>Connects skin to underlying muscle</td>
</tr>
<tr>
<td></td>
<td>Has blood vessels and nerve endings</td>
<td>Insulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature regulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensory perception</td>
</tr>
</tbody>
</table>
How is the epidermis supplied with oxygen and nutrients? What tissue is located beneath the skin?
Figure 6-2 Microscopic view of thin skin.

Structure of the Skin (cont.)
Structure of the Skin (cont.)

**Figure 6-3** Upper portion of the skin.

- **Epidermis**
- **Dermis**
- **Keratin in stratum corneum**
- **Stratum basale**
Structure of the Skin (cont.)

Checkpoints

6-1 What is the name of the system that comprises the skin and all its associated structures?

6-2 Moving from the superficial to the deeper layer, what are the names of the two layers of the skin?

6-3 What is the composition of the subcutaneous layer?
Pop Quiz

6.1 Where do new epidermal cells come from?
A) Subcutaneous layer
B) Stratum basale
C) Stratum corneum
D) Dermis
Structure of the Skin (cont.)

Pop Quiz Answer

6.1 Where do new epidermal cells come from?
A) Subcutaneous layer
B) Stratum basale
C) Stratum corneum
D) Dermis
Accessory Structures of the Skin

Learning Objective

3. Give the locations and functions of the accessory structures of the integumentary system.
Accessory Structures of the Skin (cont.)

• Help protect the skin and give it more functions

• Include:
  – Sebaceous oil glands
  – Sudoriferous glands
  – Hair
  – Nails
## Glands

<table>
<thead>
<tr>
<th>Structure</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebaceous (oil) glands</td>
<td>Saclike glands associated with hair follicles</td>
<td>Secrete sebum, an oily substance that lubricates skin and hair, and prevents drying</td>
</tr>
<tr>
<td>Sudoriferous (sweat) glands</td>
<td>Coiled glands that vent directly to the skin surface or through hair follicles</td>
<td>Release perspiration to cool body by evaporation Eliminate some soluble wastes</td>
</tr>
</tbody>
</table>
## Accessory Structures of the Skin (cont.)

### Hair and Nails

<table>
<thead>
<tr>
<th>Structure</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
</table>
| Hair      | Composed of keratin  
Develops in a follicle  
Grows from base of follicle  
Structure:  
- Follicle  
- Shaft  
- Root  
- Arrector pili muscle | Conserve heat when raised by arrector pili muscles  
Stimulates secretion of sebum |
| Nails     | Cover distal end of fingers and toes  
Composed of keratin  
Grow from proximal end  
Structure:  
- Root  
- Plate  
- Lunula | Protection  
Help in grasping objects |
How do the sebaceous glands and apocrine sweat glands secrete to the outside? What kind of epithelium makes up the sweat glands?
Accessory Structures of the Skin (cont.)

Figure 6-5 Nail structure.

- Free edge
- Nail plate
- Lunula
- Cuticle

A

- Nail bed
- Lunula
- Nail plate
- Cuticle
- Nail root
- Distal bone of finger
- Growth region (nail matrix)
Accessory Structures of the Skin (cont.)

Checkpoints

6-4 What is the name of the skin glands that produce an oily secretion?

6-5 What is the scientific name for the sweat glands?

6-6 What is the name of the sheath in which a hair develops?

6-7 Where are the active cells that produce a nail located?
Pop Quiz

6.2 The maintenance of constant body temperature would be difficult without the actions of the:

A) Apocrine glands
B) Meibomian glands
C) Sebaceous glands
D) Eccrine glands
Pop Quiz Answer

6.2 The maintenance of constant body temperature would be difficult without the actions of the:

A) Apocrine glands
B) Meibomian glands
C) Sebaceous glands
D) Eccrine glands
Functions of the Integumentary System

Learning Objective

4. List the main functions of the integumentary system.
Four major functions:

1. Protection against infection

2. Protection against dehydration (drying)

3. Regulation of body temperature

4. Collection of sensory information
Functions of the Integumentary System (cont.)

Protection against Infection

- Intact skin forms a primary barrier against invasion.
- Interlocking pattern resists penetration.
- Shedding removes pathogens.
- Protects against bacterial toxins.
- Protects against some harmful environmental chemicals.
Protection against Dehydration

- Skin prevents water loss by evaporation.
  - Keratin in the epidermis
  - Sebum release from the sebaceous glands
Functions of the Integumentary System (cont.)

Regulation of Body Temperature

- Loss of excess heat and protection from cold are important functions of the skin.
  - Constriction of blood vessels
  - Dilation of blood vessels
  - Evaporation of perspiration
Functions of the Integumentary System (cont.)

Collection of Sensory Information

- Skin has many nerve endings and other special receptors.
  - Free nerve endings
  - Touch receptors (Meissner corpuscle)
  - Deep pressure receptors (Pacinian corpuscle)
Other Activities of the Skin

- Absorption of substances such as medications
- Excretion
  - Water
  - Electrolytes
  - Wastes
- Manufacture of vitamin D
Functions of the Integumentary System (cont.)

Checkpoints

6-8 What two substances produced in the skin help to prevent dehydration?

6-9 What two mechanisms involving the skin are used to regulate temperature?
Functions of the Integumentary System (cont.)

Pop Quiz

6.3 Which of the following is NOT a function of skin?
A) Respiration
B) Excretion
C) Sensation
D) Thermoregulation
Functions of the Integumentary System (cont.)

Pop Quiz Answer

6.3 Which of the following is NOT a function of skin?
   A) Respiration
   B) Excretion
   C) Sensation
   D) Thermoregulation
Learning Objective

5. Summarize the information to be gained by observation of the skin.
Observations of the Skin (cont.)

- Skin attributes can indicate a serious systemic disorder.

- Color
  - Factors that influence skin color include:
    - Melanin
    - Hemoglobin
    - Carotene
    - Bile pigments
What color is associated with cyanosis? What color is associated with jaundice?
Observations of the Skin (cont.)

Checkpoints

6-10 Name some pigments that give color to the skin?

6-11 What is the term for a bluish skin discoloration caused by insufficient oxygen?
Pop Quiz

6.4 Which pigment is responsible for a tan-brown color?
A) Melanin
B) Carotene
C) Hemoglobin
D) Bile
Observations of the Skin (cont.)

Pop Quiz Answer

6.4 Which pigment is responsible for a tan-brown color?
A) Melanin
B) Carotene
C) Hemoglobin
D) Bile
Repair of the Integument

Learning Objective

6. Cite the steps in repair of skin wounds and the factors that affect healing.
Repair of the Integument (cont.)

Wound Healing

• Occurs only in areas with actively dividing cells.
• Larger injuries require extensive growth.
  – Scar or cicatrix
  – Keloids

Factors That Affect Healing

• Nutrition
• Blood supply
• Infection
• Age
Repair of the Integument (cont.)

Wound Care

- Control infection
- Antibacterial ointments
Repair of the Integument (cont.)

Checkpoints

6-12 What two categories of tissues repair themselves most easily?

6-13 Name four factors that affect skin healing.
Effects of Aging on the Integumentary System

Learning Objective

7. Describe how the skin changes with age.
Effects of Aging on the Integumentary System (cont.)

- Age-related changes in:
  - Skin
  - Tissues
  - Pigment
  - Hair
  - Sweat glands
  - Circulation
  - Fingernails and toenails
Disorders of the Integumentary System

Learning Objective

8. List the main disorders of the integumentary system.
Disorders of the Integumentary System (cont.)

Lesions

- Any wound or local damage to tissue

<table>
<thead>
<tr>
<th>Surface Lesion</th>
<th>Deeper Lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macule</td>
<td>Excoriation</td>
</tr>
<tr>
<td>Papule</td>
<td>Laceration</td>
</tr>
<tr>
<td>Vesicle</td>
<td>Ulcer</td>
</tr>
<tr>
<td>Pustule</td>
<td>Fissure</td>
</tr>
</tbody>
</table>
Disorders of the Integumentary System (cont.)

Figure 6-7 Skin lesions.
Disorders of the Integumentary System (cont.)

Pressure Ulcers

- Skin lesions that appear where the body rests on skin that covers bony projections
- Also known as decubitus ulcers or bedsores
Disorders of the Integumentary System (cont.)

Burns

- Categorized by
  - Depth of damage
    - Superficial
    - Superficial partial thickness
    - Deep partial thickness
    - Full thickness
  - Amount of body surface area (BSA) involved
    - Rule of nines
    - Lund and Browder method
Disorders of the Integumentary System (cont.)

Figure 6-8 Burns.
Disorders of the Integumentary System (cont.)

Figure 6-9  The rule of nines.

Anterior

Posterior
Disorders of the Integumentary System (cont.)

Cancer

- Skin cancer is most common form of cancer in the United States.
- Basal cell carcinoma
- Squamous cell carcinoma
- Melanoma
Disorders of the Integumentary System (cont.)

Figure 6-10 Skin cancer.
Skin Infections

• Bacterial infections
  – Impetigo
    • Staphylococcal or streptococcal origin

• Viral infections
  – Herpes simplex virus
  – Herpes zoster virus (shingles)
  – Human papillomavirus (HPV) (wart or verruca)

• Fungal infection
  – Tinea or ringworm
Disorders of the Integumentary System (cont.)

Figure 6-11 Infectious skin diseases.
Disorders of the Integumentary System (cont.)

Inflammatory Disorders—Acute

- Dermatitis
- Urticaria
- Eczema
- Atopic dermatitis
Disorders of the Integumentary System (cont.)

**Figure 6-12** Acute inflammatory skin disorders.
Disorders of the Integumentary System (cont.)

Inflammatory Disorders—Chronic

- Pemphigus
- Lupus erythematosus
- Systemic sclerosis
- Psoriasis
  - Chronic, recurrent overgrowth of epidermis
  - Sharply outlined red (erythematous) areas
  - Flat areas (plaques) covered with silvery scales
  - Hereditary pattern sometimes present
  - Immune disorder may be involved
Disorders of the Integumentary System (cont.)

Figure 6-13 Chronic inflammatory skin disorders.
Disorders of the Integumentary System (cont.)

Acne

- Acne
  - Sebaceous gland disease

Alopecia (Baldness)

- Factors that affect baldness
  - Heredity, aging, and male sex hormones (male pattern baldness)
  - Systemic disease
  - Drugs
Disorders of the Integumentary System (cont.)

Figure 6-14 Accessory organ disorders.
Disorders of the Integumentary System (cont.)

Checkpoints

6-14 What is a lesion?
6-15 What two factors are used to assess the severity of burns?
6-16 What are some microorganisms that affect the skin?
6-17 What is the general term for inflammation of the skin?
6-18 What is the probable cause of chronic inflammatory skin diseases?
6-19 What skin disorder results from overactivity of the sebaceous glands?
6-20 What is the technical term for baldness?
Disorders of the Integumentary System (cont.)

Pop Quiz

6.5 What is redness of the skin called?

A) Pallor
B) Carotenemia
C) Erythema
D) Jaundice
Disorders of the Integumentary System (cont.)

Pop Quiz Answer

6.5 What is redness of the skin called?

A) Pallor
B) Carotenemia
C) Erythema
D) Jaundice
Disorders of the Integumentary System (cont.)

Pop Quiz

6.6 What is an autoimmune disease of unknown cause that involves overproduction of collagen with thickening and tightening of the skin?

A) Pemphigus
B) Scleroderma
C) Psoriasis
D) Lupus erythematosus
Disorders of the Integumentary System (cont.)

Pop Quiz Answer

6.6 What is an autoimmune disease of unknown cause that involves overproduction of collagen with thickening and tightening of the skin?

A) Pemphigus
B) Scleroderma
C) Psoriasis
D) Lupus erythematosus
Learning Objective

9. Using information in the case study and the text, describe the causes, classification and dangers of a burn.
Case Study (cont.)

Most burns are caused by contact with hot objects, explosions, or scalding with hot liquids. They may also be caused by electrical injuries, contact with harmful chemicals, abrasions, and sunlight.

- The “rule of nines” is used to determine the severity of burns.
- Intact skin is the body’s first line of defense. In Regina’s situation, this protective barrier had been compromised.

Complications of burns:

- Infections are the main complication of burns.
- Respiratory complications may be caused by inhalation of smoke and toxic chemicals.
- Circulatory problems may result from loss of fluids and electrolytes.
10. Show how word parts are used to build words related to the integumentary system.
### Structure of the Skin

<table>
<thead>
<tr>
<th>Word Part</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>corne/o</td>
<td>cornified, keratinized</td>
<td>The <em>stratum corneum</em> is the outermost thickened, keratinized layer of the skin.</td>
</tr>
<tr>
<td>derm/o</td>
<td>skin</td>
<td>The <em>epidermis</em> is the outermost layer of the skin.</td>
</tr>
<tr>
<td>melan/o</td>
<td>dark, black</td>
<td>A <em>melanocyte</em> is a cell that produces the dark pigment melanin.</td>
</tr>
<tr>
<td>sub-</td>
<td>under, below</td>
<td>The <em>subcutaneous</em> layer is under the skin.</td>
</tr>
</tbody>
</table>
### Accessory Structures of the Skin

<table>
<thead>
<tr>
<th>Word Part</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ap/o-</td>
<td>separation from, derivation from</td>
<td>The <em>apocrine</em> sweat glands release some cellular material in their secretions.</td>
</tr>
<tr>
<td>pil/o</td>
<td>hair</td>
<td>The <em>arrector pili</em> muscle raises the hair to produce goose bumps.</td>
</tr>
</tbody>
</table>
## Word Anatomy (cont.)

<table>
<thead>
<tr>
<th>Word Part</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observation of the Skin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>alb/i</td>
<td>white</td>
<td><em>Albinism</em> is a condition associated with a lack of pigment.</td>
</tr>
<tr>
<td>bili</td>
<td>bile</td>
<td><em>Bilirubin</em> is a pigment found in bile.</td>
</tr>
<tr>
<td>cyan/o</td>
<td>blue</td>
<td><em>Cyanosis</em> is a bluish discoloration of the skin caused by a lack of oxygen.</td>
</tr>
<tr>
<td>-emia</td>
<td>condition of the blood</td>
<td>In <em>carotenemia</em>, vegetable pigments, as from carrots, appear in the blood and give color to the skin.</td>
</tr>
<tr>
<td>eryth-</td>
<td>red</td>
<td><em>Erythema</em> is redness of the skin.</td>
</tr>
<tr>
<td>-ism</td>
<td>state of</td>
<td>See <em>alb/i</em> example.</td>
</tr>
<tr>
<td>-sis</td>
<td>condition, process</td>
<td>See <em>cyan/o</em> example.</td>
</tr>
</tbody>
</table>
### Disorders of the Integumentary System

<table>
<thead>
<tr>
<th>Word Part</th>
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<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>dermat/o</td>
<td>skin</td>
<td><em>Dermatosis</em> is any skin disease.</td>
</tr>
<tr>
<td>scler/o</td>
<td>hard</td>
<td><em>Scleroderma</em> is associated with a hardening of the skin.</td>
</tr>
</tbody>
</table>