Student Objectives

When you have completed the exercises in this chapter, you will have accomplished the following objectives:

The Skin

1. Name the tissue types composing the epidermis and dermis. List the major layers of each and describe the functions of each layer.

2. Describe the factors that normally contribute to skin color. Briefly describe how changes in skin color may be used as clinical signs of certain disease states.

Appendages of the Skin

3. Compare the structure and locations of sweat and oil glands. Also compare the composition and functions of their secretions.

4. Compare and contrast eccrine and apocrine glands.

5. List the parts of a hair follicle and explain the function of each part. Also describe the functional relationship of arrector pili muscles to the hair follicles.

6. Name the regions of a hair and explain the basis of hair color. Describe the distribution, growth, replacement, and changing nature of hair during the life span.

7. Describe the structure of nails.

Functions of the Integumentary System

8. Describe how the skin accomplishes at least five different functions.

Homeostatic Imbalances of Skin

9. Explain why serious burns are life threatening. Describe how to determine the extent of a burn and differentiate first-, second-, and third-degree burns.

10. Summarize the characteristics of the three major types of skin cancers.

Developmental Aspects of the Integumentary System

11. Describe and attempt to explain the causes of changes that occur in the skin from birth to old age.
The integumentary system consists of the skin and its derivatives—glands, hairs, and nails. Although the skin is very thin, it provides a remarkably effective external shield that acts to protect our internal organs from what is outside the body.

This chapter reviews the anatomical characteristics of the skin (composed of the dermis and the epidermis) and its derivatives. It also reviews the manner in which the skin responds to both internal and external stimuli to protect the body.

**BUILDING THE FRAMEWORK**

**The Skin**

1. 1. Name the tissue type composing the epidermis.

2. Name the tissue type composing the dermis.

2. The more superficial cells of the epidermis become less viable and ultimately die. What two factors account for this natural demise of the epidermal cells?

   1. 
   
   2. 

3. Several types of skin markings may reveal structural characteristics of the dermis. Complete the following statements by inserting your responses in the answer blanks.

   1. Skin cuts that run parallel to ____ [1] ____ gape less than cuts running across these skin markings.

   2. A more scientific term for “stretch marks” is ____ [2] ____.

   3. Skin markings that occur where the dermis is secured to deeper structures are called ____ [3] ____.

4. Figure 5.1 depicts a longitudinal section of the skin. Label the skin structures and areas indicated by leader lines and brackets on the figure. Select different colors for the structures below and color the coding circles and the corresponding structures on the figure.

- Arrector pili muscle
- Nerve fibers
- Adipose tissue
- Sweat (sudoriferous) gland
- Hair follicle
- Sebaceous gland
5. Using the key choices, choose all responses that apply to the following descriptions. Enter the appropriate letters and/or terms in the answer blanks. [Note: S. = stratum]

**Key Choices**

<table>
<thead>
<tr>
<th>A. S. basale</th>
<th>D. S. lucidum</th>
<th>G. Reticular layer</th>
<th>J. Hypodermis</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. S. corneum</td>
<td>E. S. spinosum</td>
<td>H. Epidermis (as a whole)</td>
<td></td>
</tr>
<tr>
<td>C. S. granulosum</td>
<td>F. Papillary layer</td>
<td>I. Dermis (as a whole)</td>
<td></td>
</tr>
</tbody>
</table>

1. Layer of translucent cells, absent in thin skin
2. Strata containing all (or mostly) dead cells
3. Dermal layer responsible for fingerprints
4. Vascular region
5. Actively mitotic epidermal region, the deepest epidermal layer
6. Cells are flat, dead “bags” of keratin
7. Site of elastic and collagen fibers
8. General site of melanin formation
9. Major skin area where derivatives (hair, nails) reside
10. Largely adipose tissue; anchors the skin to underlying tissues
11. The stratum germinativum
12. Epidermal layer where most melanocytes are found
13. Cells of this layer contain keratohyalin and lamellated granules
14. Accounts for the bulk of epidermal thickness
15. When tanned, becomes leather; provides mechanical strength to the skin
16. Epidermal layer containing the “oldest” cells

6. Circle the term that does not belong in each of the following groupings.

1. Reticular layer  Keratin  Dermal papillae  Meissner’s corpuscles
2. Melanin  Freckle  Wart  Malignant melanoma
3. Prickle cells  Stratum basale  Stratum spinosum  Cell shrinkage
4. Meissner’s corpuscles  Pacinian corpuscles  Tactile cells  Arrector pili
Appendages of the Skin

1. Figure 5.2 shows longitudinal and cross-sectional views of a hair follicle.

Part A

1. Identify and label all structures provided with leader lines.

2. Select different colors to identify the structures described below and color both the coding circles and the corresponding structures on the diagram.

- Contains blood vessels that nourish the growth zone of the hair
- Secretes sebum into the hair follicle
- Pulls the hair follicle into an upright position during fright or exposure to cold
- The follicle sheath that consists of dermal tissue
- The follicle sheath that consists of epidermal tissue
- The actively growing region of the hair

3. Draw in the nerve fibers and blood vessels that supply the follicle, the hair, the hair root, and the arrector pili.

See Figure 5.2B for cross section

Figure 5.2A
4. Name four factors that can cause hair loss and hair thinning other than nutritional or circulatory factors.

5. Draw a simple diagram of a fingertip bearing a fingernail in the space at the right. Identify and label the following nail regions on your sketch: free edge, body, lunule, lateral nail folds, proximal nail fold (eponychium).

1. What is the common name for the eponychium?

2. Why does the lunule appear whiter than the rest of the nail?

6. Using the key choices, complete the following statements. Insert the appropriate letters in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>A. Sebaceous glands</th>
<th>B. Sweat glands (apocrine)</th>
<th>C. Sweat glands (eccrine)</th>
</tr>
</thead>
</table>

1. Their products are an oily mixture of lipids, cholesterol, and cell fragments.

2. Functionally, these are merocrine glands.

3. The less numerous variety of perspiration gland, their secretion (often milky in appearance) contains proteins and other substances that favor bacterial growth.

4. Their ducts open to the external environment via a pore.

5. These glands are found everywhere on the body except the palms of the hands and soles of the feet.

6. Their secretions contain bactericidal substances.

7. They become more active at puberty under the influence of androgens.

8. Their secretions, when oxidized, are seen on the skin surface as a blackhead.

9. The ceruminous glands that produce earwax are a modification of this gland variety.

10. These glands are involved in thermoregulation.
Functions of the Integumentary System

1. The skin protects the body by providing three types of barriers. Classify each of the protective factors listed below as an example of a chemical barrier (C), a biological barrier (B), or a mechanical (physical) barrier (M).

   ____ 1. Epidermal dendritic cells and macrophages  ____ 4. Keratin
   ____ 2. Intact epidermis  ____ 5. Melanin
   ____ 3. Bactericidal secretions  ____ 6. Acid mantle

2. Substances that can penetrate the skin in limited amounts include (circle all that apply):

   Fat-soluble vitamins Steroid hormones Water-soluble substances
   Organic solvents Oxygen Mercury, lead, and nickel

3. In what way does a sunburn impair the body’s ability to defend itself?

   [Assume the sunburn is mild.]

4. Explain the role of sweat glands in maintaining body temperature homeostasis.

   In your explanation, indicate how their activity is regulated.

5. Complete the following statements. Insert your responses in the answer blanks.

   ____________ 1. The cutaneous sensory receptors that reside in the skin are actually part of the __[1]__ system. Four types of stimuli that can be detected by certain of the cutaneous receptors are __[2]__, __[3]__, __[4]__, and __[5]__.
   ____________ 2. ____________ 3.
   ____________ 4. Vitamin D is synthesized when modified __[6]__ molecules in the __[7]__ of the skin are irradiated by __[8]__ light. Vitamin D is important in the absorption and metabolism of __[9]__ ions.
   ____________ 5.
   ____________ 6. ____________ 8.
   ____________ 7. ____________ 9.
Homeostatic Imbalances of Skin

1. Overwhelming infection is one of the most important causes of death in burn patients. What is the other major problem they face, and what are its possible consequences?

2. This section reviews the severity of burns. Using the key choices, select the correct burn type for each of the following descriptions. Enter the correct answers in the answer blanks.

**Key Choices**

A. First-degree burn  
B. Second-degree burn  
C. Third-degree burn

1. Full-thickness burn; epidermal and dermal layers destroyed; skin is blanched

2. Blisters form

3. Epidermal damage, redness, and some pain (usually brief)

4. Epidermal and some dermal damage; pain; regeneration is possible

5. Regeneration impossible; requires grafting

6. Pain is absent because nerve endings in the area are destroyed

3. What is the importance of the “rule of nines” in the treatment of burn patients?

4. Fill in the type of skin cancer that matches each of the following descriptions:

1. Cells of the stratum spinosum develop lesions; metastasizes to lymph nodes.

2. Cells of the lowest level of the epidermis invade the dermis and hypodermis; exposed areas develop an ulcer; slow to metastasize.

3. Rare but deadly cancer of pigment-producing cells.

5. What does ABCD mean in reference to examination of pigmented areas?