Integumentary System
Laboratory Exercise 10

Background

The integumentary system includes the skin, hair, nails, sebaceous glands, and sweat glands. These organs provide a protective covering for deeper tissues, aid in regulating body temperature, retard water loss, house sensory receptors, synthesize various chemicals, and excrete small quantities of wastes.

Materials Needed

Textbook
Skin model
Dissecting microscope
Compound light microscope
Hand magnifier
Forceps
Microscope slide and coverslip
Prepared slides of the following:
  - Human scalp
  - Heavily pigmented skin
  - Thick skin (plantar)
  - Tattoo

Purpose of the Exercise

Observe the organs and tissues of the integumentary system and review the functions of these parts.

Procedure

1. Label figures 10.1, 10.2, and 10.3.
2. Locate these same structures on the skin model.
3. Use the hand magnifier or dissecting microscope and proceed as follows:
   (a) observe the skin, hair, and nails on your hand.
   (b) compare the type and distribution of hairs on the anterior and posterior sides of your forearm.
4. Use low-power magnification of the compound light microscope and proceed as follows:
   (a) pull out a single hair with forceps and mount it on a microscope slide under a coverslip.
   (b) observe the root and shaft of the hair and note the scalelike parts that make up the shaft.
5. As vertical sections of human skin are observed, remember that the lenses of the microscope invert and reverse images. It is important to orient the position of the epidermis, dermis, and subcutaneous (hypodermis) layers using scan magnification before continuing with additional observations. Compare all of your skin observations to figure 10.4. Use low-power magnification of the compound light microscope and proceed as follows:

(a) observe the prepared slide of human scalp
(b) locate the epidermis, dermis, and subcutaneous (hypodermis) layer, a hair follicle, an arrector pili muscle, a sebaceous gland, and a sweat gland.
(c) focus on the epidermis with high power and locate the stratum corneum and stratum basale. Note how the shapes of the cells in these two layers differ.
(d) observe the dense connective tissue that makes up the bulk of the dermis.
(e) observe the adipose tissue that composes most of the subcutaneous (hypodermis) layer.

6. Observe the prepared slide of heavily pigmented human skin with low-power magnification. Note that the pigment is most abundant in the epidermis. Focus on this region with the high-power objective. The pigment-producing cells, or melanocytes, are located among the deeper layers of epidermal cells. Differences in skin color are primarily due to the amount and size of pigment (melanin) granules produced by these cells. The number of melanocytes in the skin is about the same for members of all racial groups.

7. Complete parts A, B, C, and D.

**Critical Thinking Application**

Explain the advantage for melanin granules of being located in the deep layer of the epidermis.

Observe a tattooed vertical section of human skin using low-power magnification. Note the location of the dispersed ink granules within the upper portion of the dermis. From a thin vertical section of a tattoo, it is not possible to determine the figure or word of the entire tattoo as seen on the surface of the skin. Compare this to the location of melanin granules found in heavily pigmented skin. Describe why a tattoo is permanent and a suntan is not.

7. Observe the prepared slide of thick skin from the sole of a foot. Locate the stratum lucidum. Note how the stratum corneum compares to your observation of human scalp.

8. Using low-power magnification, locate a hair follicle that has been sectioned longitudinally through its bulblike base. Also locate a sebaceous gland close to the follicle and find a sweat gland. Observe the detailed structure of these parts with high-power magnification.
**Figure 10.1** Label the vertical section of skin.

**Figure 10.2** Label the section of thick skin from the palm of the hand.
Part A

Complete the following:

1. How does the skin of your palm differ from that on the back (posterior) of your hand?

2. Describe the differences you observed in the type and distribution of hair on the front (anterior) and back (posterior) of your forearm.

3. Explain how a hair is formed.

4. What cells produce the pigment in hair?
Part B

Match the structures in column B with the descriptions and functions in column A. Place the letter of your choice in the space provided.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ 1. An oily secretion that helps waterproof skin</td>
<td>a.  Apocrine sweat gland</td>
</tr>
<tr>
<td>___ 2. Outermost layer of the epidermis</td>
<td>b.  Arrector pili muscle</td>
</tr>
<tr>
<td>___ 3. Become active at puberty</td>
<td>c.  Dermis</td>
</tr>
<tr>
<td>___ 4. Epidermal pigment</td>
<td>d.  Eccrine sweat gland</td>
</tr>
<tr>
<td>___ 5. Inner layer of skin</td>
<td>e.  Epidermis</td>
</tr>
<tr>
<td>___ 6. Responds to elevated body temperature</td>
<td>f.  Hair follicle</td>
</tr>
<tr>
<td>___ 7. Pigment-producing cell</td>
<td>g.  Keratin</td>
</tr>
<tr>
<td>___ 8. Superficial layer of skin</td>
<td>h.  Melanin</td>
</tr>
<tr>
<td>___ 9. Gland that secretes an oily substance</td>
<td>i.  Melanocyte</td>
</tr>
<tr>
<td>___10. Hard protein of nails and hair</td>
<td>j.  Sebaceous gland</td>
</tr>
<tr>
<td>___11. Binds skin to underlying organs</td>
<td>k.  Sebum</td>
</tr>
<tr>
<td>___12. Cell division and deepest layer of epidermis</td>
<td>l.  Stratum basale</td>
</tr>
<tr>
<td>___13. Contains the root of the hair</td>
<td>m.  Stratum corneum</td>
</tr>
<tr>
<td>___14. Causes goose bumps to appear</td>
<td>n.  Subcutaneous layer</td>
</tr>
</tbody>
</table>

Part C

Complete the following:

1. Distinguish among the epidermis, dermis, and subcutaneous (hypodermis) layer.
2. How do the cells of stratum corneum and stratum basale differ?

3. State the specific location of melanin observed in heavily pigmented skin.

4. What are the special qualities of the connective tissue within the dermis?

5. What part of the hair extends from the hair papilla to the body surface?

6. In which layer of skin are sebaceous glands found?

7. How are sebaceous glands associated with hair follicles?

8. In which layer of skin are sweat glands usually located?

Part D

Sketch and label a vertical section of human skin, using the scanning objective.
Figure 10.4 Micrographs showing features of human skin.