The Integumentary System

Here's a quiz for you. What part of your body has to be partly dead to keep you alive? Here are some clues: it comes in a variety of colors, it is the largest organ in the body, and it protects you from the outside world. Oh, and guess what—it is showing right now. Did you guess your skin? If you did, you guessed correctly.

Your skin, hair, and nails make up your integumentary (in TEG yoo men tuhr ee) system. (Integument means "covering.") Like all organ systems, the integumentary system helps your body maintain a healthy internal environment.

The Skin: More than Just a "Coat"

Why do you need skin? Here are four good reasons:

- Skin protects you by keeping moisture in your body and foreign particles out of your body.
- Skin keeps you "in touch" with the outside world. The nerve endings in your skin allow you to feel what's around you.
- Skin helps regulate your body's temperature. For example, small organs in the skin called sweat glands produce sweat, a salty liquid that flows to the surface of the skin. As sweat evaporates, the skin cools.
- Skin helps get rid of wastes. Several types of waste chemicals can leave the bloodstream and be removed in sweat.

What Determines Skin Color? A darkening chemical in skin called melanin determines skin color, as shown in Figure 14. If a lot of melanin is present, the skin is very dark. If only a little melanin is produced, the skin is very light. Melanin in the upper layer of the skin absorbs much of the harmful radiation from the sun, reducing DNA damage that can lead to cancer. However, all skin is vulnerable to cancer and therefore should be protected from sun exposure whenever possible.

Figure 14 Variety in skin color is caused by the pigment melanin. The amount of melanin varies from person to person.
A Tale of Two Layers

As you already know, the skin is the largest organ of your body. In fact, the skin of an adult covers an area of about 2 m²! However, there’s a lot more to skin than meets the eye. The skin has two main layers: the dermis and the epidermis. The epidermis is the thinner layer of the two. It’s what you see when you look at your skin. (Epi means “on top of.”) The deeper, thicker layer is known as the dermis.

Epidermis The epidermis is composed of a type of epithelial tissue. Even though the epidermis has many layers of cells, it is only as thick as two sheets of notebook paper over most of the body. It is thicker in the palms of your hands and the soles of your feet. Most epidermal cells are dead and are filled with a protein called keratin, which helps make the skin tough.

Dermis The dermis lies underneath the epidermis. It is mostly connective tissue, and it contains many fibers made of a protein called collagen. The fibers provide strength and allow skin to bend without tearing. The dermis also contains a variety of small structures, as shown in Figure 15.

Figure 15 Beneath the surface, your skin is a complex organ made of blood vessels, nerves, glands, and muscles.

Blood vessels transport substances and help regulate body temperature.

Nerves carry messages to and from the brain.

Muscle fibers attached to a hair follicle can contract, causing the hair to stand up.

Hair follicles in the dermis produce hair.

Oil glands release oil that keeps hair flexible and helps waterproof the epidermis.

Sweat glands release sweat. As sweat evaporates, the body is cooled. Sweat also contains waste materials taken out of the body.

Self-Check

To what system do the skin’s blood vessels belong? (See page 782 to check your answer.)

Your epidermis is showing!
Hair and Nails

A hair, shown in Figure 16, is formed at the bottom of a tiny sac called a hair follicle. The hair grows as new cells are added at the hair follicle and older cells get pushed upward. The only living cells in a hair are in the hair follicle, where the hair is produced.

Letting Your Hair Down Hairs protect skin from ultraviolet light and can help keep particles, such as dust and insects, out of your eyes and nose. Like skin, hair gets its color from the pigment melanin. Dark hair contains more melanin than blond hair. In most mammals, hair also helps regulate body temperature. A contraction of a tiny muscle attached to the hair follicle causes the follicle to bend. In humans, the bending follicle pushes up the epidermis to make a goose bump. If the follicle contains a hair, the hair “stands up.” The lifted hairs function like a sweater to trap warm air around the body.

A Nail Tale Nails protect the tips of your fingers and toes so that they can remain soft and sensitive. This allows you to have a keen sense of touch. Nails form from nail roots under the skin at the base and sides of nails. As new cells form, the nail grows longer. The parts of a nail are shown in Figure 17.
Skin is often damaged. The damage may be minor—a blister, an insect bite, or a small cut. Fortunately, your skin has an amazing ability to repair itself, as shown in Figure 18.

**Figure 18  How Skin Heals**

1. **When you get a cut, a blood clot forms to prevent bacteria from entering the wound. Bacteria-fighting cells then come to the area to kill bacteria.**

Other damage to the skin is very serious. Damage to the genetic material in skin cells can result in uncontrolled cell division, producing a mass of skin cells called a tumor. The term cancer is used to describe a tumor that invades other tissue. Darkened areas on the skin, such as moles, should be watched carefully for signs of cancer. Figure 19 shows an example of a mole that has possibly become cancerous.

Your skin may also be affected by hormones that cause the oil glands in your skin to produce excess oil. This oil combines with dead skin cells and bacteria to clog hair follicles and cause infections. Proper cleansing and daily skin care can be helpful in decreasing the amount of infections.

**1. Why does skin color vary from person to person?**

**2. List six structures found in the dermis and the function of each one.**

**3. Making inferences  Why do you feel pain when you pull on your hair or nails but not when you cut them?**