

6

# SKIN & the Integumentary System

Chapter 6  
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Unit Two

Integument URLs

<http://www.nurseminerva.co.uk/integ.html>

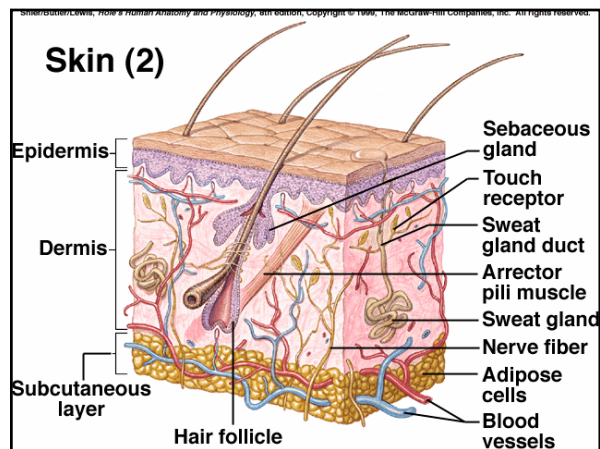
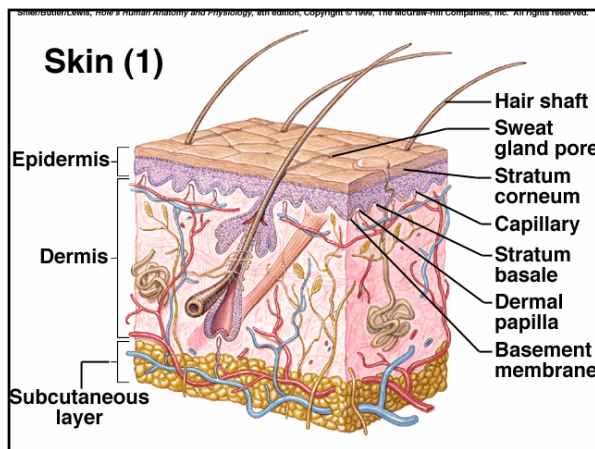
<http://www.aap.org/policy/s010116.html>

## I. Introduction

- A. Organs are body structures composed of two or more different tissues.
- B. The skin and its accessory organs make up the integumentary organ system

## II. Skin and Its Tissues

- A. The skin is a large organ responsible for maintaining homeostasis through temperature regulation, protection of underlying tissues, retardation of water loss, sensing environmental change, and housing cells of the immune system.
- B. The skin consists of an outer epidermis and a dermis, connected to underlying tissue by the subcutaneous layer (hypodermis).



### III. Skin & Its Tissues

#### C. Epidermis

\*outer layer of skin; stratified squamous epithelium, lacks blood vessels, are 4-5 layers

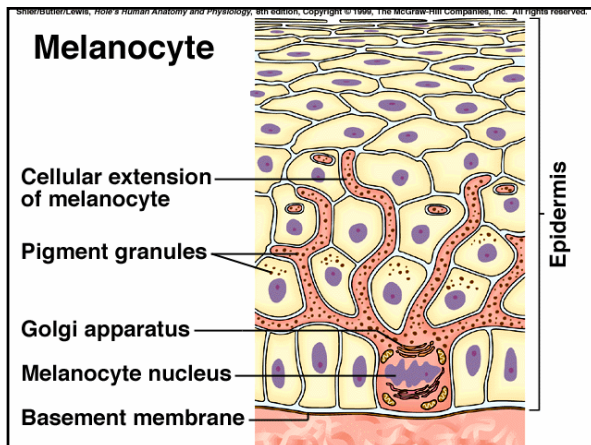
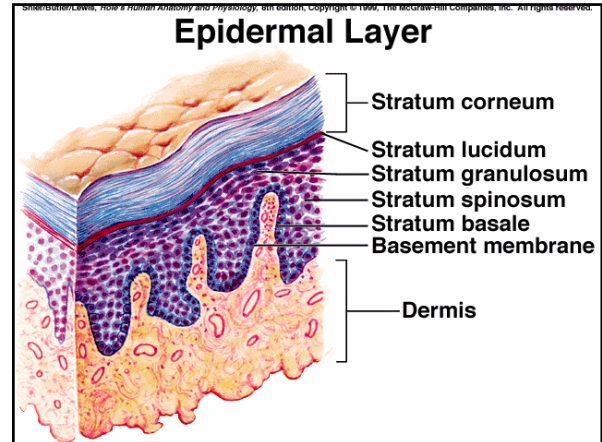
- 1) stratum corneum – keratinized layer, (dead cells)
- 2) stratum lucidum - only found in thickest skin
- 3) stratum granulosum – granular layer
- 4) stratum spinosum – thick layer
- 5) stratum basale (germinativum) – deepest layer

\*cells in these layers change shape as they are pushed toward the surface

\*new cell reproduction is balanced with loss of dead cells from the stratum corneum

\*calluses and corns form on areas where skin is rubbed

\*melanocytes in stratum basale & dermis; produce dark pigments for skin color; absorb light energy & protect against UV radiation; have long cellular extensions that contain melanin & cytokine secretion transfers melanin to upper epidermis



#### D. Dermis

\*composed of irregular dense connective tissue that binds epidermis to underlying tissues

\*fingerprints are due to ridges & dermal papillae; genetically determined & due to movement of fetus

\*includes tough collagenous & elastic fibers in a gel-like ground substance > toughness & elasticity

\*contains muscle fibers; nerve fibers are scattered (touch)

\*sensory receptors:

Pacinian corpuscles = stimulated by heavy pressure

Meissner's corpuscles = stimulated by light touch

\*contains blood vessels, hair follicles, sebaceous glands, & sweat glands

#### E. Subcutaneous Layer (hypodermis)

\*loose connective & adipose tissue; fibers run between both dermis & subcutaneous; there isn't a clear boundary as a result

\*adipose tissue insulates; usually absent in eyelids

\*contains major blood vessels

### IV. Accessory Organs of the Skin

\*\*\* (hair follicles, nails, and skin glands) \*\*\*

As long as accessory organs remain intact, severely burned or injured dermis can regenerate.

#### A. Hair Follicles

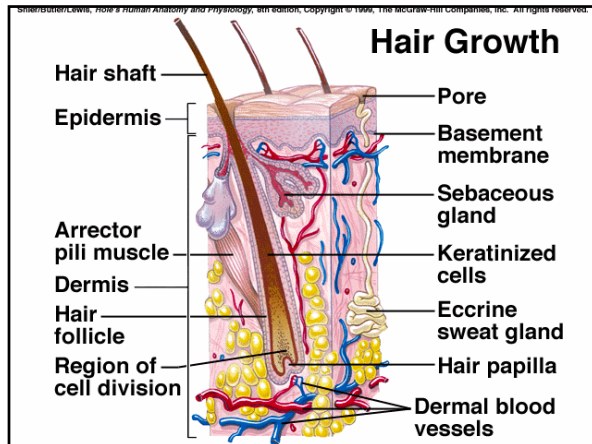
\* hair isn't found on palms, soles, lips, nipples, & external reproductive organs

\*each hair develops from a group of epidermal cells at the base of a tube-like depression called a hair follicle; also contains hair root; hair papillae nourish follicle; keratinization occurs as hair shaft grows

\*individual hair growth occurs for a time, then rests while new growth occurs at the base of the follicle

\*genes determine hair color = melanin; black hair has eumelanin; blonde & red hair has pheomelanin; gray hair is a mixture of pigmented & unpigmented hair

\*arrector pili (smooth muscle cells) muscle attaches to each hair follicle > goose bumps; sebaceous glands are also associated with hair follicles



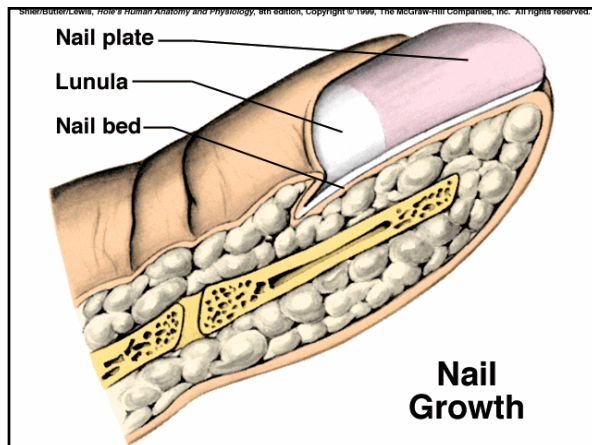
**B. Nails :** protective coverings for fingers & toes

\*nail plate overlies a surface of skin called the nail bed

\*nail bed produced by epithelial cells from skin

\*lunula (moon-shaped) is growing region

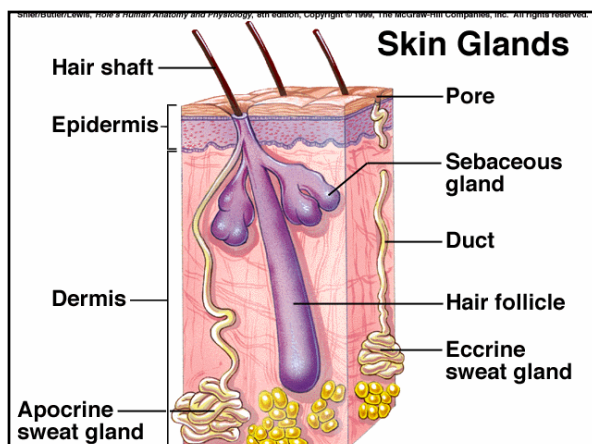
\*keratinization occurs in nail plate and scales are pushed over the nail bed



**C. Skin Glands**

\*sebaceous glands (holocrine glands) – are associated with hair follicles sometimes, produce globules of fatty material (sebum), sebum keeps hairs & skin soft, pliable, & waterproof; sebum can cause acne

\*sweat glands (sudoriferous glands) – each gland consists of a tiny tube that looks like a coiled ball that is lined with sweat secreting epithelial cells; eccrine glands respond to body temperature (heat), found in forehead, neck, feet, & palms; sweat is carried to skin surface by ducts & pores, glands become less active in elderly people; apocrine glands are sweat glands that produce an odor, they are metabolized by skin bacteria, become active at puberty; ceruminous glands are sweat glands of the external ear canal that secrete ear wax; mammary glands of the female secrete milk



**V. Regulation of Body Temperature**

**A.** Proper temperature regulation is vital to maintaining metabolic reactions.

**B.** The skin plays a major role in temperature regulation.

\*body temperature set point is 37 degrees C/ 98.6 degrees F

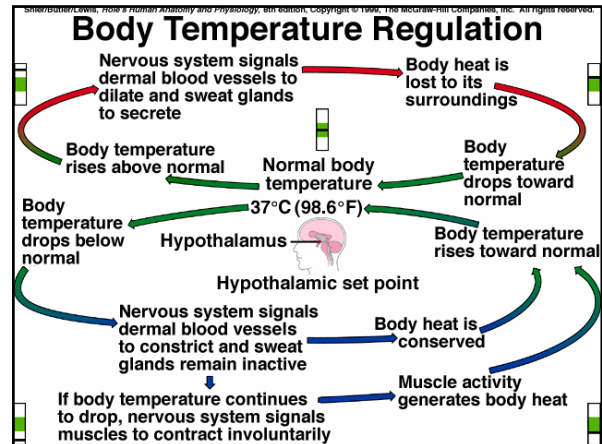
\*amount of heat lost must balance heat produced

\*skin plays a big role in the homeostatic mechanism that regulates body temperature



### C. Heat Production and Loss

- \*skeletal muscle, & cells of glands (liver) are most active cells & produce most heat
- \*nerves stimulate body to release heat; when body temperature rises above normal, more blood enters dermal blood vessels & the skin reddens
- \*heat is lost to outside by:
  - radiation – infrared heat rays escape from warmer to cooler surroundings (primary means heat is lost to the outside)
  - conduction – heat moves from the body directly into molecules of cooler objects in contact with its surface
  - convection – continuous circulation of air over a warm surface
  - evaporation – carries heat away from the skin's surface
- \*heat can be produced in body: shivering



### D. Problems in Temperature Regulation

- \*air can hold a limited amount of water vapor
- \*when air is saturated with water, sweat may fail to evaporate, and body temperature may remain elevated
- \*hypothermia is lowered body temperature, it causes shivering, mental confusion, lethargy, loss of reflexes & consciousness, and eventually major organ failure.

## VI. Skin Color

### A. Genetic Factors

- \*all people have the same # of melanocytes in their skin
- \*genetics controls the amount of melanin in skin cells
- \*albinism – condition in which mutant melanin genes are inherited

### B. Environmental Factors

- \*sunlight, ultraviolet light, & X-rays affect skin color by stimulating melanocytes to produce more pigment & transfer it to nearby epithelial cells > sunbathing; tan fades as cells become keratinized & slough off

### C. Physiological Factors

- \*well-oxygenated blood (hemoglobin) gives skin a pink tone; low oxygenated blood skin appears bluish > cyanosis
- \*blood vessels can affect skin color; if dilated skin color reddens; if constricted skin becomes pale
- \*pigment carotene gives skin a yellowish cast if too many yellow vegetables are consumed

## VII. Healing of Wounds and Burns

- ### A. Inflammation
- in which blood vessels dilate and become more permeable, causing tissues to become red and swollen, is the body's normal response to injury.

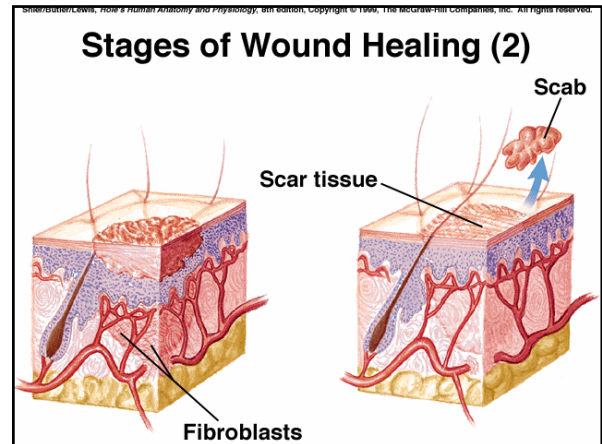
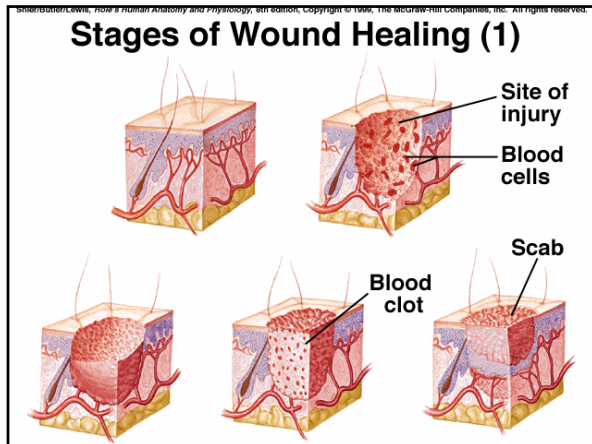
- \*dilated blood vessels do provide injured tissues with nutrients & oxygen

### B. Cuts

**KNOW steps**

- \*in a shallow cut epithelial cells are stimulated to fill the gap
- \*injury into dermis, clot forms (fibrous protein, fibrin), tissue fluids & dried blood form scab, fibroblasts begin forming new collagen which suture edges of wound, growth factors are released that help regenerate damaged tissue, blood vessels extend to area beneath wound, phagocytic cells remove dead cells, scab sloughs off, sometime a scar (connective tissue) appears

- \*large wounds form granulations that develop as small rounded masses

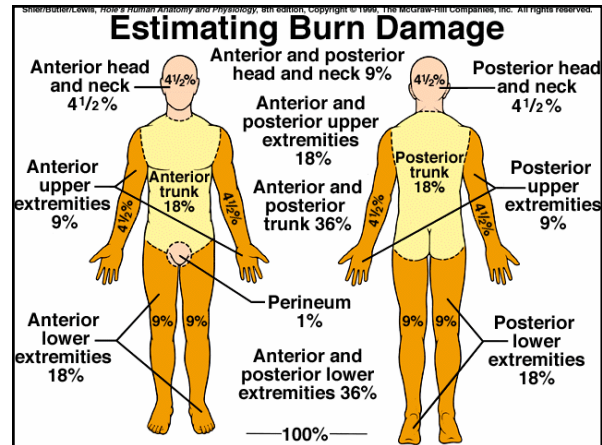


**C. Burns**

- \***superficial partial-thickness burn** (first degree burn) – injures only the epidermis, healing is quick, no scarring
- \***deep partial-thickness burn** (second degree burn) – destroys epidermis & some dermis, fluid escapes, blisters appear, healing is helped by accessory organs
- \***full-thickness burn** (third degree burn)- destroys epidermis, dermis, & accessory organs of the skin

**autograft** – transferring unburned skin to burned area,  
**homograft** – cadaveric skin from a skin bank (cadaver),  
 skin substitutes – amniotic membrane from fetus,  
 artificial membranes, & cultured human epithelial cells

\*\***rule of nines**\*\* – subdividing the skin's surface into 9's for estimating the replacement of body fluids, electrolytes, & for covering the burned area with skin or skin substitutes



Be sure to examine the **Interconnections** of the Integumentary System to the other 10 body systems.

Mastery of the Integumentary System will lead to successful accomplishment of the Skeletal System.

**SAYONARA**

**Remember** – At the end of the chapter is a Chapter Summary that is your Study Guide for the Chapter 6 test.



**Integument URLs**

<http://www.vh.org/adult/provider/anatomy/MicroscopicAnatomy/Section07/Section07.html>

<http://www.science.ubc.ca/~biomania/tutorial/skin/outline.htm>

<http://www.nurseminerva.co.uk/integ.html>