



The Human Body
in Health and Illness

Barbara Herlihy

Chapter 7:
Integumentary System
and Body Temperature

Lesson 7.1 Objectives

- List six functions of the skin.
- Define *stratum germinativum* and *stratum corneum*.
- Describe the two layers of the skin: epidermis and dermis.
- List the two major functions of the subcutaneous layer.

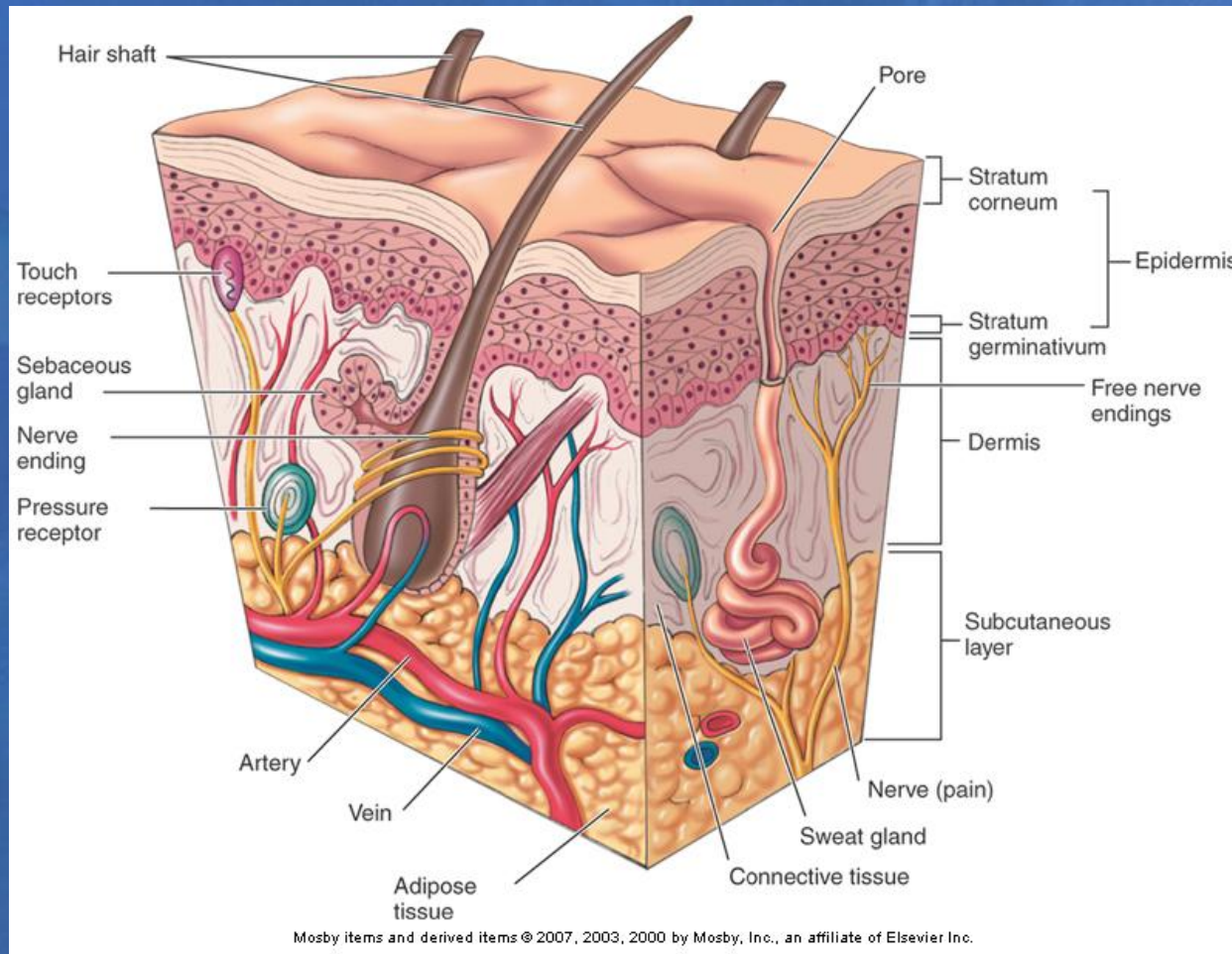
Functions of the Skin

- Keeps harmful substances out; keeps water and electrolytes in
- Protects internal structures and organs
- Acts as a gland for vitamin D synthesis
- Performs excretory function
- Performs sensory role
- Helps regulate body temperature

Structure of the Skin

- Considered an organ
- Also called the integument or cutaneous membrane
- Two distinct layers:
 - Epidermis
 - Dermis

Structure of the Skin (cont'd.)



Epidermis

- Thin outer layer of the skin
- Formed of stratified squamous epithelium
- Avascular
- Site of insensible perspiration

Epidermis (cont'd.)

- Layers of the epidermis
 - Stratum germinativum (deeper): on top of dermis; cells continuously dividing
 - Stratum corneum (superficial): surface layer of epidermis; composed of dead, flattened cells
- Keratinization: process by which skin cells are hardened and flattened with the protein keratin as they move toward the surface

Dermis

- Inner layer of the skin
- Formed of dense fibrous connective tissue
- Strong and elastic
- Accessory structures embedded
- Contains blood vessels, nervous tissue, and some muscle tissue

Subcutaneous Layer

- Tissue that lies beneath skin: hypodermis
- Formed of loose connective tissue and adipose tissue
- Highly vascularized
- Two main roles:
 - Insulate the body from extreme temperature changes in the external environment
 - Anchor the skin to the underlying structures

The Skin, Drugs, and Chemicals

- Skin can absorb many chemicals
 - Used for transdermal drug delivery and intradermal allergy testing
 - Danger of absorption of toxins

Skin Color

- Determined by genes, physiology, and sometimes pathology
- Dark pigment: melanin
 - Secreted by melanocytes in the epidermis
 - The more melanin secreted, the darker the skin
 - Melanocyte malfunctions: albinism, vitiligo, moles, melanomas
- Yellow pigment: carotene
 - Presence of melanin overshadows carotene's tint in most people

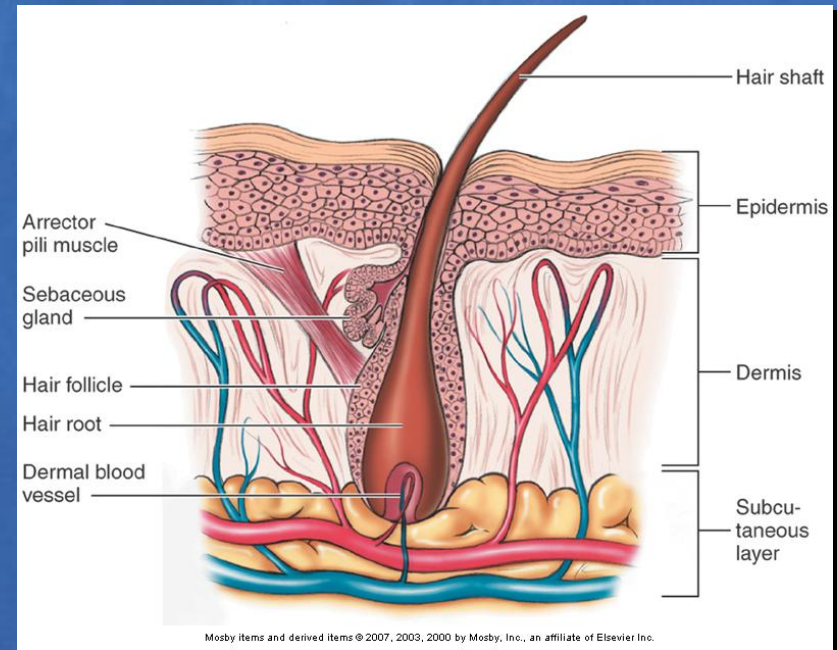
Skin Color (cont'd.)

- Physiological changes in skin color:
 - Cyanosis: poor oxygenation causes bluish tint
 - Blushing: blood vessel dilation causes reddening
 - Pallor: blood vessel constriction causes paling
- Pathological changes in skin color:
 - Jaundice: bilirubin, a yellow pigment, deposited
 - Bronze skin tint: melanin overproduction
 - Ecchymosis: black-and-blue bruising

Accessory Structures of the Skin

- Hair

- Functions: detect insects, protect eyes, keep dust out of lungs, reduce heat loss
- Growth affected by sex hormones
- Color influenced by type and amount of melanin
- Texture determined by shape of shaft

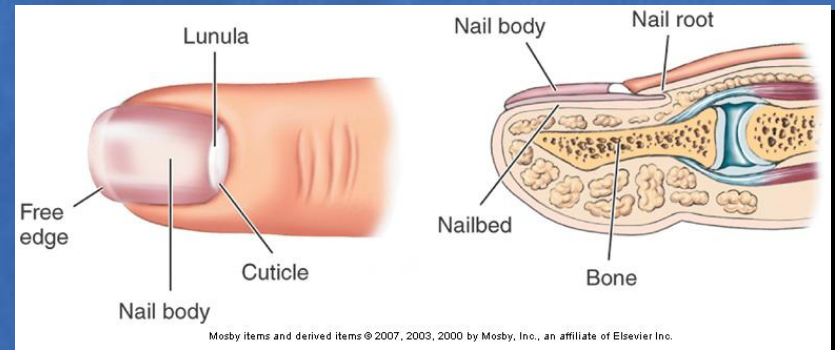


Accessory Structures of the Skin

(cont'd.)

- Nails

- Functions: protect tips of fingers and toes from injury
- Condition affected by oxygenation of blood supply, trauma, and nutritional deficiencies

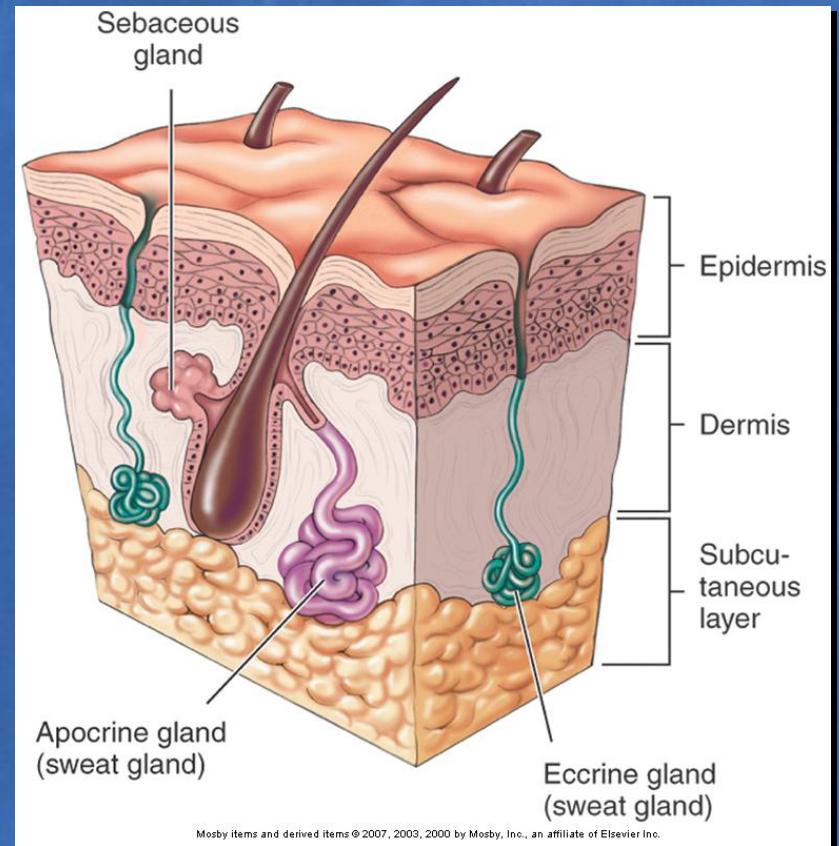


Accessory Structures of the Skin

(cont'd.)

- Glands

- Sebaceous glands: secrete sebum into the hair follicle
- Sudoriferous glands: secrete sweat through pores



Accessory Structures of the Skin

(cont'd.)

- Types of sudoriferous glands:
 - Apocrine glands: usually associated with hair follicles; activated by emotional stress; become more active during puberty
 - Eccrine glands: involved in temperature regulation; responsible for sensible perspiration
- Types of modified sweat glands:
 - Mammary glands: secrete milk
 - Ceruminous glands: secrete ear wax (cerumen)

Lesson 7.2 Objectives

- Explain four processes by which the body loses heat.
- Describe how the skin helps to regulate temperature.

Body Temperature

- Core temperature: the temperature of the inner parts of the body
- Shell temperature: the temperature of the surface areas of the body
- Thermoregulation: the mechanism by which the body balances heat production and heat loss

Body Temperature (cont'd.)

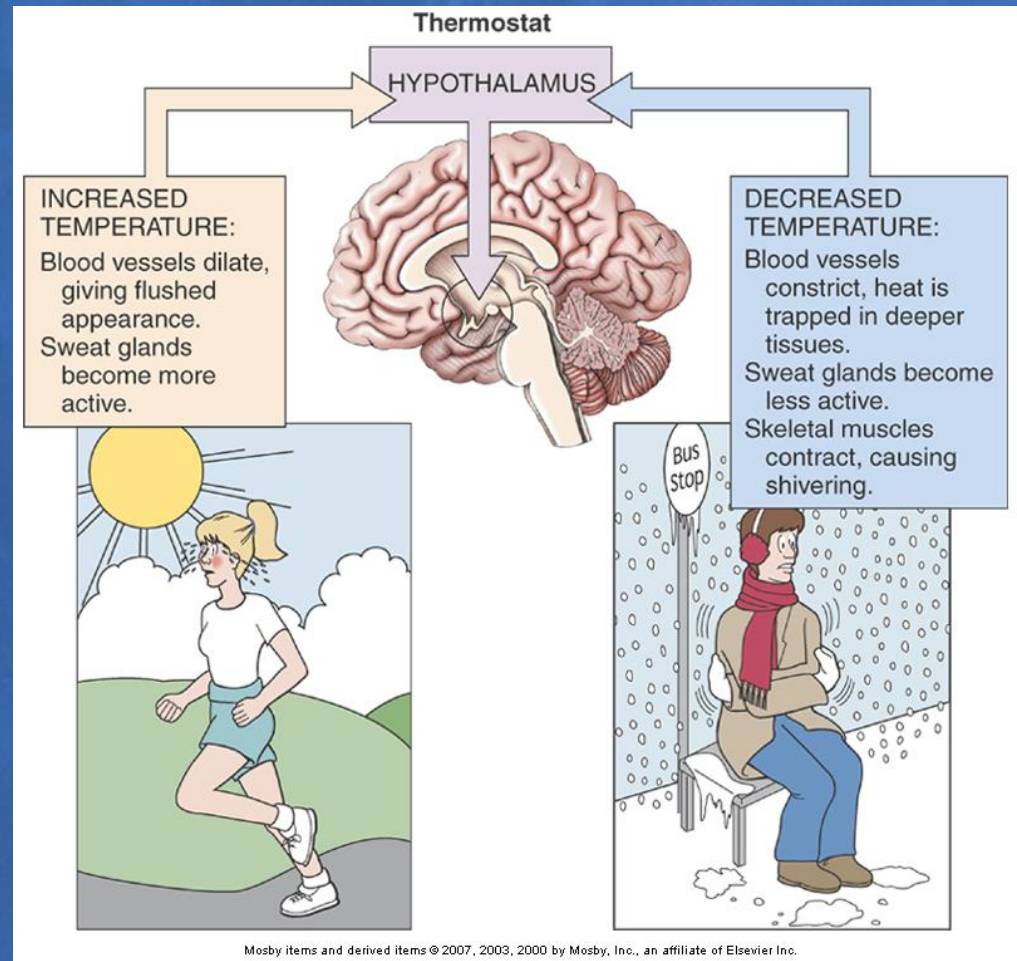
- Heat production:
 - Metabolic processes release thermal energy
 - Most heat produced by muscles, liver, and endocrine glands
 - Affected by food consumption, hormonal secretion, and physical activity
 - Heat produced by cells warms blood, which distributes it throughout body

Body Temperature (cont'd.)

- Sites of heat loss: skin (80%); lungs and excretion (20%)
- Types of heat loss:
 - Radiation: from body to cooler air surrounding it
 - Conduction: from warm body to cooler object in contact with it
 - Convection: by air currents moving over skin's surface
 - Evaporation: by liquid becoming a gas and evaporating from skin's surface

Body Temperature (cont'd.)

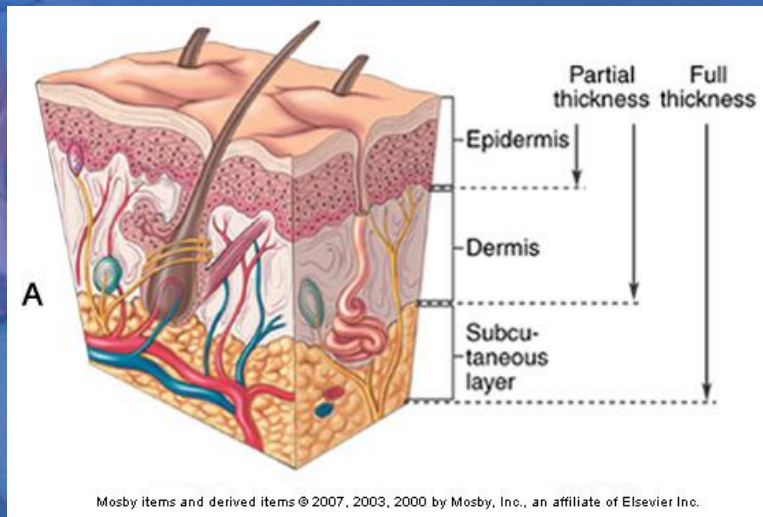
- Regulation:
 - Hypothalamus
 - Blood vessels
 - Sweat glands
 - Skeletal muscles



Body Temperature (cont'd.)

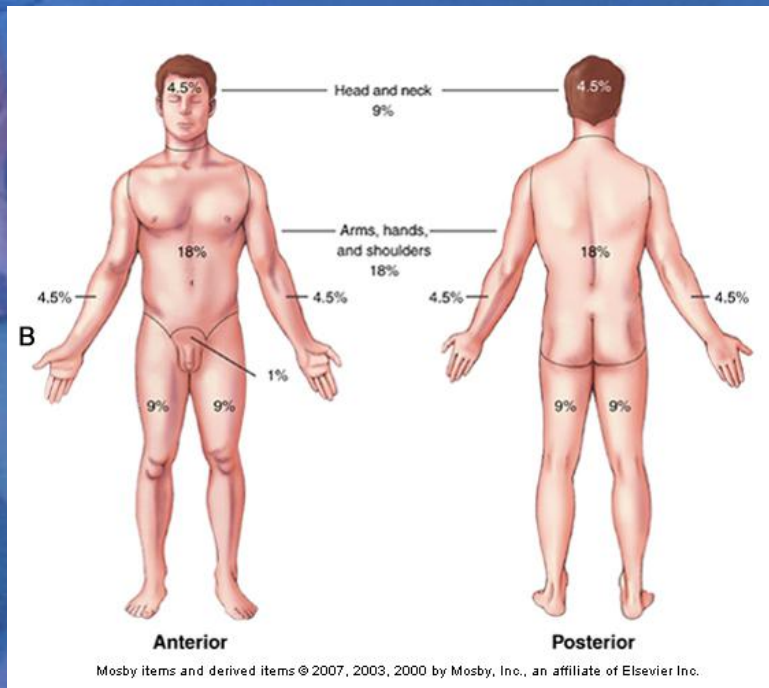
- Effects of heat extremes:
 - Overheating: syncope, cramps, heat exhaustion, heat stroke
 - Hypothermia: slowed metabolism, fibrillation
- Neonate heat regulation:
 - Large surface area increases heat loss
 - Less insulation due to thin layer of subcutaneous fat
 - Unable to shiver
 - Nonshivering thermogenesis: metabolism of brown adipose tissue (BAT) generates heat when needed

Burns



- Classified by depth and extent of surface burned
- Depth:
 - First-degree damages epidermis only
 - Second-degree damages epidermis and dermis
 - Third-degree destroys dermis and epidermis, and damages underlying tissues

Burns (cont'd.)



- “Rule of nines”: initial assessment of how much surface is burned
- Eschar: dead burned tissue that forms a scab-like layer over burned surface
 - Acts like a tourniquet
 - Becomes a breeding ground for bacteria
 - Secretes toxins into blood

Skin Care

- All ages:
 - Reduce exposure to UV radiation
- Especially among elderly:
 - Skin dries out more easily: retain moisture by limiting excessive bathing and use of soap
 - Thinner skin bruises more easily and does not insulate as well