The Human Body in Health and Illness

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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.

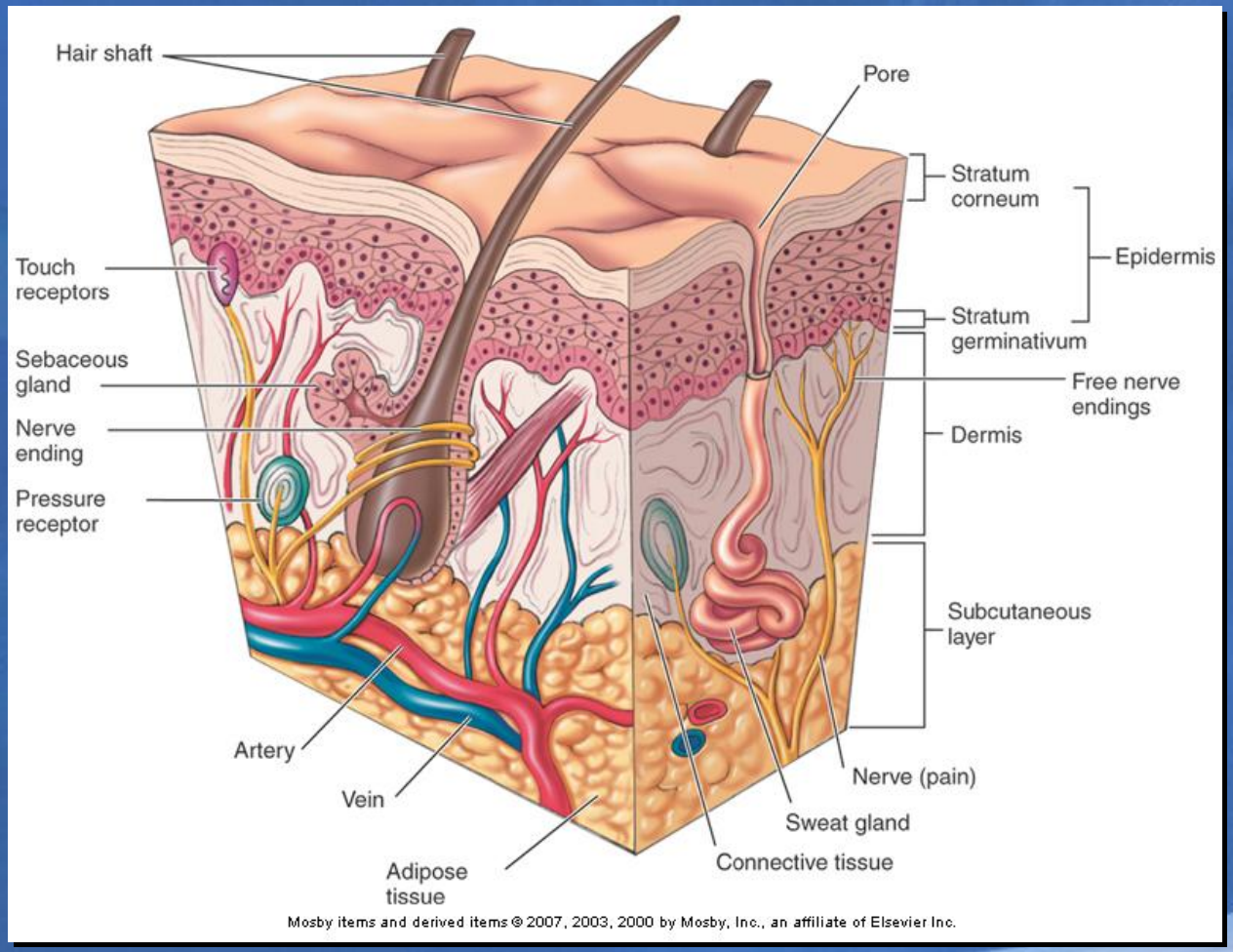
Functions of the Skin

- 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

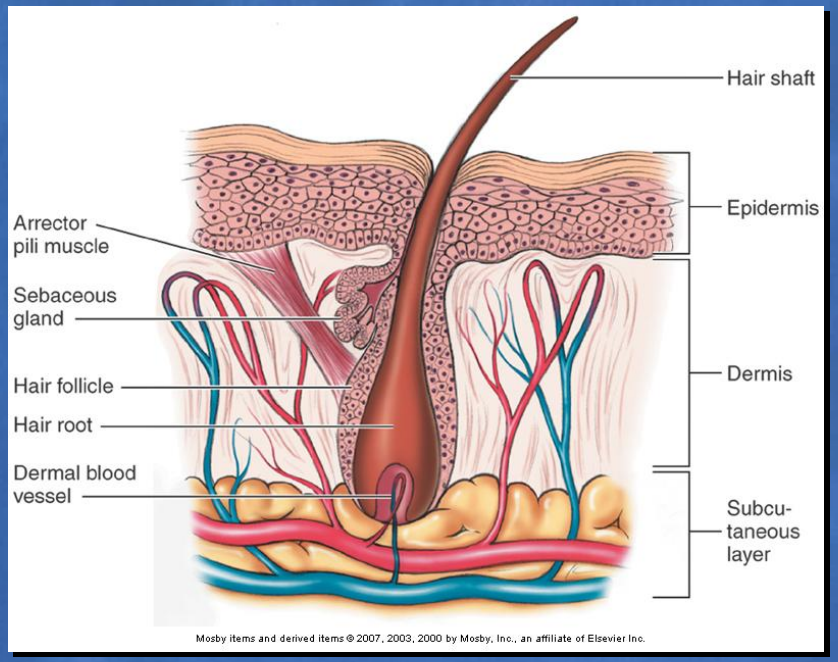
- Determined by genes, physiology, and sometimes pathology
- Dark pigment: melanin
  - Secreted by melanoctyes in the epidermis
  - The more melanin secreted, the darker the skin
  - Melanocyte malfunctions: albinism, vitiligo, moles, melanomas
- Yellow pigment: carotene
  - Presence of melanin overshadows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

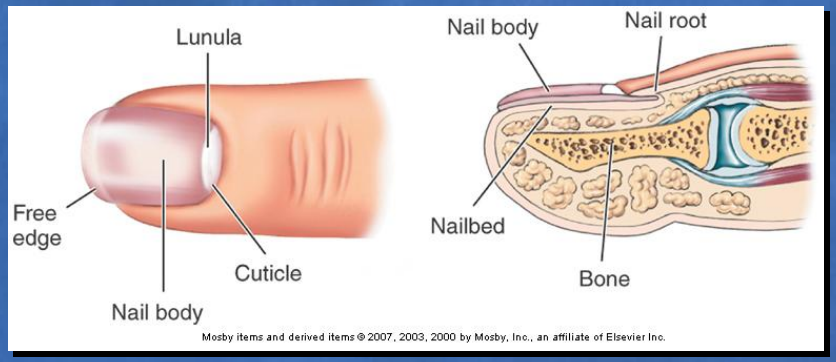
Accessory Structures of the Skin

- 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



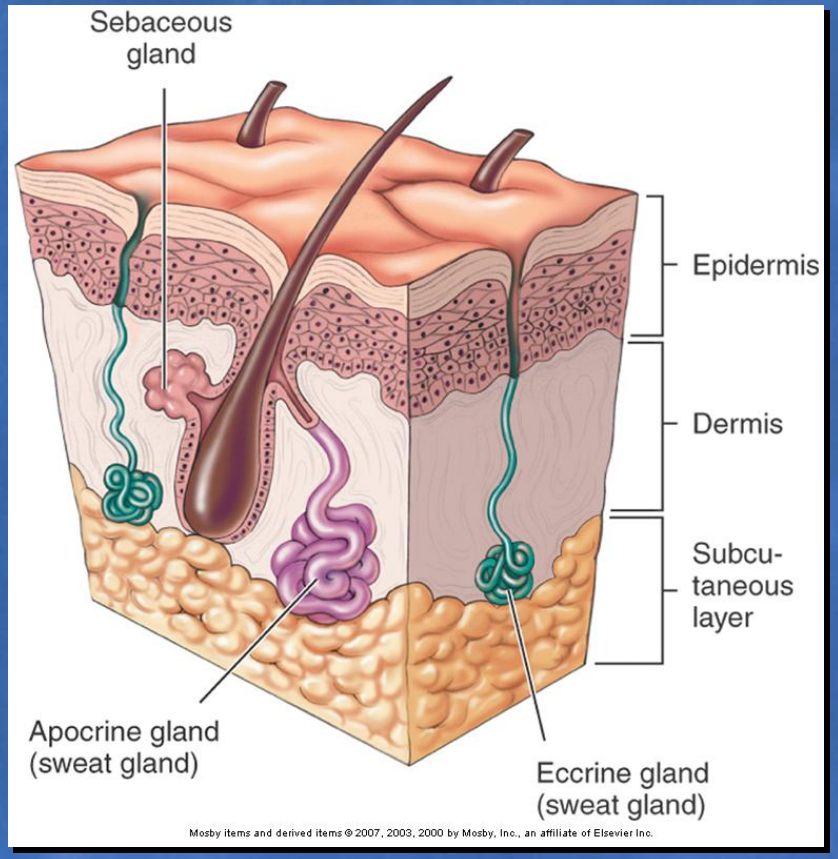
Accessory Structures of the Skin (cont'd.)

- 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.)

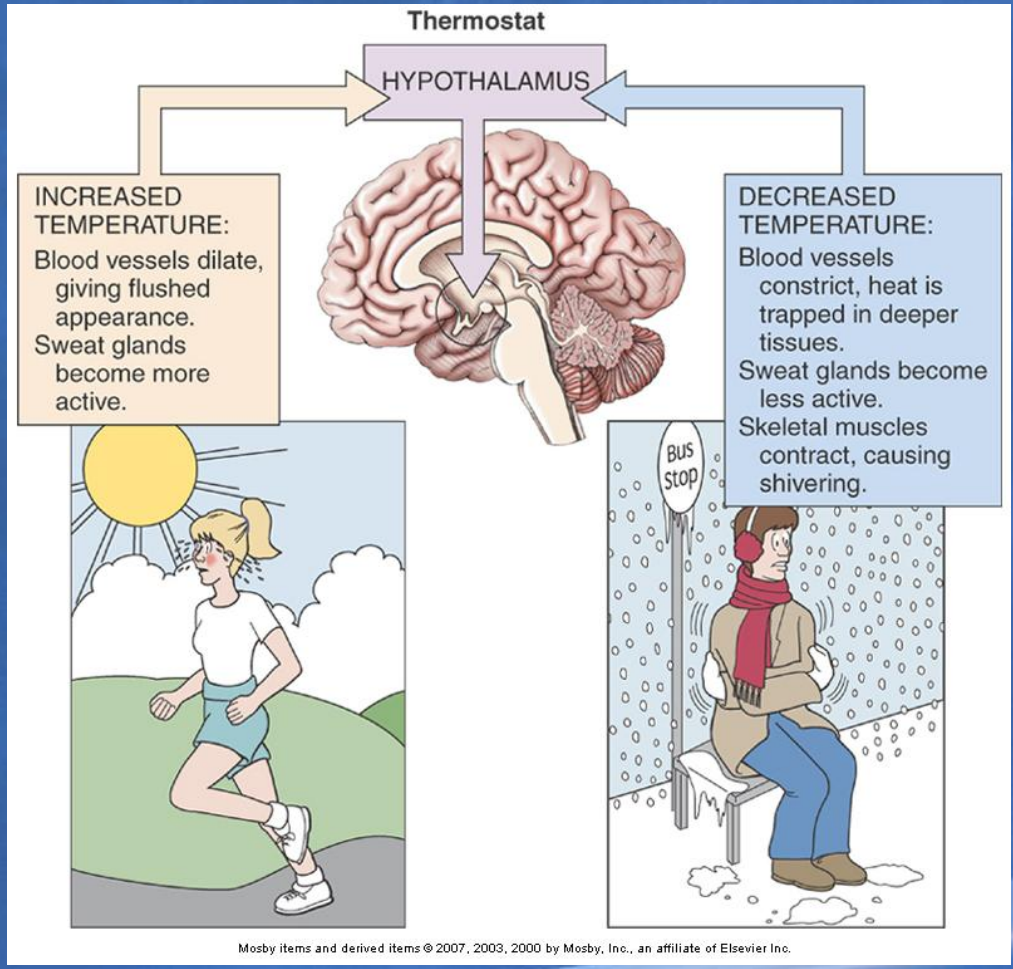
- Heat production:
  - Metabolic processes release thermal energy
  - Most heat produced by muscles, liver, and endocrine glands
  - Affected by food consumption, hormonal secretion, and physical activity
  - Heat produced by cells warms blood, which distributes it throughout body

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.)

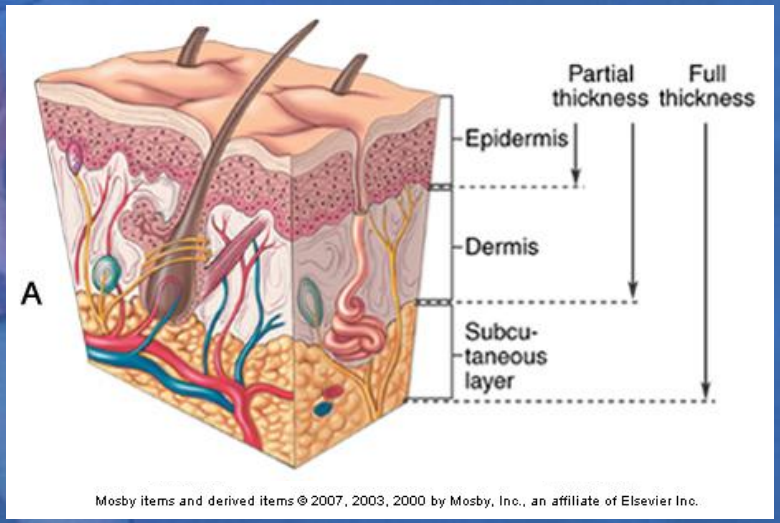
- Regulation:
  - Hypothalamus
  - Blood vessels
  - Sweat glands
  - Skeletal muscles



Body Temperature (cont'd.)

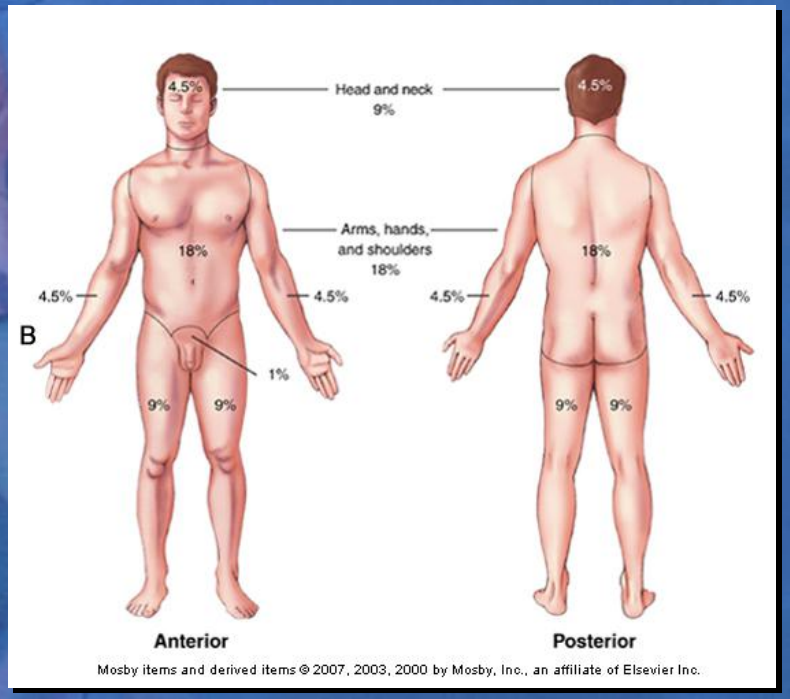
- Effects of heat extremes:
  - Overheating: syncope, cramps, heat exhaustion, heat stroke
  - Hypothermia: slowed metabolism, fibrillation
- Neonate heat regulation:
  - Large surface area increases heat loss
  - Less insulation due to thin layer of subcutaneous fat
  - Unable to shiver
  - Nonshivering 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