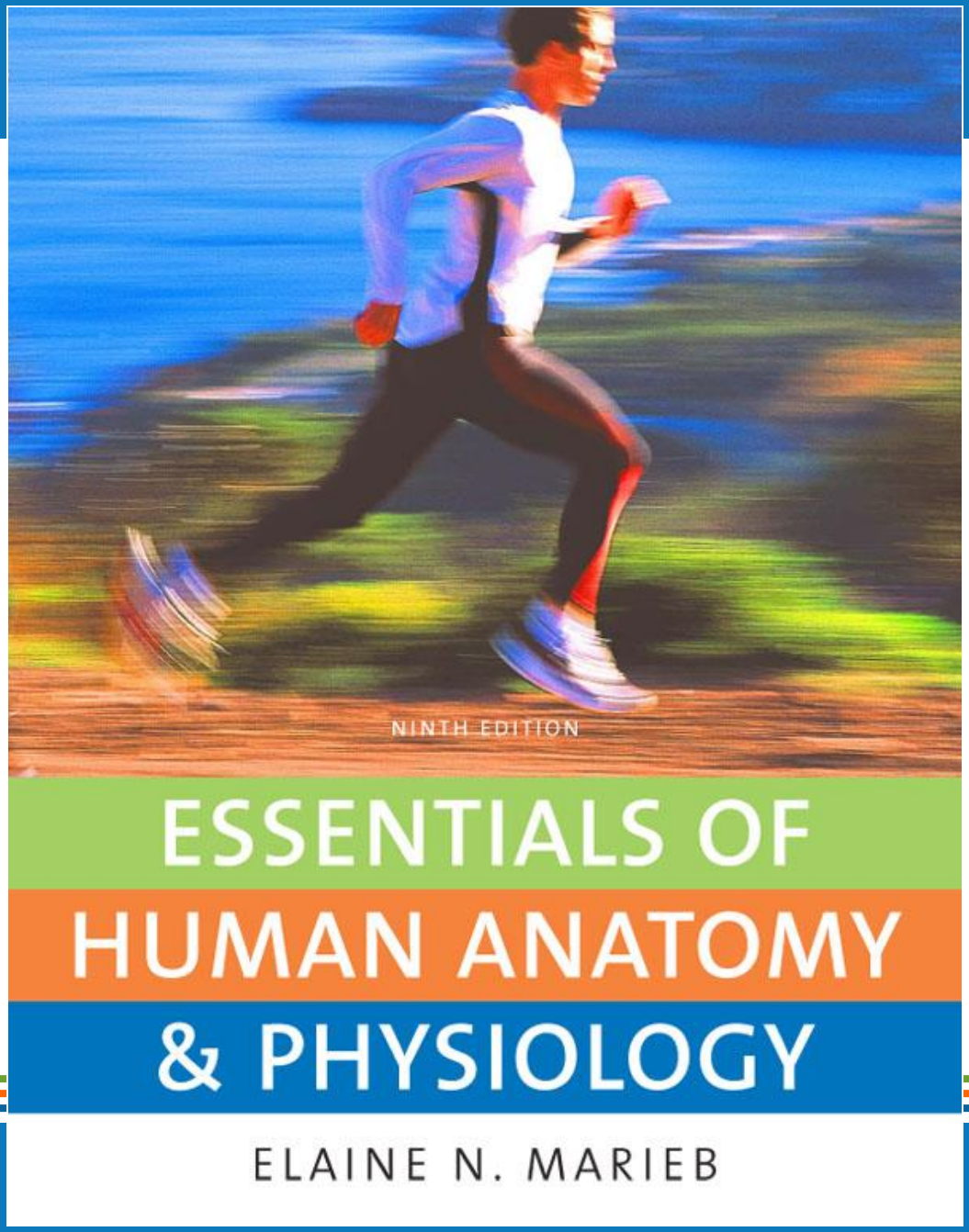


PowerPoint® Lecture Slide Presentation
by Patty Bostwick-Taylor,
Florence-Darlington Technical College

Skin and Body Membranes

4

Body Membranes

- Function of body membranes
  - Cover body surfaces
  - Line body cavities
  - Form protective sheets around organs

Classification of Body Membranes

- Epithelial membranes
  - Cutaneous membranes
  - Mucous membranes
  - Serous membranes
- Connective tissue membranes
  - Synovial membranes

Cutaneous Membrane

- Cutaneous membrane = skin
  - Dry membrane
  - Outermost protective boundary
- Superficial epidermis is composed of keratinized stratified squamous epithelium
- Underlying dermis is mostly dense connective tissue

Cutaneous Membranes

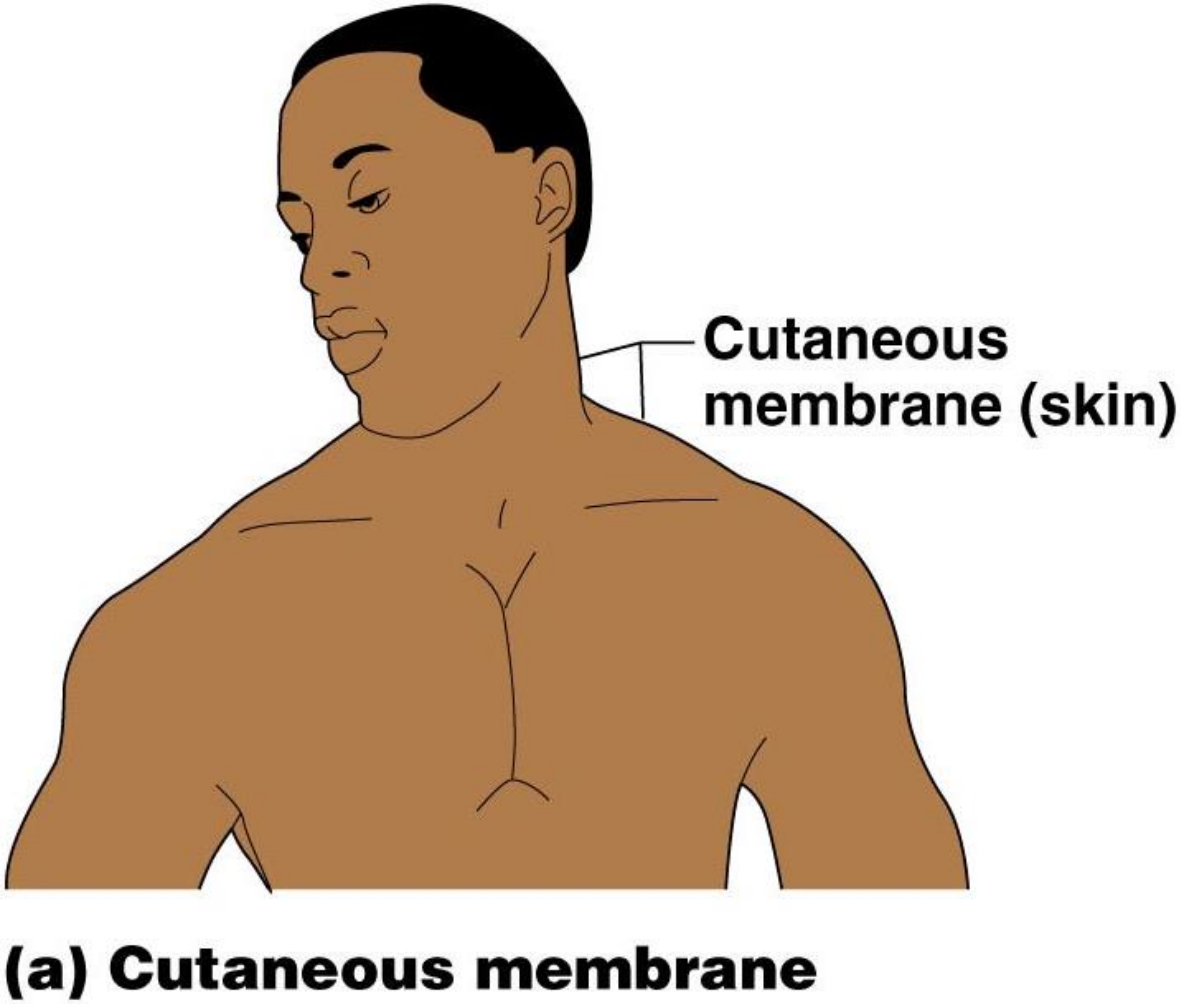
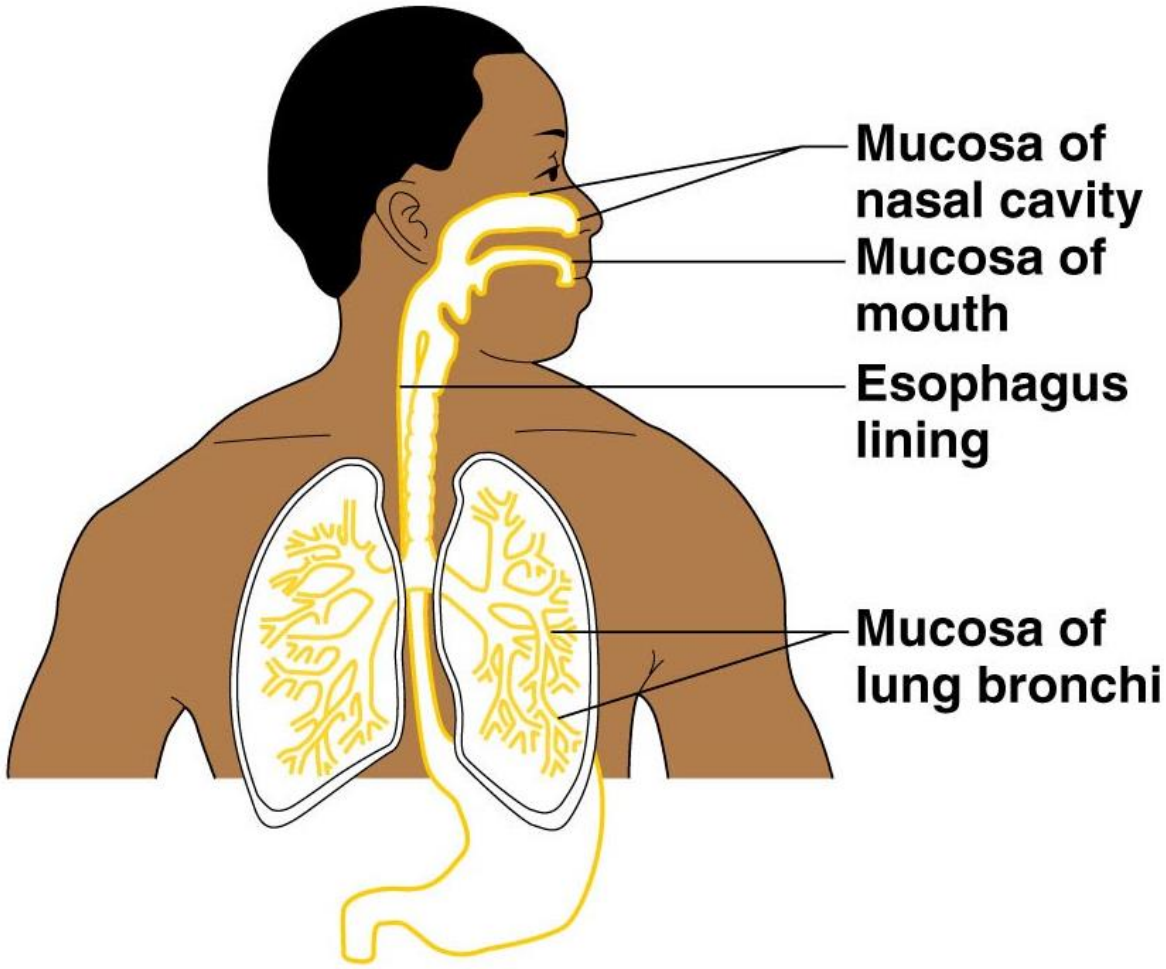


Figure 4.1a

Mucous Membranes

- Surface epithelium type depends on site
  - Stratified squamous epithelium (mouth, esophagus)
  - Simple columnar epithelium (rest of digestive tract)
- Underlying loose connective tissue (lamina propria)
- Lines all body cavities that open to the exterior body surface
- Often adapted for absorption or secretion

Mucous Membranes



(b) Mucous membranes

Figure 4.1b

Serous Membranes

- Surface is a layer of simple squamous epithelium
- Underlying layer is a thin layer of areolar connective tissue
- Lines open body cavities that are closed to the exterior of the body
- Serous membranes occur in pairs separated by serous fluid
  - Visceral layer covers the outside of the organ
  - Parietal layer lines a portion of the wall of ventral body cavity

Serous Membranes

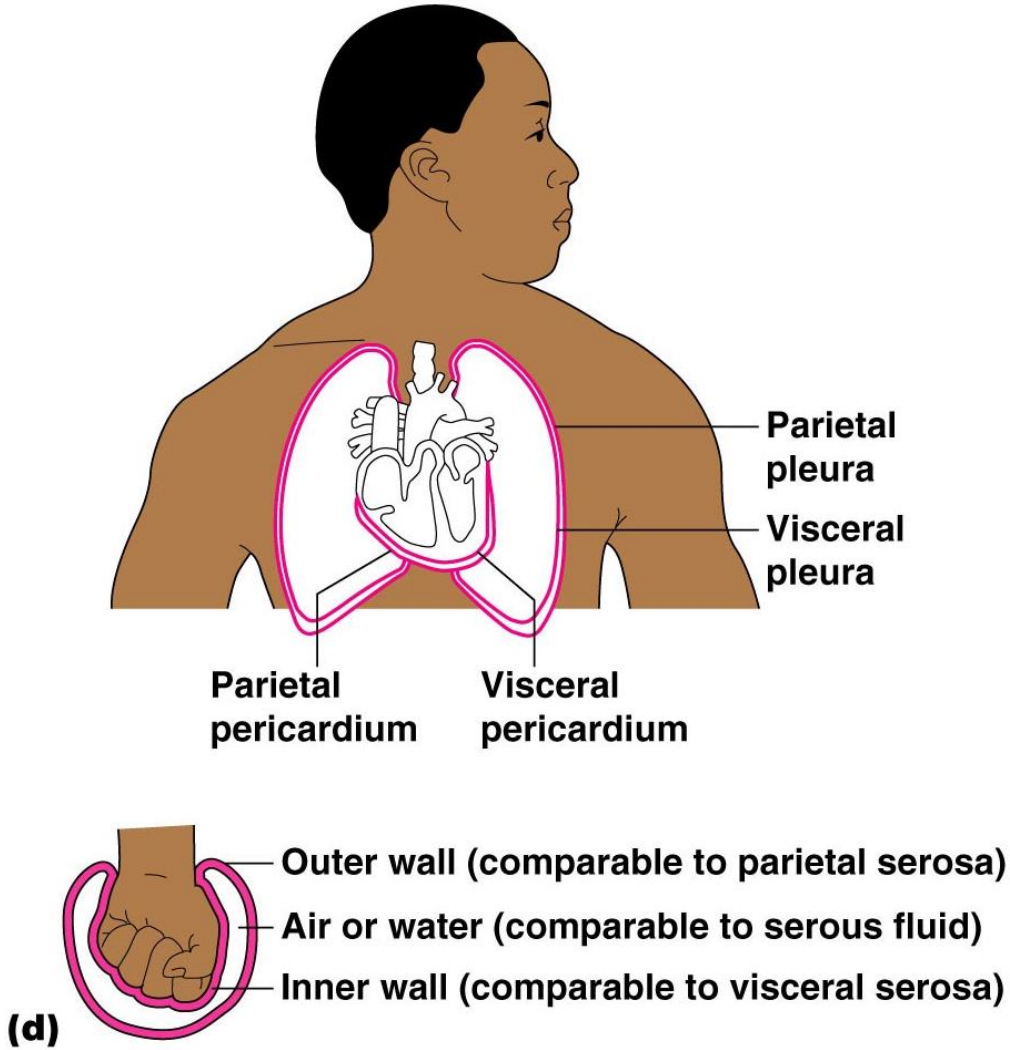


Figure 4.1d

Serous Membranes

- Specific serous membranes
  - Peritoneum
    - Abdominal cavity
  - Pleura
    - Around the lungs
  - Pericardium
    - Around the heart

Serous Membranes

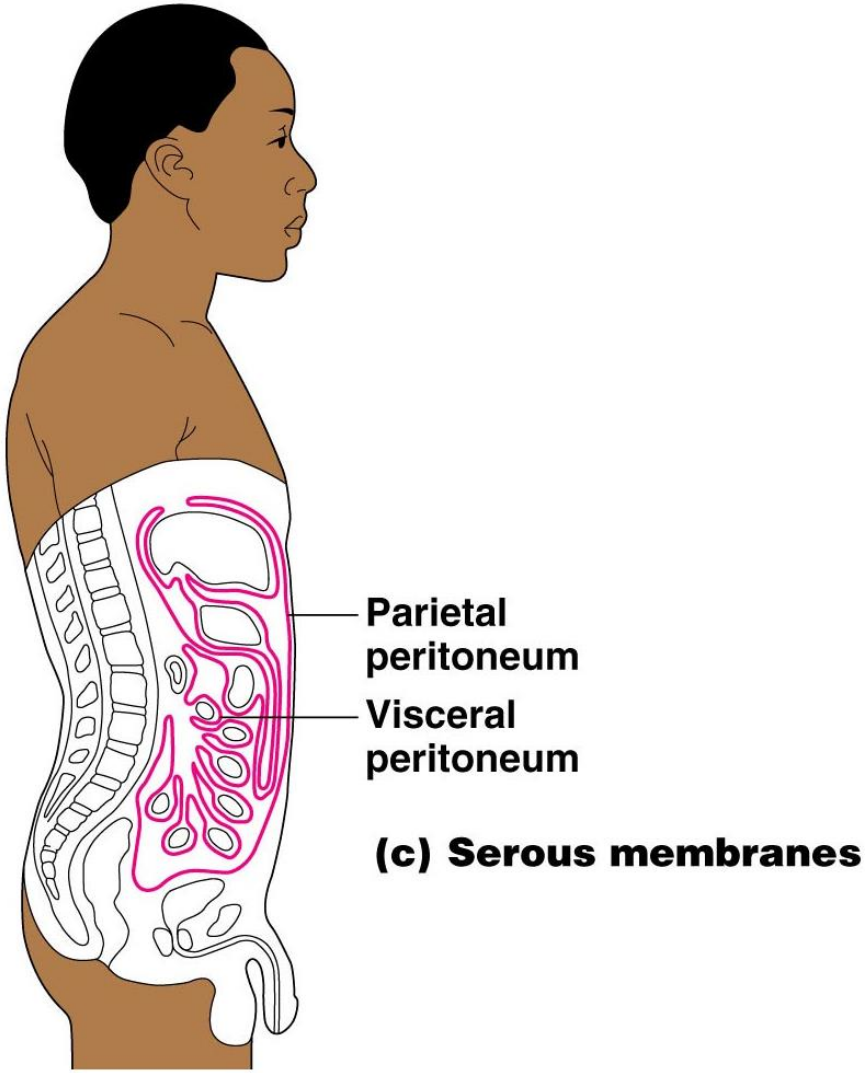


Figure 4.1c

Connective Tissue Membrane

- Synovial membrane
  - Connective tissue only
  - Lines fibrous capsules surrounding joints
  - Secretes a lubricating fluid

Connective Tissue Membrane

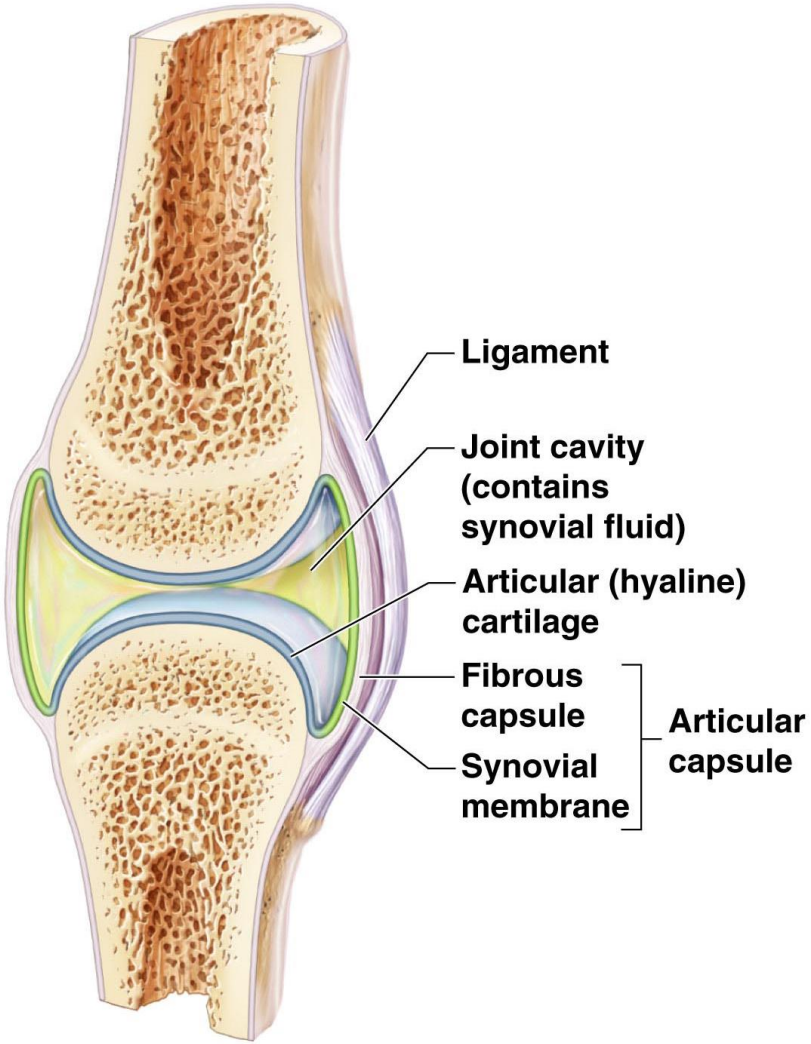


Figure 4.2

Integumentary System

- Skin (cutaneous membrane)
- Skin derivatives
  - Sweat glands
  - Oil glands
  - Hair
  - Nails

Skin Functions

TABLE 4.1 Functions of the Integumentary System

Functions	How accomplished
Protects deeper tissues from	
• Mechanical damage (bumps)	Physical barrier contains keratin, which toughens cells; fat cells to cushion blows; and pressure receptors, which alert the nervous system to possible damage.
• Chemical damage (acids and bases)	Has relatively impermeable keratinized cells; contains pain receptors, which alert the nervous system to possible damage.
• Bacterial damage	Has an unbroken surface and "acid mantle" (skin secretions are acidic, and thus inhibit bacteria). Phagocytes ingest foreign substances and pathogens, preventing them from penetrating into deeper body tissues.
• Ultraviolet radiation (damaging effects of sunlight)	Melanin produced by melanocytes offers protection from UV damage.
• Thermal (heat or cold) damage	Contains heat/cold/pain receptors.
• Desiccation (drying out)	Contains a waterproofing glycolipid and keratin.

Table 4.1 (1 of 2)

Skin Functions

TABLE 4.1 Functions of the Integumentary System

Functions	How accomplished
Aids in body heat loss or heat retention (controlled by the nervous system)	*Heat loss:* By activating sweat glands and by allowing blood to flush into skin capillary beds so that heat can radiate from the skin surface. *Heat retention:* By not allowing blood to flush into skin capillary beds.
Aids in excretion of urea and uric acid	Contained in perspiration produced by sweat glands.
Synthesizes vitamin D	Modified cholesterol molecules in skin converted to vitamin D by sunlight.

Table 4.1 (2 of 2)

Skin Structure

- Epidermis—outer layer
  - Stratified squamous epithelium
  - Often keratinized (hardened by keratin)
- Dermis
  - Dense connective tissue

Skin Structure

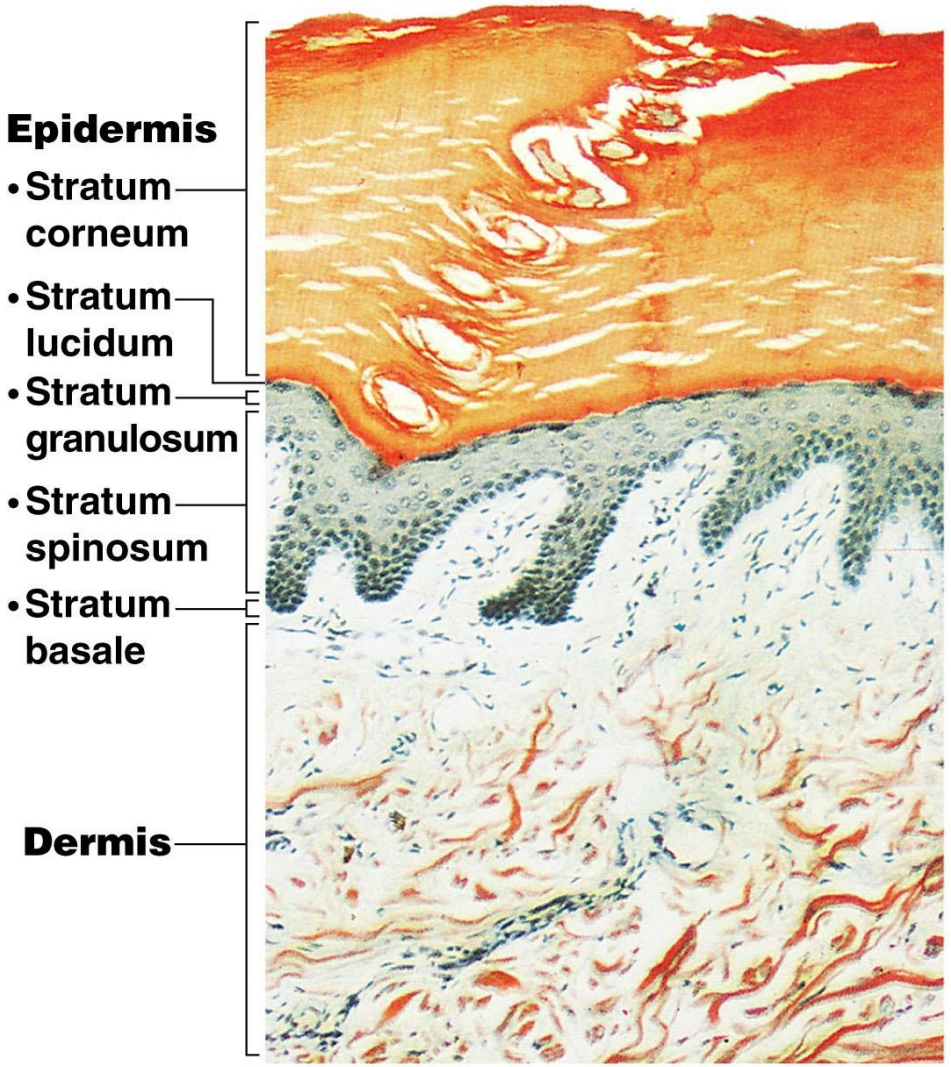


Figure 4.3

Skin Structure

- Subcutaneous tissue (hypodermis) is deep to dermis
  - Not part of the skin
  - Anchors skin to underlying organs
  - Composed mostly of adipose tissue

Layers of the Epidermis

- Stratum basale (stratum germinativum)
  - Deepest layer of epidermis
  - Lies next to dermis
  - Cells undergoing mitosis
  - Daughter cells are pushed upward to become the more superficial layers
- Stratum spinosum
- Stratum granulosum

Layers of the Epidermis

- Stratum lucidum
  - Formed from dead cells of the deeper strata
  - Occurs only in thick, hairless skin of the palms of hands and soles of feet
- Stratum corneum
  - Outermost layer of epidermis
  - Shingle-like dead cells are filled with keratin (protective protein prevents water loss from skin)

Layers of the Epidermis

- Summary of layers from deepest to most superficial
  - Stratum basale
  - Stratum spinosum
  - Stratum granulosum
  - Stratum lucidum (thick, hairless skin only)
  - Stratum corneum

Melanin

- Pigment (melanin) produced by melanocytes
- Melanocytes are mostly in the stratum basale
- Color is yellow to brown to black
- Amount of melanin produced depends upon genetics and exposure to sunlight

Dermis

- Two layers
  - Papillary layer (upper dermal region)
    - Projections called dermal papillae
      - Some contain capillary loops
      - Other house pain receptors and touch receptors
  - Reticular layer (deepest skin layer)
    - Blood vessels
    - Sweat and oil glands
    - Deep pressure receptors

Dermis

- Overall dermis structure
  - Collagen and elastic fibers located throughout the dermis
    - Collagen fibers give skin its toughness
    - Elastic fibers give skin elasticity
  - Blood vessels play a role in body temperature regulation

Skin Structure

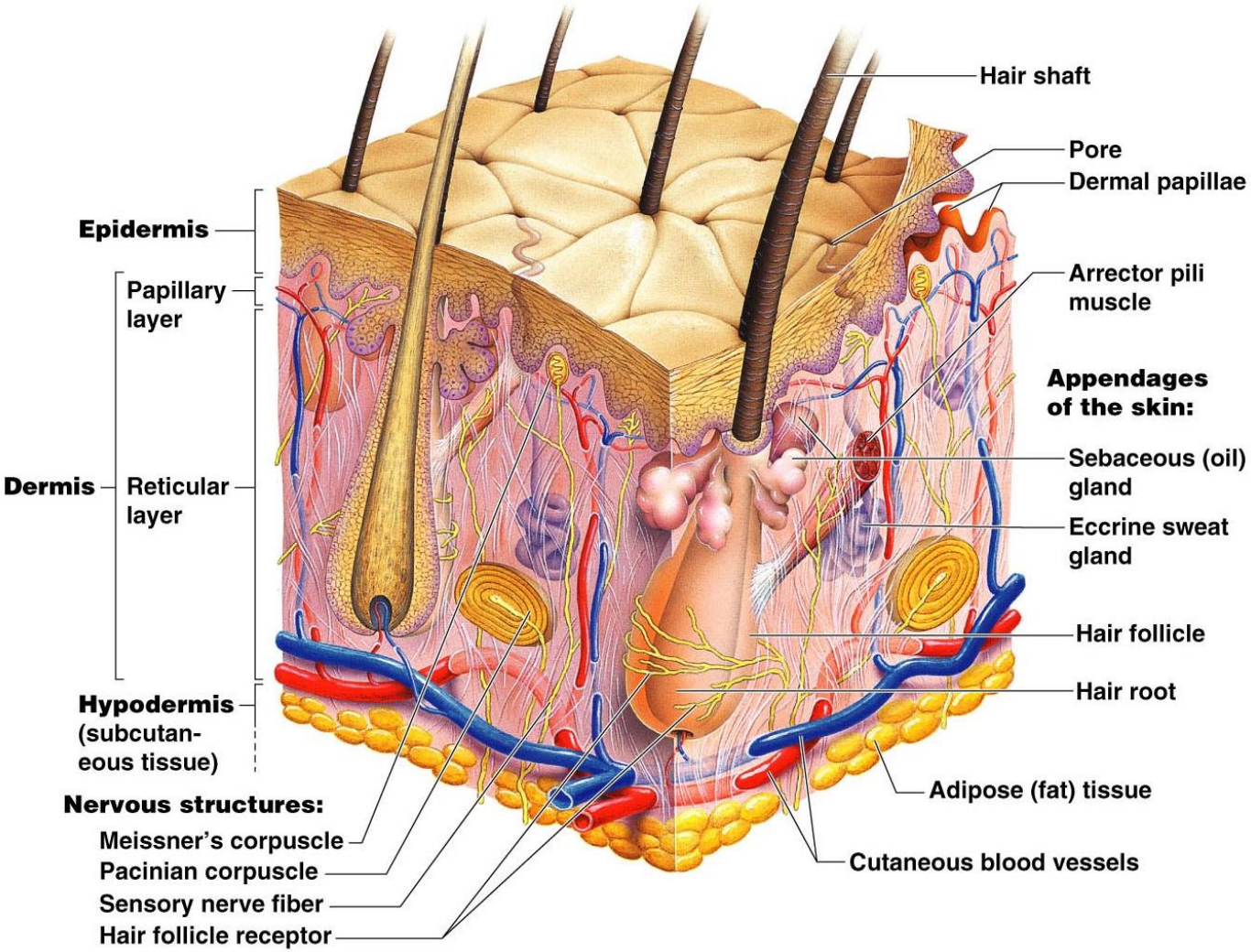


Figure 4.4

Normal Skin Color Determinants

- Melanin
  - Yellow, brown, or black pigments
- Carotene
  - Orange-yellow pigment from some vegetables
- Hemoglobin
  - Red coloring from blood cells in dermal capillaries
  - Oxygen content determines the extent of red coloring

Skin Appendages

- Cutaneous glands are all exocrine glands
  - Sebaceous glands
  - Sweat glands
- Hair
- Hair follicles
- Nails

Appendages of the Skin

- Sebaceous glands
  - Produce oil
    - Lubricant for skin
    - Prevents brittle hair
    - Kills bacteria
  - Most have ducts that empty into hair follicles; others open directly onto skin surface
  - Glands are activated at puberty

Appendages of the Skin

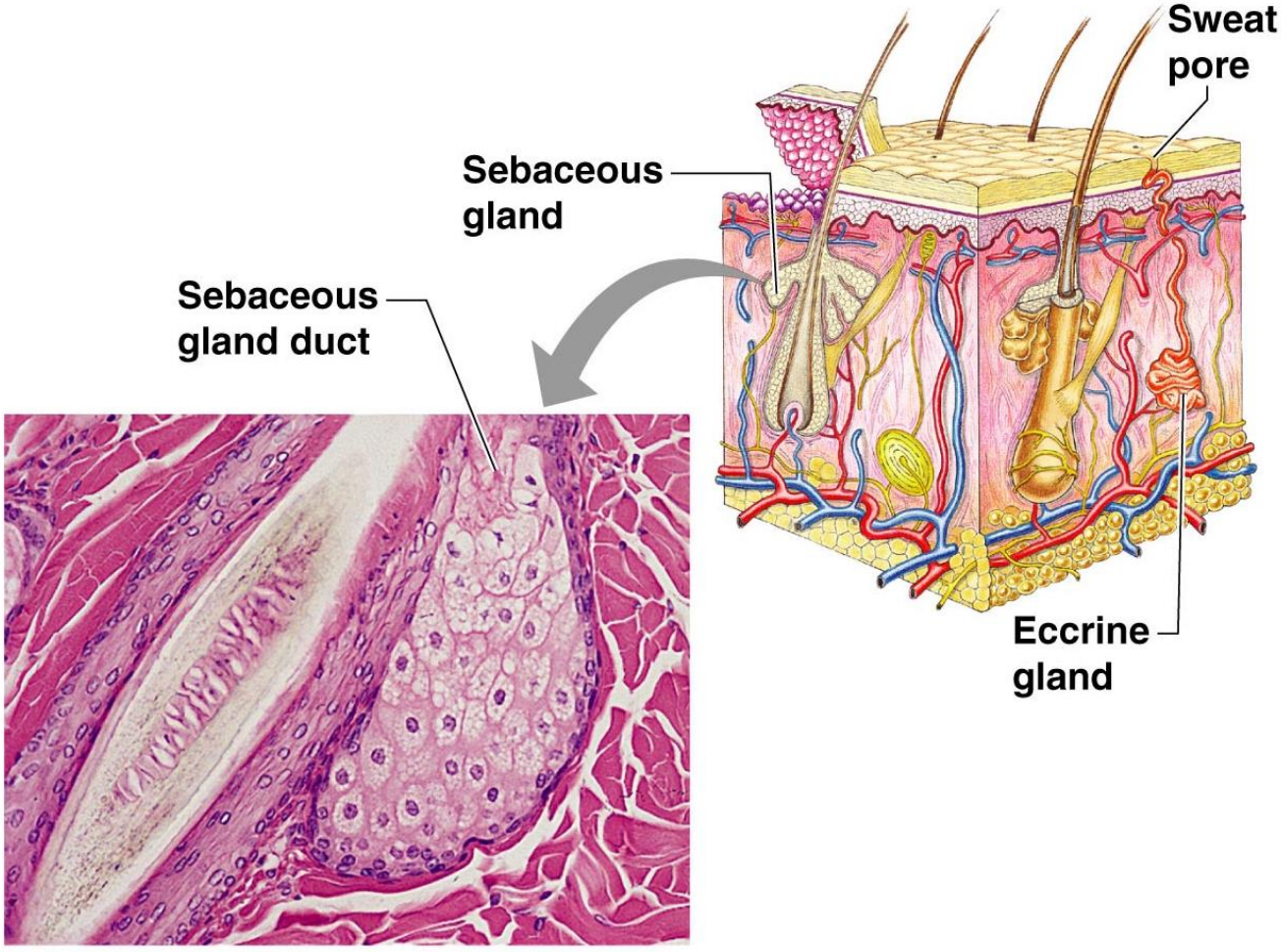


Figure 4.6a

Appendages of the Skin

- Sweat glands
  - Produce sweat
  - Widely distributed in skin
  - Two types
    - Eccrine
      - Open via duct to pore on skin surface
    - Apocrine
      - Ducts empty into hair follicles

Appendages of the Skin

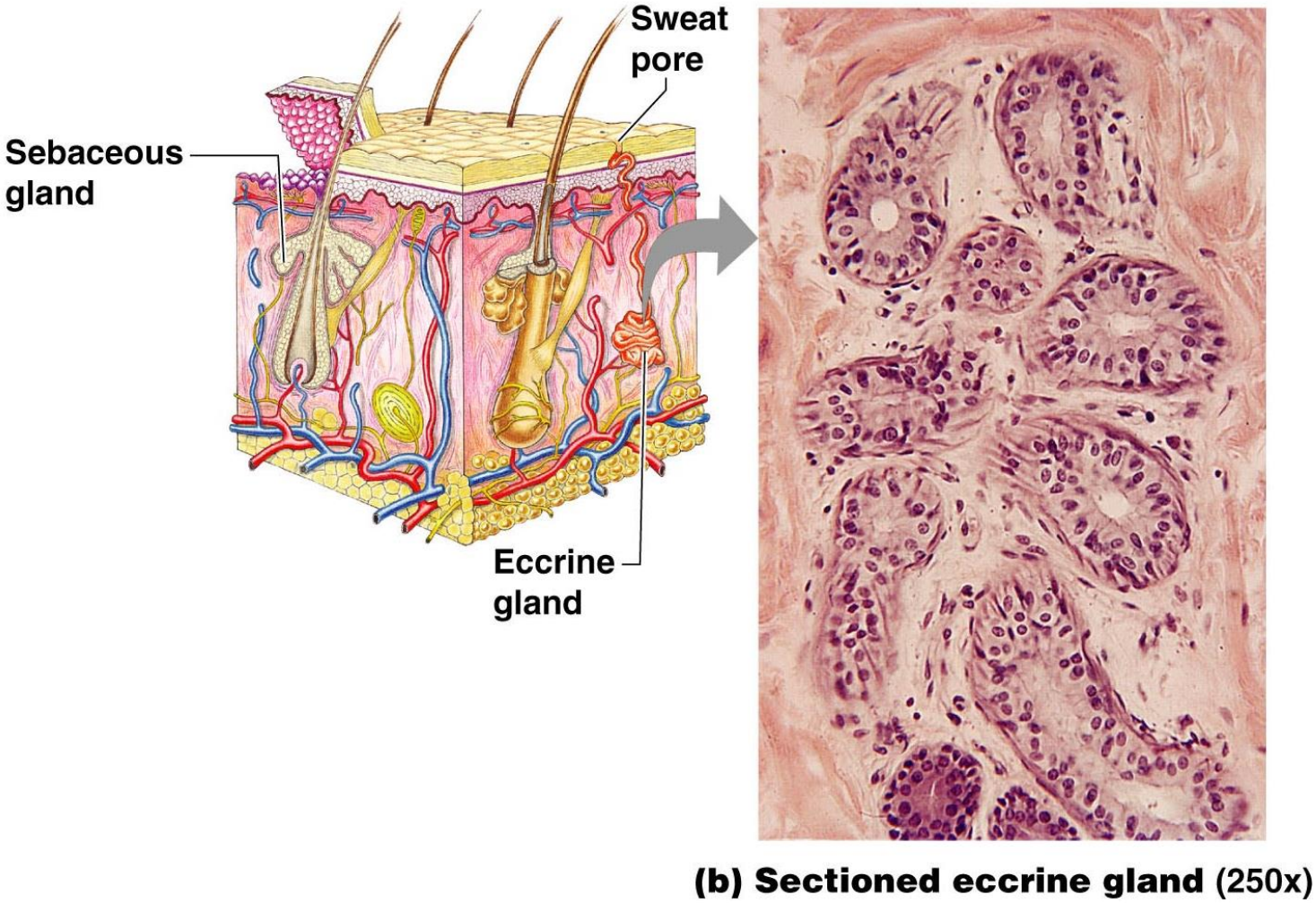


Figure 4.6b

Sweat and Its Function

- Composition
  - Mostly water
  - Salts and vitamin C
  - Some metabolic waste
  - Fatty acids and proteins (apocrine only)
- Function
  - Helps dissipate excess heat
  - Excretes waste products
  - Acidic nature inhibits bacteria growth
- Odor is from associated bacteria

Appendages of the Skin

- Hair
  - Produced by hair follicle
  - Consists of hard keratinized epithelial cells
  - Melanocytes provide pigment for hair color

Appendages of the Skin

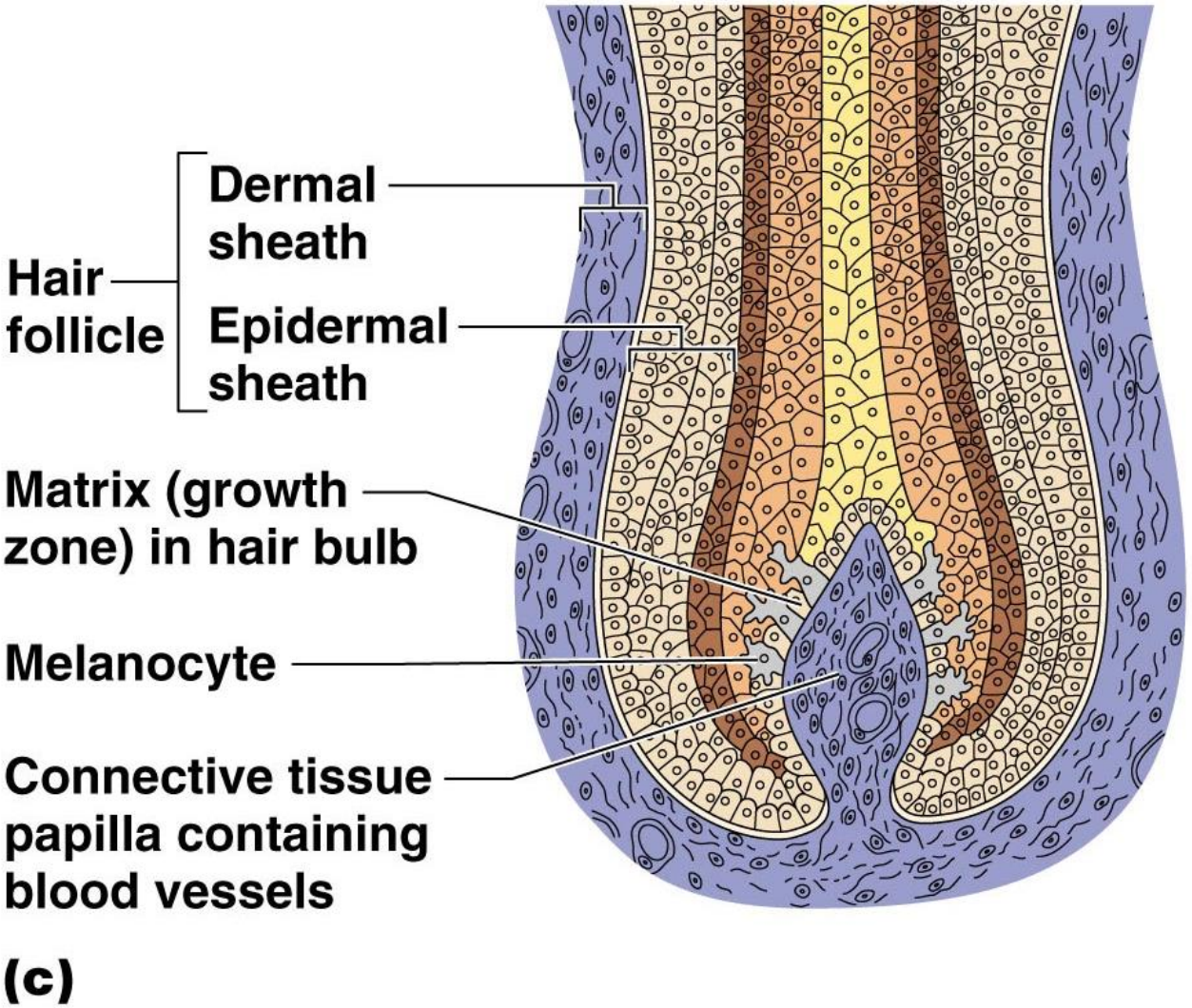


Figure 4.7c

Appendages of the Skin

- Hair anatomy
  - Central medulla
  - Cortex surrounds medulla
  - Cuticle on outside of cortex
    - Most heavily keratinized

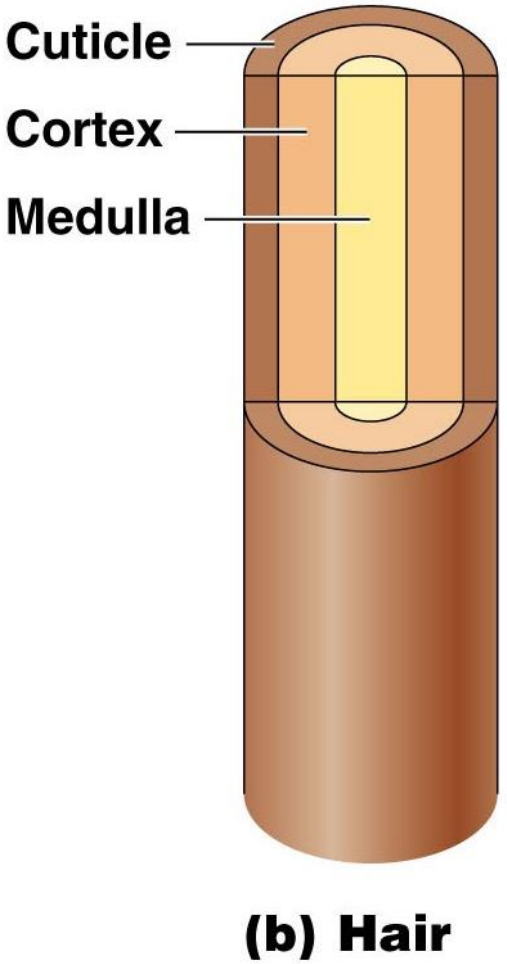


Figure 4.7b

Appendages of the Skin

- Associated hair structures
  - Hair follicle
    - Dermal and epidermal sheath surround hair root
  - Arrector pili muscle
    - Smooth muscle
    - Pulls hairs upright when cold or frightened
  - Sebaceous gland
  - Sweat gland

Appendages of the Skin

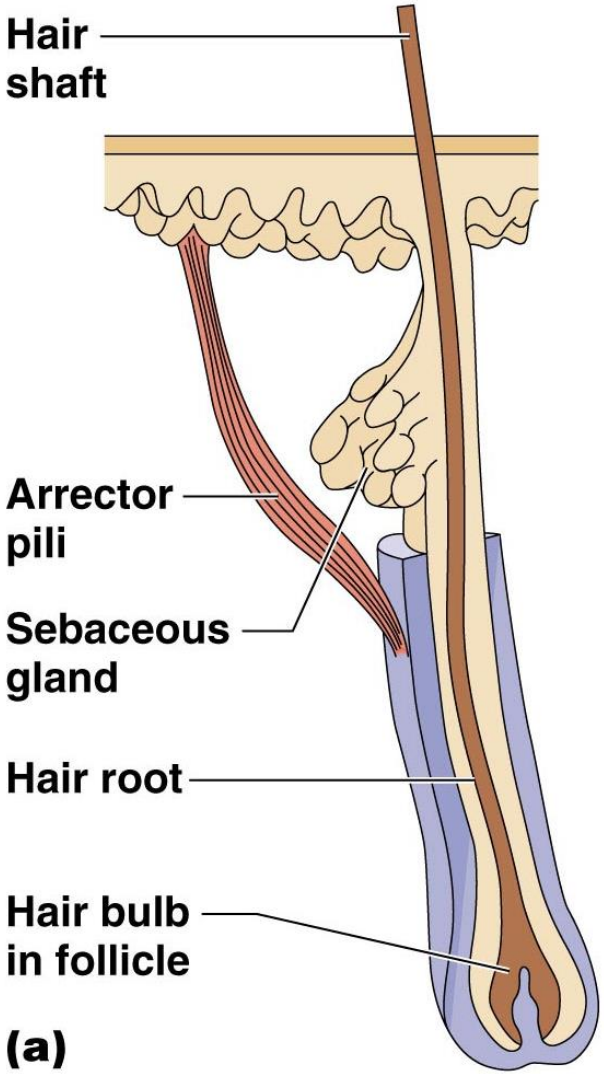


Figure 4.7a

Appendages of the Skin

Figure 4.8

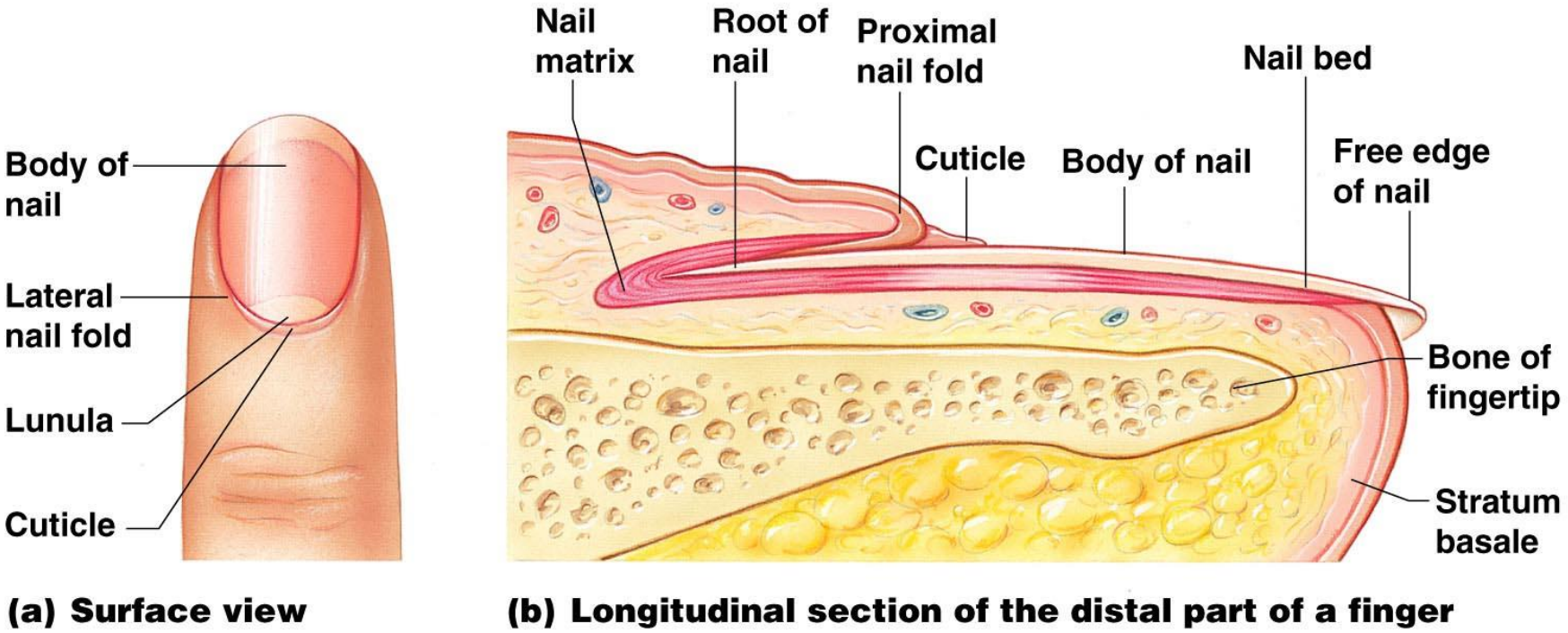
Appendages of the Skin

- Nails
  - Scale-like modifications of the epidermis
    - Heavily keratinized
  - Stratum basale extends beneath the nail bed
    - Responsible for growth
  - Lack of pigment makes them colorless

Appendages of the Skin

- Nail structures
  - Free edge
  - Body is the visible attached portion
  - Root of nail embedded in skin
  - Cuticle is the proximal nail fold that projects onto the nail body

Appendages of the Skin



(a) Surface view

(b) Longitudinal section of the distal part of a finger

Figure 4.9

Skin Homeostatic Imbalances

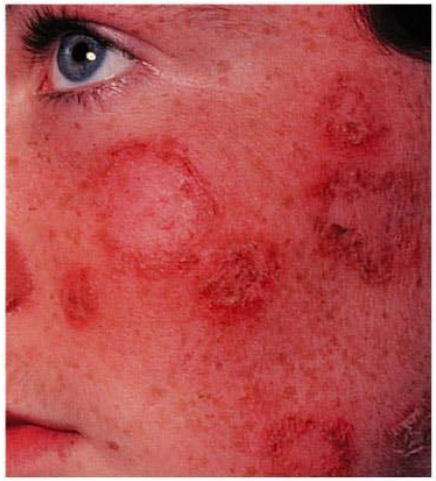
- Infections
  - Athlete's foot (tinea pedis)
    - Caused by fungal infection
  - Boils and carbuncles
    - Caused by bacterial infection
  - Cold sores
    - Caused by virus

Skin Homeostatic Imbalances

- Infections and allergies
  - Contact dermatitis
    - Exposures cause allergic reaction
  - Impetigo
    - Caused by bacterial infection
  - Psoriasis
    - Cause is unknown
    - Triggered by trauma, infection, stress

Skin Homeostatic Imbalances

(a) Cold sores



(b) Impetigo

(c) Psoriasis

Figure 4.10

Skin Homeostatic Imbalances

- Burns
  - Tissue damage and cell death caused by heat, electricity, UV radiation, or chemicals
  - Associated dangers
    - Dehydration
    - Electrolyte imbalance
    - Circulatory shock

Rule of Nines

- Way to determine the extent of burns
- Body is divided into 11 areas for quick estimation
- Each area represents about 9% of total body surface area

Rule of Nines

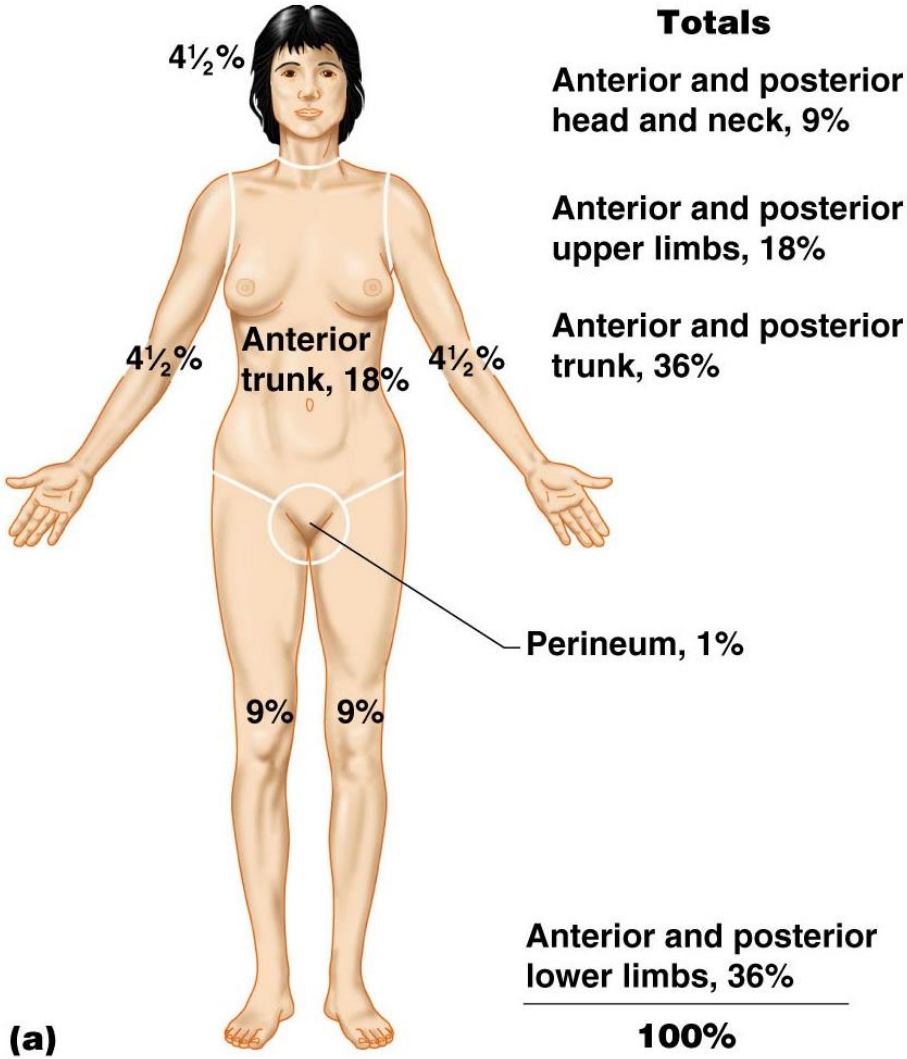


Figure 4.11a

Severity of Burns

- First-degree burns
  - Only epidermis is damaged
  - Skin is red and swollen
- Second-degree burns
  - Epidermis and upper dermis are damaged
  - Skin is red with blisters
- Third-degree burns
  - Destroys entire skin layer
  - Burn is gray-white or black

Severity of Burns

Figure 4.11b

Critical Burns

- Burns are considered critical if
  - Over 25% of body has second-degree burns
  - Over 10% of the body has third-degree burns
  - There are third-degree burns of the face, hands, or feet

Skin Cancer

- Cancer—abnormal cell mass
- Classified two ways
  - Benign
    - Does not spread (encapsulated)
  - Malignant
    - Metastasized (moves) to other parts of the body
- Skin cancer is the most common type of cancer

Skin Cancer Types

- Basal cell carcinoma
  - Least malignant
  - Most common type
  - Arises from stratum basale

Skin Cancer Types

(a) Basal cell carcinoma

Figure 4.12a

Skin Cancer Types

- Squamous cell carcinoma
  - Metastasizes to lymph nodes if not removed
  - Early removal allows a good chance of cure
  - Believed to be sun-induced
  - Arises from stratum spinosum

Skin Cancer Types

(b) Squamous cell carcinoma

Figure 4.12b

Skin Cancer Types

- Malignant melanoma
  - Most deadly of skin cancers
  - Cancer of melanocytes
  - Metastasizes rapidly to lymph and blood vessels
  - Detection uses ABCD rule

Skin Cancer Types

(c) Melanoma

Figure 4.12c

ABCD Rule

- A = Asymmetry
  - Two sides of pigmented mole do not match
- B = Border irregularity
  - Borders of mole are not smooth
- C = Color
  - Different colors in pigmented area
- D = Diameter
  - Spot is larger then 6 mm in diameter

Developmental Aspects of Skin and Membranes

- Fetal Development
  - Lanugo – downy hair on fetus
  - Vernix caseosa – sebaceous gland product; white, cheesy-looking, protects skin while fetus is floating in water
- Newborn
  - Milia – sebaceous gland produces small white spots on nose and forehead that usually go away in a month
- Adolescence
  - Acne
  - Skin looks best in our 20's and 30's

Developmental Aspects of Skin and Membranes

- Changes as we age
  - Subcutaneous tissue decreases, intolerance to cold
  - Decreased skin gland products, skin is dry and itchy
  - Decrease in dermis fibers (collagen), bruises easier
  - Loss of fat and elastic fibers, skin bags and sag
- What you can do to have healthier skin
  - Don’t smoke
  - Shield your skin from sun damage
  - Good nutrition, plenty of fluids, and cleanliness help to delay aging effects

Developmental Aspects of Skin and Membranes

- By age 50, hair is losing luster and the number of follicles producing hair has dropped by 1/3.
  - Alopecia – some degree of baldness in most people
  - Male pattern baldness – genetic factor; still have hair but it doesn't emerge from follicle; colorless and tiny; called "vellus" hairs
  - Graying of hair – genetic factor; "delayed-action gene" turns off melanin production resulting in gray to white hair
- Changes in hair that are not genetic and not permanent
  - Stress, chemotherapy, protein-deficient diets, radiation, excessive Vit A, certain fungal diseases (ringworm)