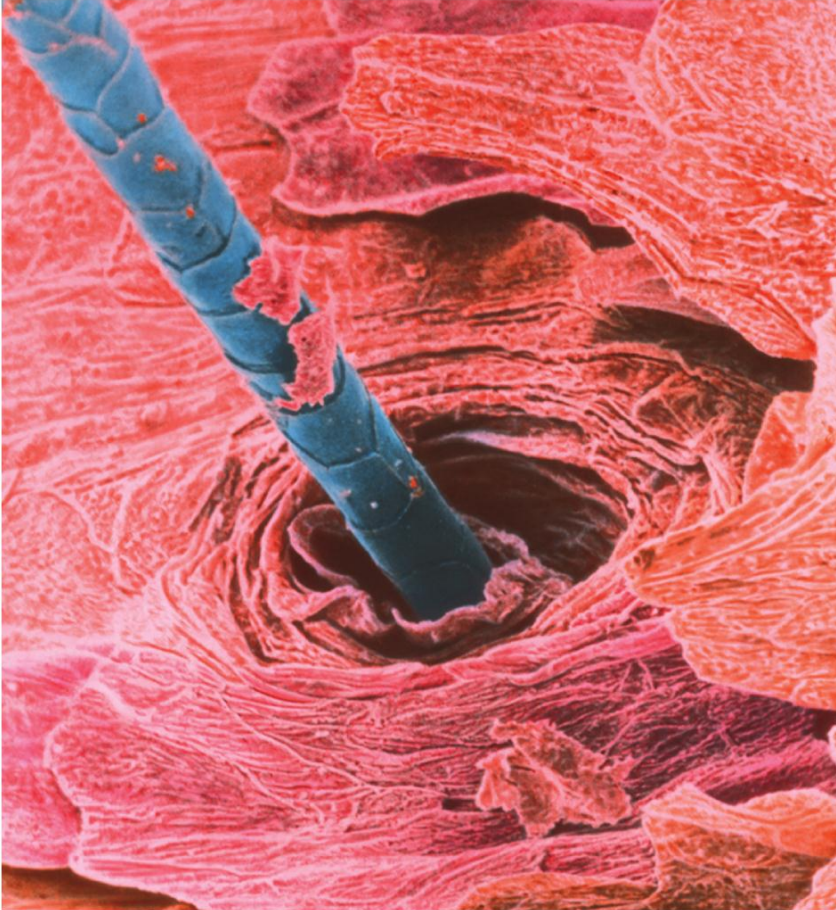


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Chapter 6

*Lecture PowerPoint The Integumentary System

*See separate *FlexArt PowerPoint* slides for all figures and tables preinserted into PowerPoint without notes.

Introduction

- **Integumentary system**
 - Consists of the skin and its accessory organs; hair, nails, and cutaneous glands
- Inspection of the skin, hair, and nails is significant part of a physical exam
- Skin is the most vulnerable organ
 - Exposed to radiation, trauma, infection, and injurious chemicals
- Receives more medical treatment than any other organ system
- **Dermatology**—scientific study and medical treatment of the integumentary system

The Skin and Subcutaneous Tissue

- **Expected Learning Outcomes**

- List the functions of the skin and relate them to its structure.
- Describe the histological structure of the epidermis, dermis, and subcutaneous tissue.
- Describe the normal and pathological colors that the skin can have, and explain their causes.
- Describe the common markings of the skin.

Structure of the Skin

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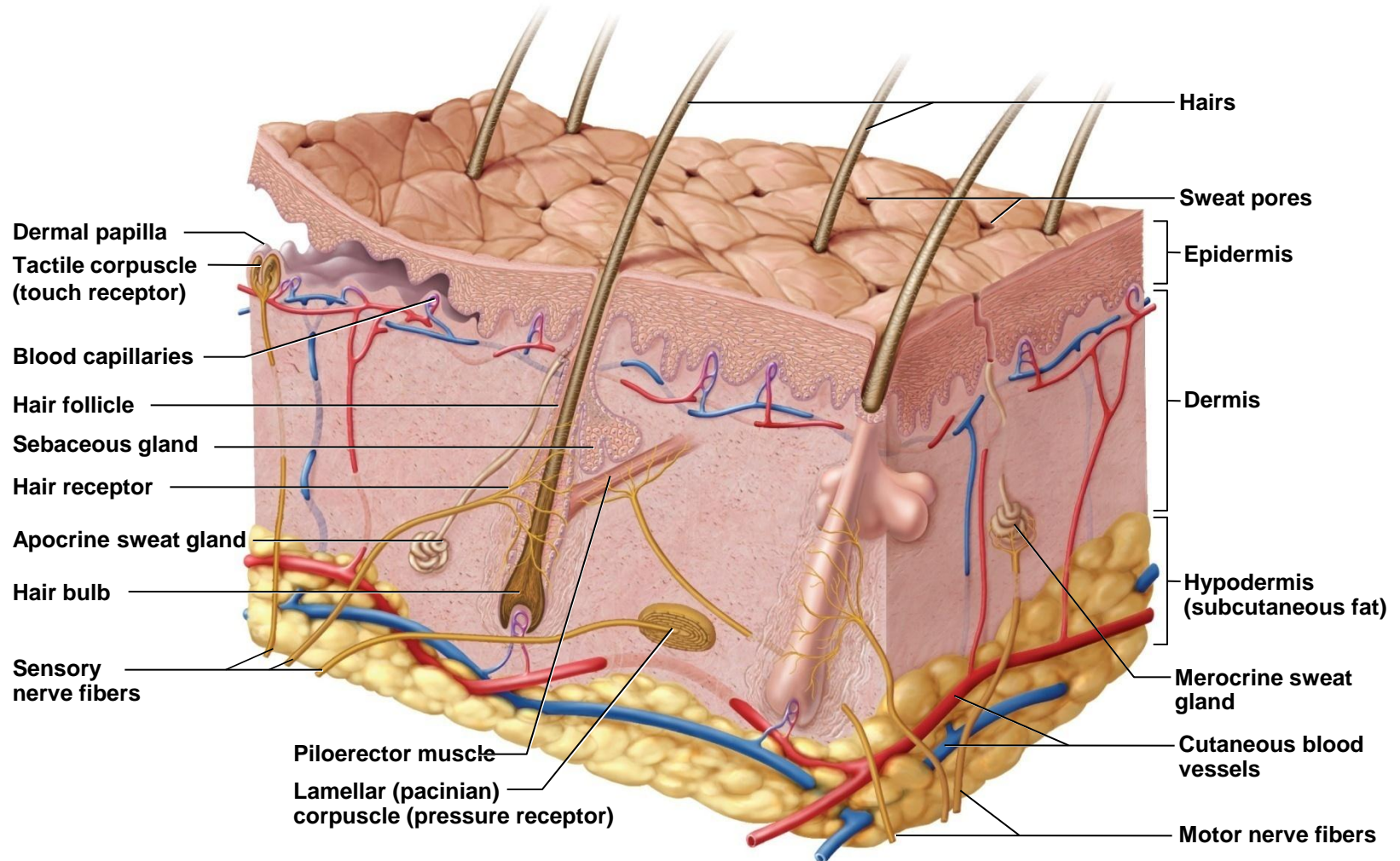


Figure 6.1

The Skin and Subcutaneous Tissue

- The body's largest and heaviest organ
 - Covers area of 1.5 to 2.0 m²
 - 15% of body weight
 - Most skin is 1 to 2 mm thick
- Two layers
 - **Epidermis:** stratified squamous epithelium
 - **Dermis:** connective tissue layer

The Skin and Subcutaneous Tissue

- **Hypodermis**—another connective tissue layer below the dermis
- **Thick skin**—on palms and sole, and corresponding surfaces on fingers and toes
 - Has sweat glands, but no hair follicles or sebaceous (oil) glands
 - Epidermis 0.5 mm thick
- **Thin skin** covers rest of the body
 - Epidermis about 0.1 mm thick
 - Possesses hair follicles, sebaceous glands, and sweat glands

Functions of the Skin

- **Resistance to trauma and infection**
 - Keratin
 - Acid mantle
- **Other barrier functions**
 - Waterproofing
 - UV radiation
 - Harmful chemicals
- **Vitamin D synthesis**
 - Skin first step
 - Liver and kidneys complete process

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(e)

Figure 6.2a

Functions of the Skin

- **Sensation**
 - Skin is our most extensive sense organ
- **Thermoregulation**
 - Thermoreceptors
 - Vasoconstriction/vasodilation
- **Nonverbal communication**
 - Acne, birthmark, or scar
- **Transdermal absorption**
 - Administration of certain drugs steadily through thin skin via adhesive patches

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(b)

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Figure 6.2b

The Epidermis

- **Epidermis**—keratinized stratified squamous epithelium
 - Dead cells at the surface packed with tough protein called **keratin**
 - Lacks blood vessels
 - Depends on the diffusion of nutrients from underlying connective tissue
 - Sparse nerve endings for touch and pain

Cells of the Epidermis

- **Five types of cells of the epidermis**
 - **Stem cells**
 - Undifferentiated cells that give rise to keratinocytes
 - In deepest layer of epidermis (stratum basale)
 - **Keratinocytes**
 - Great majority of epidermal cells
 - Synthesize **keratin**
 - **Melanocytes**
 - Occur only in stratum basale
 - Synthesize pigment **melanin** that shields DNA from ultraviolet radiation
 - Branched processes that spread among keratinocytes

Cells of the Epidermis

Cont.

– **Tactile (Merkel) cells**

- In basal layer of epidermis
- Touch receptor cells associated with dermal nerve fibers

– **Dendritic (Langerhans) cells**

- Macrophages originating in bone marrow that guard against pathogens
- Found in stratum spinosum and granulosum
- Stand guard against toxins, microbes, and other pathogens that penetrate skin

Cells of the Epidermis

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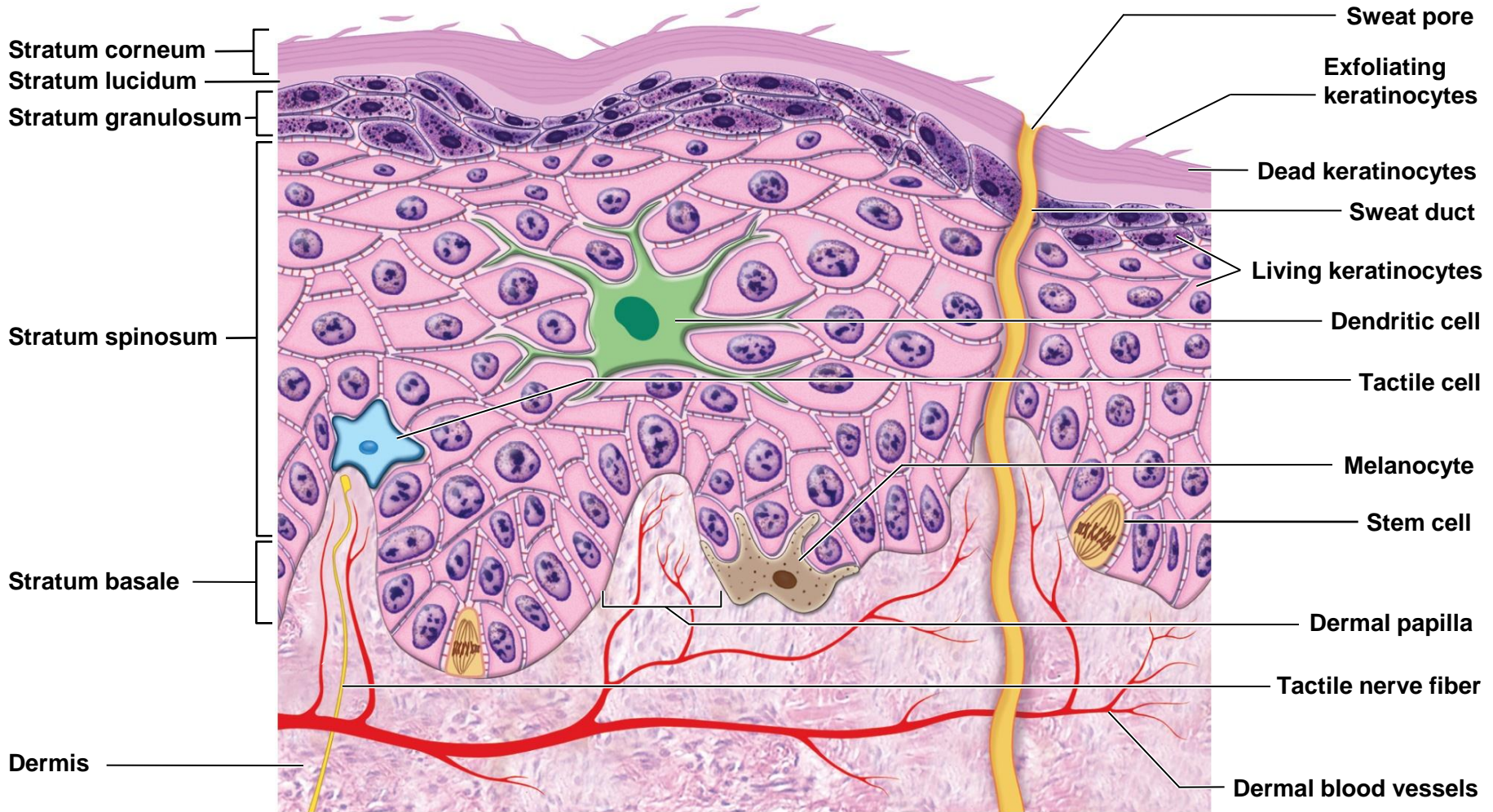


Figure 6.3

Layers of the Epidermis

- **Stratum basale**
 - A single layer of cuboidal to low columnar **stem cells** and **keratinocytes** resting on the basement membrane
 - **Melanocytes** and **tactile cells** are scattered among the stem cells and keratinocytes
- **Stem cells of stratum basale divide**
 - Give rise to keratinocytes that migrate toward skin surface
 - Replace lost epidermal cells

Layers of the Epidermis

- **Stratum spinosum**
 - Produce more and more **keratin filaments** which causes cell to flatten; the higher up in this stratum, the flatter the cells appear
- **Dendritic cells** found throughout this stratum
- Named for artificial appearance created in histological section
 - Numerous desmosomes and cell shrinkage produces spiny appearance
 - Consists of **several layers of keratinocytes**

Layers of the Epidermis

- **Thickest stratum in most skin**
 - In thick skin, exceeded by stratum corneum
- **Deepest cells remain capable of mitosis**
 - Cease dividing as they are pushed upward

Layers of the Epidermis

- **Stratum granulosum**
 - Consists of **three to five layers** of flat keratinocytes
 - Contains coarse dark-staining **keratohyalin granules**

Layers of the Epidermis

- **Stratum lucidum**
 - Seen **only** in thick skin
- **Thin translucent zone** superficial to stratum granulosum
- Keratinocytes are densely packed with **eleidin**
- Cells have no nucleus or other organelles
- Zone has a pale, featureless appearance with indistinct boundaries

Layers of the Epidermis

- **Stratum corneum**
 - Up to 30 layers of dead, scaly, keratinized cells
- Form durable surface layer
 - Surface cells flake off (exfoliate)
- Resistant to abrasion, penetration, and water loss

The Life History of a Keratinocyte

- **Keratinocytes** are produced deep in the epidermis by stem cells in **stratum basale**
 - Some deepest keratinocytes in stratum spinosum also multiply and increase their numbers
- **Mitosis requires an abundant supply of oxygen and nutrients**
 - Deep cells acquire oxygen from blood vessels in nearby dermis
 - Once epidermal cells migrate more than two or three cells away from the dermis, their mitosis ceases

The Life History of a Keratinocyte

- Newly formed keratinocytes push the older ones toward the surface
- In **30 to 40 days** a keratinocyte makes its way to the skin surface and flakes off
 - Slower in old age
 - Faster in injured or stressed skin
 - **Calluses** or **corns**—thick accumulations of dead keratinocytes on the hands or feet
- Cytoskeleton proliferates as cells are shoved upward
- Produce lipid-filled **membrane-coating vesicles** (lamellar granules)

The Life History of a Keratinocyte

- In **stratum granulosum** three important developments occur
 - Keratinocyte nucleus and other organelles degenerate; **cells die**
 - **Keratohyalin** granules release a protein **filaggrin**
 - Binds the keratin filaments together into coarse, tough bundles
 - Membrane-coating vesicles release lipid mixture that spreads out over cell surface and **waterproofs** it
- **Epidermal water barrier**—forms between stratum granulosum and stratum spinosum

The Life History of a Keratinocyte

- Consists of:
 - **Lipids** secreted by keratinocytes
 - **Tight junctions** between keratinocytes
 - Thick layer of **insoluble protein** on the inner surfaces of the keratinocyte plasma membranes
- Critical to retaining water in the body and **preventing dehydration**
- Cells above the water barrier quickly die
 - Barrier cuts them off from nutrients below
 - Dead cells **exfoliate (dander)**
 - **Dandruff**: clumps of dander stuck together by sebum (oil)

The Dermis

- **Dermis**—connective tissue layer beneath the epidermis
 - Ranges from 0.2 mm (eyelids) to 4 mm (palms, soles)
 - Composed mainly of collagen with elastic fibers, reticular fibers, and fibroblasts
 - Well supplied with **blood vessels, sweat glands, sebaceous glands, and nerve endings**

The Dermis

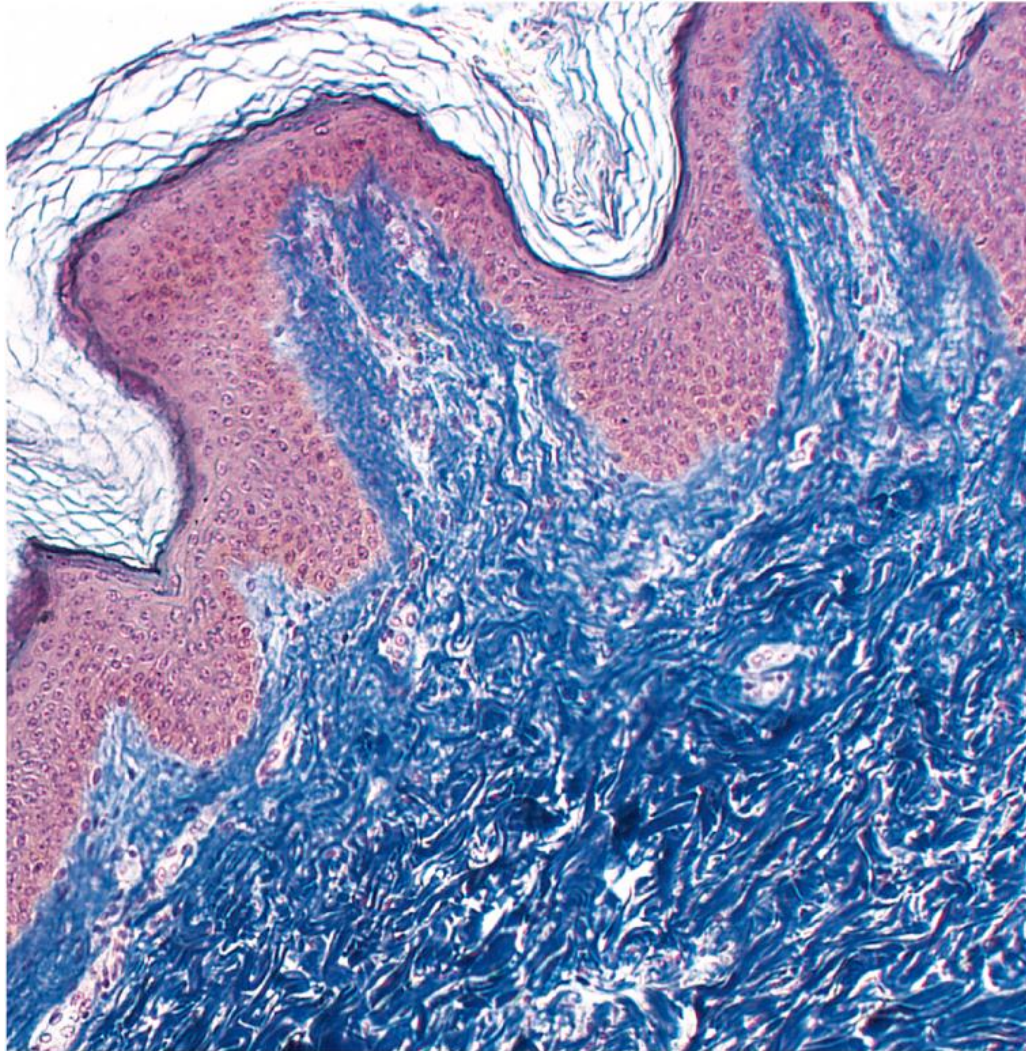
- **Hair follicles** and **nail roots** are embedded in dermis
 - Smooth muscle (**piloerector muscles**) associated with hair follicles
 - Contract in response to stimuli such as cold, fear, and touch—**goose bumps**
- **Dermal papillae**—upward fingerlike extensions of the dermis
 - **Friction ridges** on fingertips that leave fingerprints

The Dermis

- **Papillary layer**—superficial zone of dermis
 - Thin zone of areolar tissue in and near the dermal papilla
 - Allows for mobility of leukocytes and other defense cells should epidermis become broken
 - Rich in small blood vessels
- **Reticular layer**—deeper and much thicker layer of dermis
 - Consists of dense, irregular connective tissue
 - **Stretch marks (striae)**: tears in the collagen fibers caused by stretching of the skin due to pregnancy or obesity

The Dermis

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Figure 6.5a

The Hypodermis

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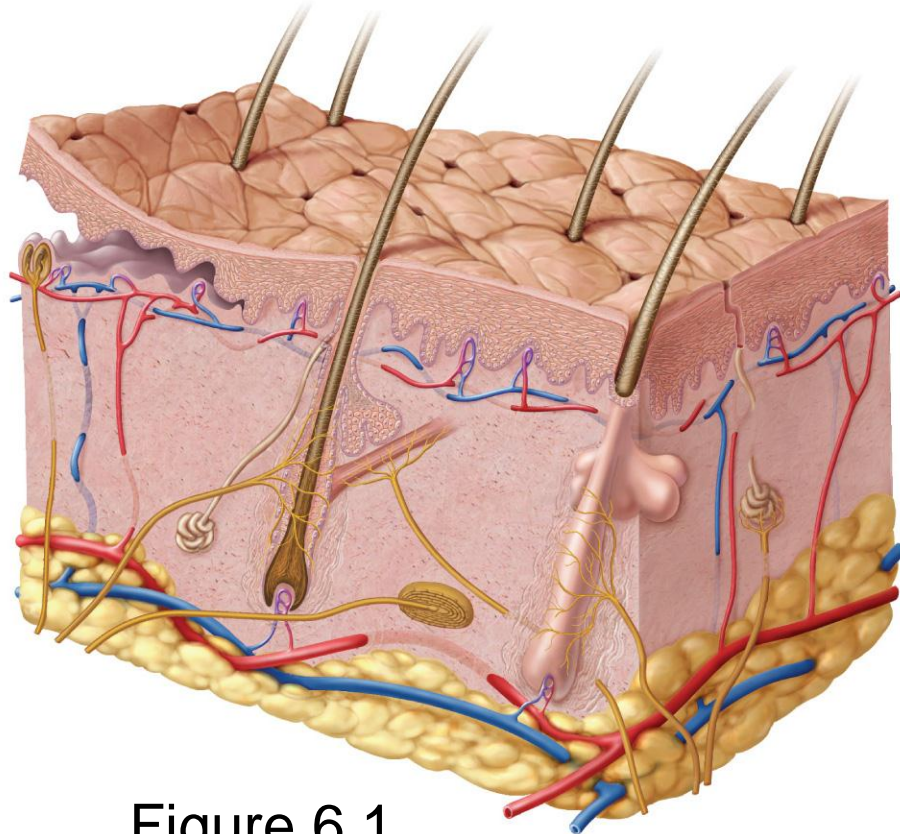


Figure 6.1

- **Hypodermis**
 - Subcutaneous tissue
 - More areolar and adipose than dermis
 - Pads body
 - Binds skin to underlying tissues
- Drugs introduced by injection
 - Highly vascular and absorbs them quickly
- Subcutaneous fat
 - Energy reservoir
 - Thermal insulation
 - 8% thicker in women

Skin Color

- **Melanin**—most significant factor in skin color
 - Produced by **melanocytes**
 - Accumulate in the **keratinocytes** of stratum basale and stratum spinosum
 - **Eumelanin**—brownish black
 - **Pheomelanin**—a reddish yellow sulfur-containing pigment

Skin Color

- People of different skin colors have the **same number of melanocytes**
 - **Dark-skinned people**
 - Produce greater quantities of melanin
 - Melanin granules in keratinocytes more spread out than tightly clumped
 - Melanin breaks down more slowly
 - Melanized cells seen throughout the epidermis

Skin Color

Cont.

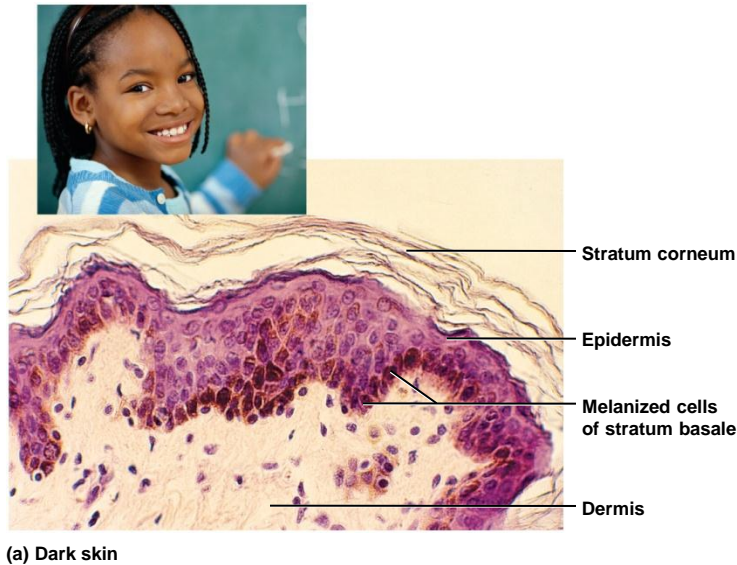
– **Light-skinned people**

- Melanin clumped near keratinocyte nucleus
 - Melanin breaks down more rapidly
 - Little seen beyond stratum basale
- Amount of melanin also varies with exposure to **ultraviolet (UV) rays of sunlight**

Skin Color

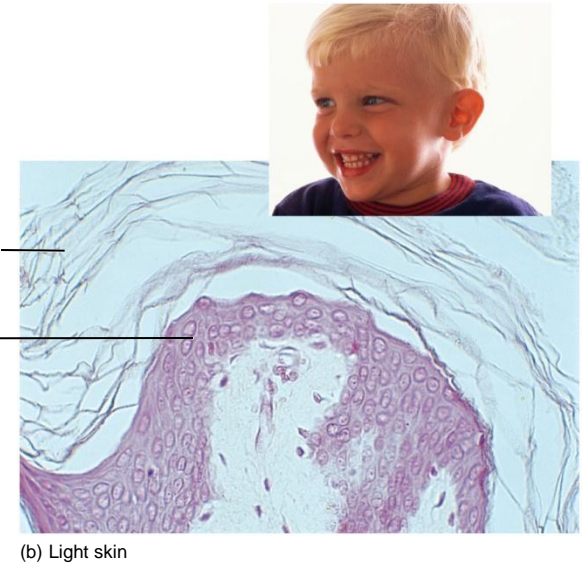
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Figure 6.6a



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Figure 6.6b

- **Hemoglobin**—red pigment of red blood cells
 - Adds reddish to pinkish hue to skin
- **Carotene**—yellow pigment acquired from egg yolks and yellow/orange vegetables
 - Concentrates in stratum corneum and subcutaneous fat

Skin Color

Colors of diagnostic value

- **Cyanosis**—blueness of the skin from deficiency of oxygen in the circulating blood
 - Airway obstruction (drowning or choking)
 - Lung diseases (emphysema or respiratory arrest)
 - Cold weather or cardiac arrest
- **Erythema**—abnormal redness of the skin due to dilated cutaneous vessels
 - Exercise, hot weather, sunburn, anger, or embarrassment

Skin Color

Colors of diagnostic value

- **Pallor**—pale or ashen color when there is so little blood flow through the skin that the white color of dermal collagen is visible
 - Emotional stress, low blood pressure, circulatory shock, cold, anemia
- **Albinism**—genetic lack of melanin that results in white hair, pale skin, and pink eyes
 - Have inherited recessive, nonfunctional tyrosinase allele

Skin Color

Cont.

- **Jaundice**—yellowing of skin and sclera due to excess of bilirubin in blood
 - Cancer, hepatitis, cirrhosis, other compromised liver function
- **Hematoma (bruise)**—mass of clotted blood showing through skin

The Evolution of Skin Color

- **Skin color**—one of the most conspicuous signs of human variation
 - Results from combination of evolutionary selection pressures
 - Especially differences in **exposure to ultraviolet radiation (UVR)**

The Evolution of Skin Color

- **UVR has two adverse effects**
 - Causes **skin cancer**
 - **Breaks down folic acid** needed for normal cell division, fertility, and fetal development
- **UVR has one desirable effect**
 - Stimulates **synthesis of vitamin D** necessary for dietary calcium absorption

The Evolution of Skin Color

- Populations native to the **tropics** and their descendants tend to have **well-melanized skin** to screen out excessive UVR
- Populations native to **far northern or southern latitudes** where the sunlight is weak, tend to have **light skin** to allow for adequate UVR penetration

The Evolution of Skin Color

- Ancestral skin color is a compromise between vitamin D and folic acid requirements
- Women have skin averaging about 4% lighter than men
 - Need greater amounts of vitamin D and folic acid to support pregnancy and lactation

The Evolution of Skin Color

- High altitude and dry air increases skin pigmentation
 - Andes, Tibet, Ethiopia
- UVR accounts for up to 77% of variation in human skin color
- Other exceptions
 - Migration, cultural differences in clothing, and shelter
 - Intermarriage of people of different geographic ancestries
 - Darwinian sexual selection: a preference in mate choice for partners of light or dark complexion

Skin Markings

- **Friction ridges**—the markings on the fingertips that leave oily fingerprints on surfaces we touch
 - Everyone has a unique pattern formed during fetal development that remains unchanged throughout life
 - Not even identical twins have identical fingerprints
 - Allow manipulation of small objects
- **Flexion lines (flexion creases)**—lines on the flexor surfaces of the digits, palms, wrists, elbows
 - Marks sites where the skin folds during flexion of the joints

Skin Markings

- **Freckles and moles**—tan to black aggregations of melanocytes
 - **Freckles** are flat, melanized patches
 - **Moles (nevus)** are elevated melanized patches often with hair
 - Moles should be watched for changes in color, diameter, or contour
 - May suggest malignancy (skin cancer)
- **Hemangiomas (birthmarks)**—patches of discolored skin caused by benign tumors of dermal blood capillaries
 - Some disappear in childhood, others last for life
 - Capillary hemangiomas, cavernous hemangiomas, port-wine stain

Hair and Nails

- **Expected Learning Outcomes**
 - Distinguish between three types of hair.
 - Describe the histology of a hair and its follicle.
 - Discuss some theories of the purposes served by various kinds of hair.
 - Describe the structure and function of nails.

Hair and Nails

- **Hair, nails, and cutaneous glands** are accessory organs of the skin
- **Hair** and **nails** are composed of mostly dead, keratinized cells
 - Pliable **soft keratin** makes up stratum corneum of skin
 - Compact **hard keratin** makes up hair and nails
 - Tougher and more compact due to numerous cross-linkages between keratin molecules

Hair and Nails

- **Pilus**—another name for hair; **pili**—plural of *pilus*
- **Hair**—a slender filament of keratinized cells that grows from an oblique tube in the skin called a **hair follicle**

Hair

- Hair is found almost everywhere on the body except:
 - Palms and soles
 - Ventral and lateral surfaces of fingers and toes
 - Distal segment of the finger
 - Lips, nipples, and parts of genitals

Hair

- Limbs and trunk have 55 to 70 hairs per cm²
 - Face about 10 times as many
 - 30,000 hairs in a man's beard
 - 100,000 hairs on an average person's scalp
 - Number of hairs does not differ much from person to person or even between sexes
 - Differences in appearance due to texture and pigmentation of the hair

Hair

- Three kinds of hair grow over the course of our lives
 - **Lanugo:** fine, downy, unpigmented hair that appears on the fetus in the last 3 months of development
 - **Vellus:** fine, pale hair that replaces lanugo by time of birth
 - Two-thirds of the hair of women
 - One-tenth of the hair of men
 - All of hair of children except eyebrows, eyelashes, and hair of the scalp

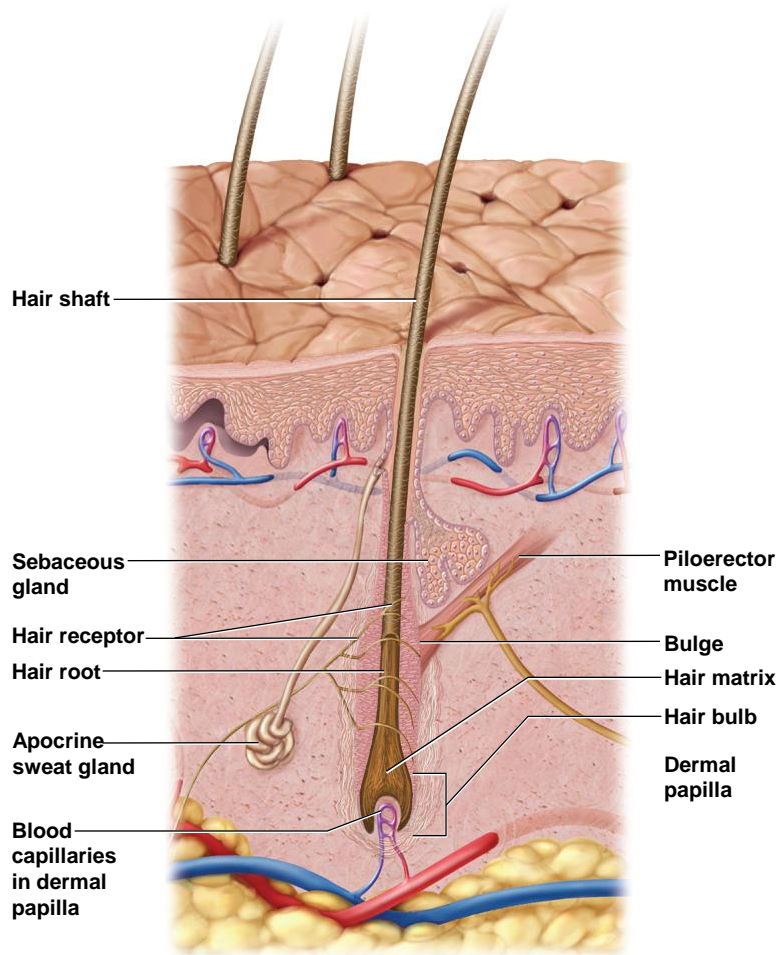
Hair

Cont.

- **Terminal:** longer, coarser, and usually more heavily pigmented
 - Forms eyebrows, eyelashes, and the hair of the scalp
 - After puberty, forms the axillary and pubic hair
 - Male facial hair and some of the hair on the trunk and limbs

Structure of the Hair and Follicle

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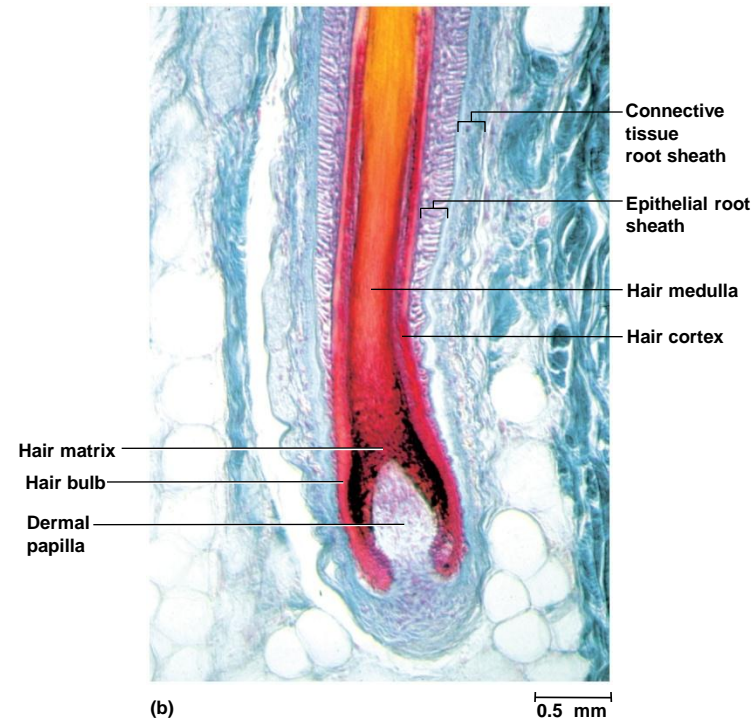
Figure 6.7a

- Hair is divisible into three zones along its length
 - **Bulb:** a swelling at the base where hair originates in dermis or hypodermis
 - Only living hair cells are in or near bulb
 - **Root:** the remainder of the hair in the follicle
 - **Shaft:** the portion above the skin surface

Structure of the Hair and Follicle

- **Dermal papilla**—bud of vascular connective tissue encased by bulb
 - Provides the hair with its sole source of nutrition
- **Hair matrix**—region of mitotically active cells immediately above papilla
 - Hair's **growth center**

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Figure 6.7b

Structure of the Hair and Follicle

- Three layers of the hair in cross section from inside out
 - **Medulla**
 - Core of loosely arranged cells and air spaces
 - **Cortex**
 - Constitutes bulk of the hair
 - Consists of several layers of elongated keratinized cells
 - **Cuticle**
 - Composed of multiple layers of very thin, scaly cells that overlap each other
 - Free edges directed upward

Structure of the Hair and Follicle

- **Follicle**—diagonal tube that dips deeply into dermis and may extend into hypodermis
 - **Epithelial root sheath**
 - Extension of the epidermis
 - Lies immediately adjacent to hair root
 - Toward deep end widens into **bulge**—a source of stem cells for follicular growth
 - **Connective tissue root sheath**
 - Derived from dermis
 - Surrounds epithelial root sheath
 - Denser than adjacent connective tissue

Structure of the Hair and Follicle

- **Hair receptors**
 - Nerve fibers that entwine each follicle
 - Respond to hair movement
- **Piloerector muscle (arrector pili)**
 - Bundles of smooth muscle cells
 - Extends from dermal collagen to connective tissue root sheath
 - Goose bumps

Hair Texture and Color

- **Texture**—related to differences in cross-sectional shape
 - **Straight hair** is round
 - **Wavy hair** is oval
 - **Curly hair** is relatively flat
- **Color**—due to pigment granules in the cells of the cortex
 - **Brown and black hair** is rich in eumelanin
 - **Red hair** has a slight amount of eumelanin but a high concentration of pheomelanin
 - **Blond hair** has an intermediate amount of pheomelanin and very little eumelanin
 - **Gray and white hair** results from scarcity or absence of melanin in the cortex and the presence of air in the medulla

Hair Texture and Color

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Figure 6.8

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Hair Growth and Loss

- **Hair cycle**—consists of three developmental stages
 - **Anagen:** growth stage, 90% of scalp follicles at any given time
 - Stem cells multiply and travel downward
 - Pushing dermal papilla deeper into skin, forming epidermal root sheath
 - Root sheath cells directly above dermal papilla form the hair matrix
 - Sheath cells transform into hair cells, synthesize keratin, and die as they are pushed upward
 - New hair grows up the follicle, often alongside of an old **club hair** from the previous cycle

Hair Growth and Loss

Cont.

- **Catagen:** degenerative stage, mitosis in the hair matrix ceases and sheath cells below the bulge die
 - Follicle shrinks and dermal papilla is drawn up toward the bulge
 - Base of hair keratinizes into a hard club—**club hair**
 - Loses its anchorage
 - Easily pulled out by brushing
- **Telogen:** resting stage, when papilla reaches the bulge

Hair Growth and Loss

- **Club hair** may fall out during catagen or telogen
 - Or, be pushed out by new hair in the next anagen phase
 - We lose about 50 to 100 scalp hairs daily
 - In young adults, the scalp follicles spend 6–8 years in anagen, 2–3 weeks in catagen, 1–2 months in telogen
- **Hair growth**—scalp hairs grow at a rate of 1 mm per 3 days (10–18 cm/yr)
- **Alopecia**—thinning of the hair or baldness

Hair Growth and Loss

- **Pattern baldness**—the condition in which hair loss occurs from specific regions of the scalp rather than thinning uniformly
 - Combination of genetic and hormonal influence
 - Baldness allele is dominant in males and expressed only in high testosterone levels
 - Testosterone causes terminal hair in scalp to be replaced by vellus hair
- **Hirsutism**—excessive or undesirable hairiness in areas that are not usually hairy

The Hair Cycle

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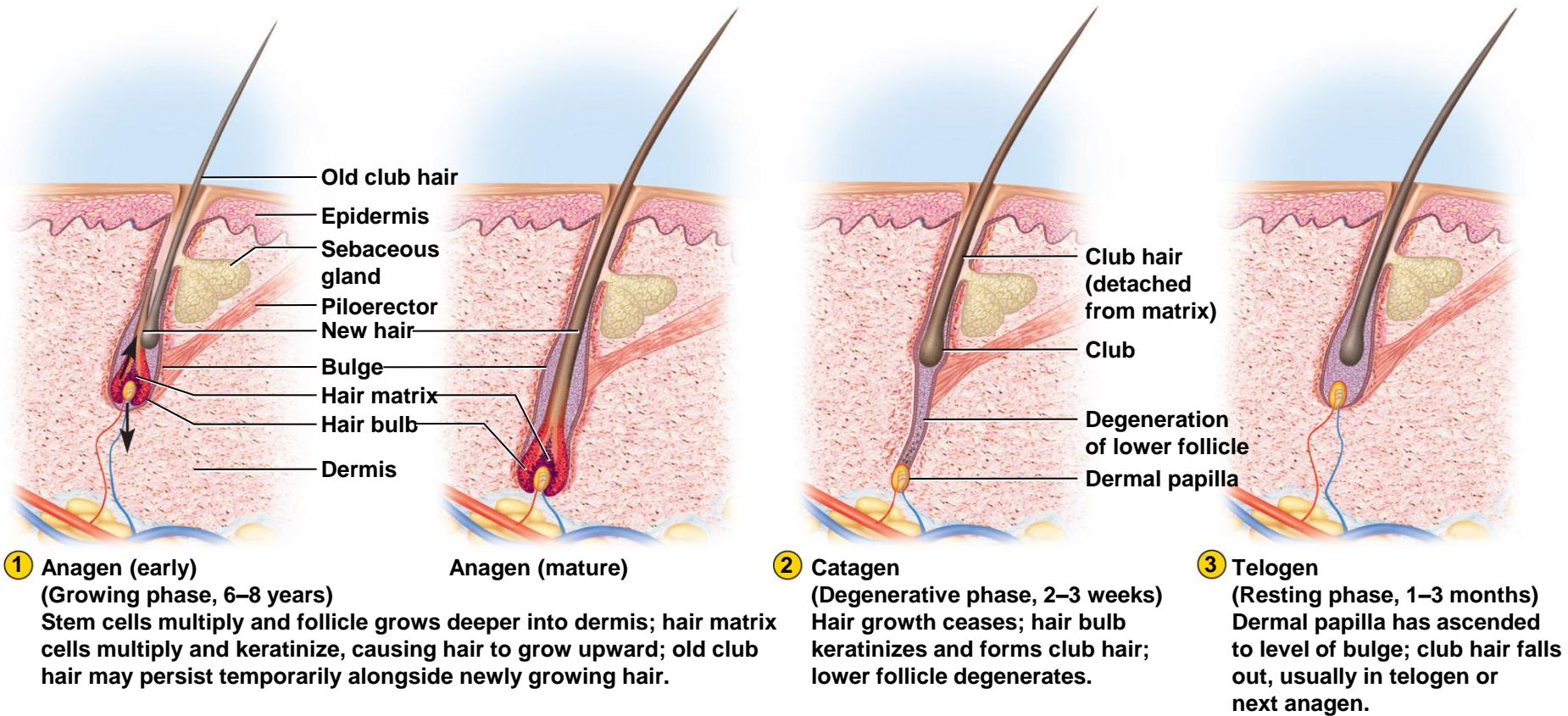


Figure 6.9

Functions of Hair

- Most hair on trunk and limbs is **vestigial**
 - Little present function
 - Warmth in ancestors
- **Hair receptors** alert us of parasites crawling on skin
- Scalp helps retain heat and protects against sunburn
- Pubic and axillary hair signify sexual maturity and aid in transmission of sexual scents
- **Guard hairs (vibrissae)**
 - Guard nostrils and ear canals
- Eyelashes and eyebrows
 - Nonverbal communication

Nails

- **Fingernails and toenails**—clear, hard derivatives of the stratum corneum
 - Composed of very thin, dead cells packed with **hard keratin**
- **Flat nails** allow for more fleshy and sensitive fingertips
 - Tools for digging, grooming, picking apart food, and other manipulations
- **Nail plate**—hard part of the nail
 - **Free edge**: overhangs the fingertip
 - **Nail body**: visible attached part of nail
 - **Nail root**: extends proximally under overlying skin

Fingernail Structure

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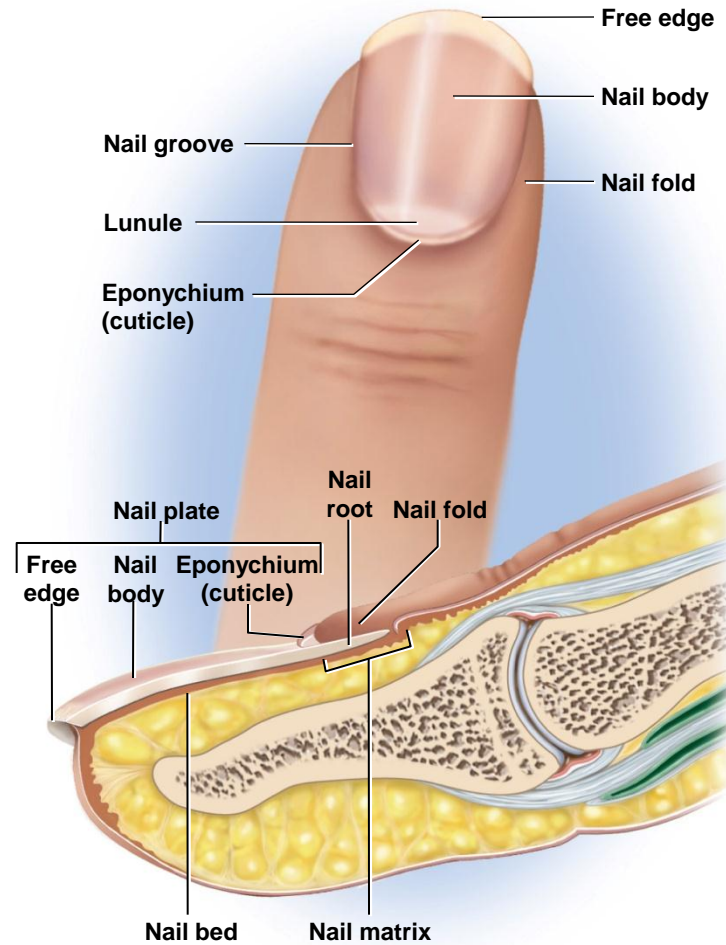


Figure 6.10

Nails

- **Nail fold**—surrounding skin rising a bit above the nail
- **Nail groove**—separates nail fold from nail plate
- **Nail bed**—skin underlying the nail plate
- **Hyponychium**—epidermis of the nail bed

Nails

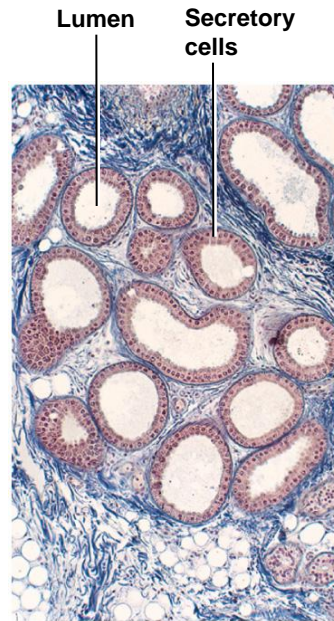
- **Nail matrix**—growth zone of thickened stratum basale at the proximal end of nail
 - Mitosis here accounts for nail growth
 - 1 mm per week in fingernails, slightly slower on toenails
- **Lunule**—an opaque white crescent at proximal end of nail
- **Eponychium (cuticle)**—narrow zone of dead skin that commonly overhangs this end of the nail

Cutaneous Glands

- **Expected Learning Outcomes**
 - Name two types of sweat glands, and describe the structure and function of each.
 - Describe the location, structure, and function of sebaceous and ceruminous glands.
 - Discuss the distinction between breasts and mammary glands, and explain their respective functions.

Sweat Glands

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(a) Apocrine gland

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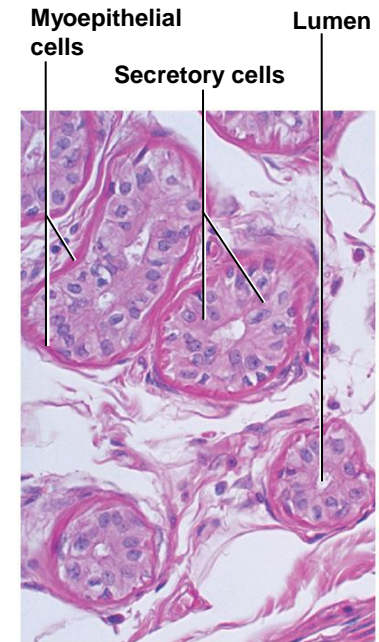
Figure 6.11a



(c) Sebaceous gland

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Figure 6.11c



(b) Merocrine gland

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Figure 6.11b

- The skin has five types of glands: merocrine sweat glands, apocrine sweat glands, sebaceous glands, ceruminous glands, and mammary glands

Sweat Glands

- Two kinds of **sweat (sudoriferous) glands**
 - **Merocrine (eccrine) sweat glands**
 - Most numerous skin glands—3 to 4 million in adult skin
 - Simple tubular glands
 - Watery perspiration that helps cool the body
 - **Myoepithelial cells**—contract in response to stimulation by sympathetic nervous system and squeeze perspiration up the duct

Sweat Glands

Cont.

– Apocrine sweat glands

- Occur in groin, anal region, axilla, areola, bearded area in mature males
- Ducts lead to nearby hair follicles
- Produce sweat that is thicker, milky, and contains fatty acids
- Scent glands that respond to stress and sexual stimulation
- Develop at puberty
- **Pheromones**—chemicals that influence the physiology of behavior of other members of the species
- **Bromhidrosis**—disagreeable body odor produced by bacterial action on fatty acids

Sweat Glands

- **Sweat**—begins as a protein-free filtrate of blood plasma produced by deep secretory portion of gland
 - Potassium ions, urea, lactic acid, ammonia, and some sodium chloride remain in the sweat, most sodium chloride reabsorbed by duct
 - Some drugs are also excreted in sweat
 - On average, 99% water, with pH range of 4 to 6
 - **Acid mantle**—inhibits bacterial growth
 - **Insensible perspiration**—500 mL/day
 - Does not produce visible wetness of skin
 - **Diaphoresis**—sweating with wetness of the skin
 - Exercise—may lose 1 L sweat per hour

Sebaceous Glands

- **Sebum**—oily secretion produced by sebaceous glands
- Flask-shaped glands with short ducts opening into hair follicle
- **Holocrine gland**—secretion consists of broken-down cells
 - Replaced by mitosis at base of gland
- Keeps skin and hair from becoming dry, brittle, and cracked
- **Lanolin**—sheep sebum

Ceruminous Glands

- Found only in **external ear canal**
- Their secretion combines with sebum and dead epithelial cells to form **earwax (cerumen)**
 - Keeps eardrum pliable
 - Waterproofs the canal
 - Kills bacteria
 - Makes guard hairs of ear sticky to help block foreign particles from entering auditory canal
- Simple, coiled tubular glands with ducts that lead to skin surface

Mammary Glands

- **Breasts (mammae)** of both sexes contain very little glandular material
- **Mammary glands**—milk-producing glands that develop only during pregnancy and lactation
 - Modified apocrine sweat gland
 - Richer secretion released by ducts opening into the nipple
- **Mammary ridges or milk lines**
 - Two rows of mammary glands in most mammals
 - Primates kept only anteriormost glands
- Additional nipples (**polythelia**)
 - May develop along milk line

Skin Disorders

- **Expected Learning Outcomes**
 - Describe the three most common forms of skin cancer.
 - Describe the three classes of burns and the priorities in burn treatment.

Skin Cancer

- **Skin cancer**—induced by the **UV rays of the sun**
 - Most often on the head and neck
 - Most common in fair-skinned people and the elderly
 - One of the most common cancer
 - One of the easiest to treat
 - Has one of the highest survival rates if detected and treated early
- **Three types** of skin cancer named for the epidermal cells in which they originate
 - **Basal cell carcinoma, squamous cell carcinoma, and malignant melanoma**

Skin Cancer

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(a) Basal cell carcinoma

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Figure 6.12a

- **Basal cell carcinoma**

- Most common type
- Least dangerous because it seldom metastasizes
- Forms from cells in stratum basale
- Lesion is small, shiny bump with central depression and beaded edges

Skin Cancer

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Figure 6.12b

(b) Squamous cell carcinoma

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- **Squamous cell carcinoma**

- Arise from keratinocytes from stratum spinosum
- Lesions usually appear on scalp, ears, lower lip, or back of the hand
- Have raised, reddened, scaly appearance later forming a concave ulcer
- Chance of recovery good with early detection and surgical removal
- Tends to metastasize to lymph nodes and may become lethal

Skin Cancer

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(c) Malignant melanoma

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Figure 6.12c

- **Malignant melanoma**
 - Skin cancer that arises from melanocytes; often in a preexisting mole
 - Less than 5% of skin cancers, but most deadly form
 - Treated surgically if caught early
 - Metastasizes rapidly; unresponsive to chemotherapy; usually fatal

Skin Cancer

Cont.

- Person with metastatic melanoma lives only 6 months from diagnosis
- 5% to 14% survive 5 years
- Greatest risk factor: familial history of malignant melanoma
- High incidence in men, redheads, people who experience severe
- sunburn in childhood

Burns

- **UVA and UVB** are improperly called “tanning rays” and “burning rays”
 - Both thought to initiate skin cancer
- **Sunscreens** protect you from sunburn but unsure if they provide protection against cancer
 - Chemical in sunscreen damage DNA and generate harmful free radicals
- **Burns**—leading cause of accidental death
 - Fires, kitchen spills, sunlight, ionizing radiation, strong acids or bases, or electrical shock
 - Deaths result primarily from fluid loss, infection, and toxic effects of **eschar** (burned, dead tissue)
 - **Debridement**: removal of eschar

Burns

- Classified according to the depth of tissue involvement
 - **First-degree burn:** partial-thickness burn; involves only the epidermis
 - Marked by redness, slight edema, and pain
 - Heals in a few days
 - Most sunburns are first-degree burns

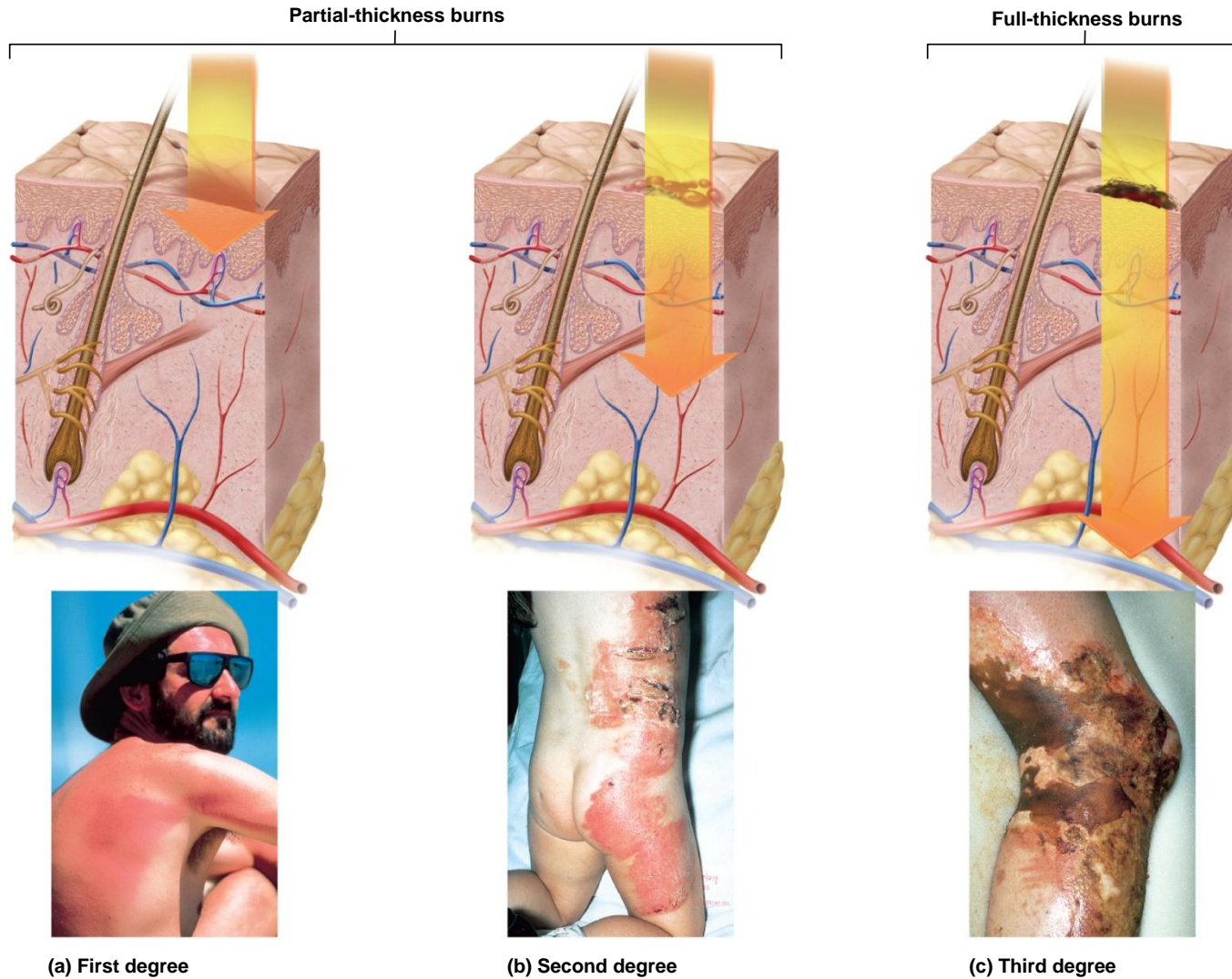
Burns

Cont.

- **Second-degree burn:** partial-thickness burn; involves the epidermis and part of the dermis
 - Leaves part of the dermis intact
 - Red, tan, or white
 - Two weeks to several months to heal and may leave scars
 - Blistered and very painful
- **Third-degree burn:** full-thickness burn; the epidermis and all of the dermis, and often some deeper tissues (muscles or bones) are destroyed
 - Often requires skin grafts
 - Needs fluid replacement and infection control

Degrees of Burn Injuries

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Figure 6.13

Skin Grafts and Artificial Skin

- Third-degree burns require skin grafts
- Graft options
 - **Autograft:** tissue taken from another location on the same person's body
 - **Split-skin graft**—taking epidermis and part of the dermis from an undamaged area such as the thigh or buttocks and grafting it into the burned area
 - **Isograft:** skin from identical twin

Skin Grafts and Artificial Skin

- Temporary grafts (immune system rejection)
 - **Homograft (allograft)**: from unrelated person
 - **Heterograft (xenograft)**: from another species
 - Amnion from afterbirth
 - Artificial skin from silicone and collagen