

ANATOMY, PHYSIOLOGY, AND DISEASE

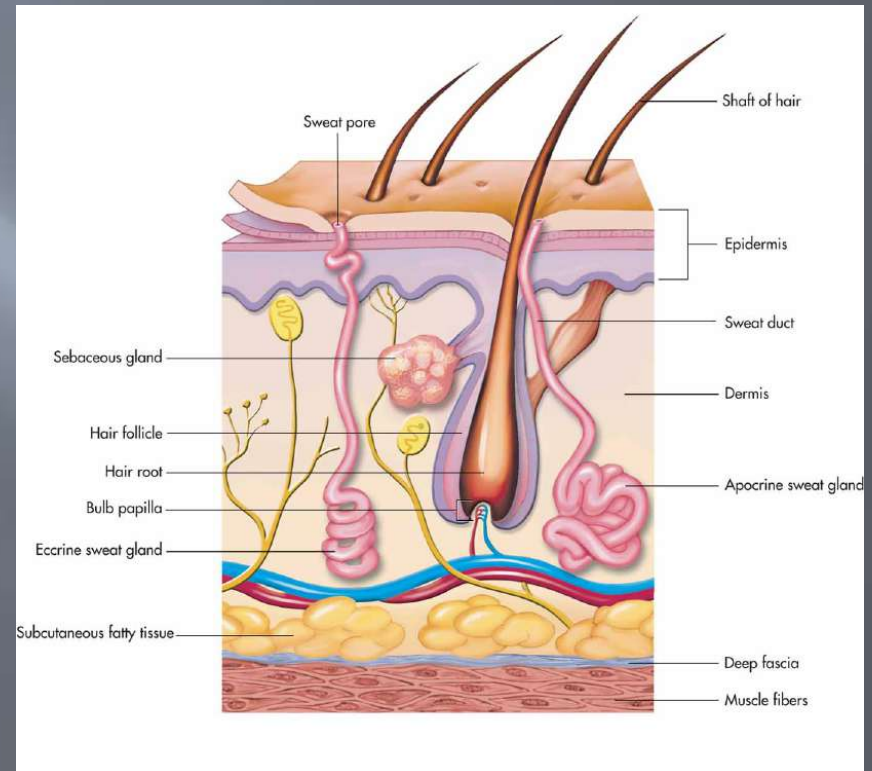
*Chapter 8: The Integumentary
System:
The Protective Covering*

Integumentary System

Definition: comprised of skin and its accessory components including hair, nails, and associated glands.

Vital Functions

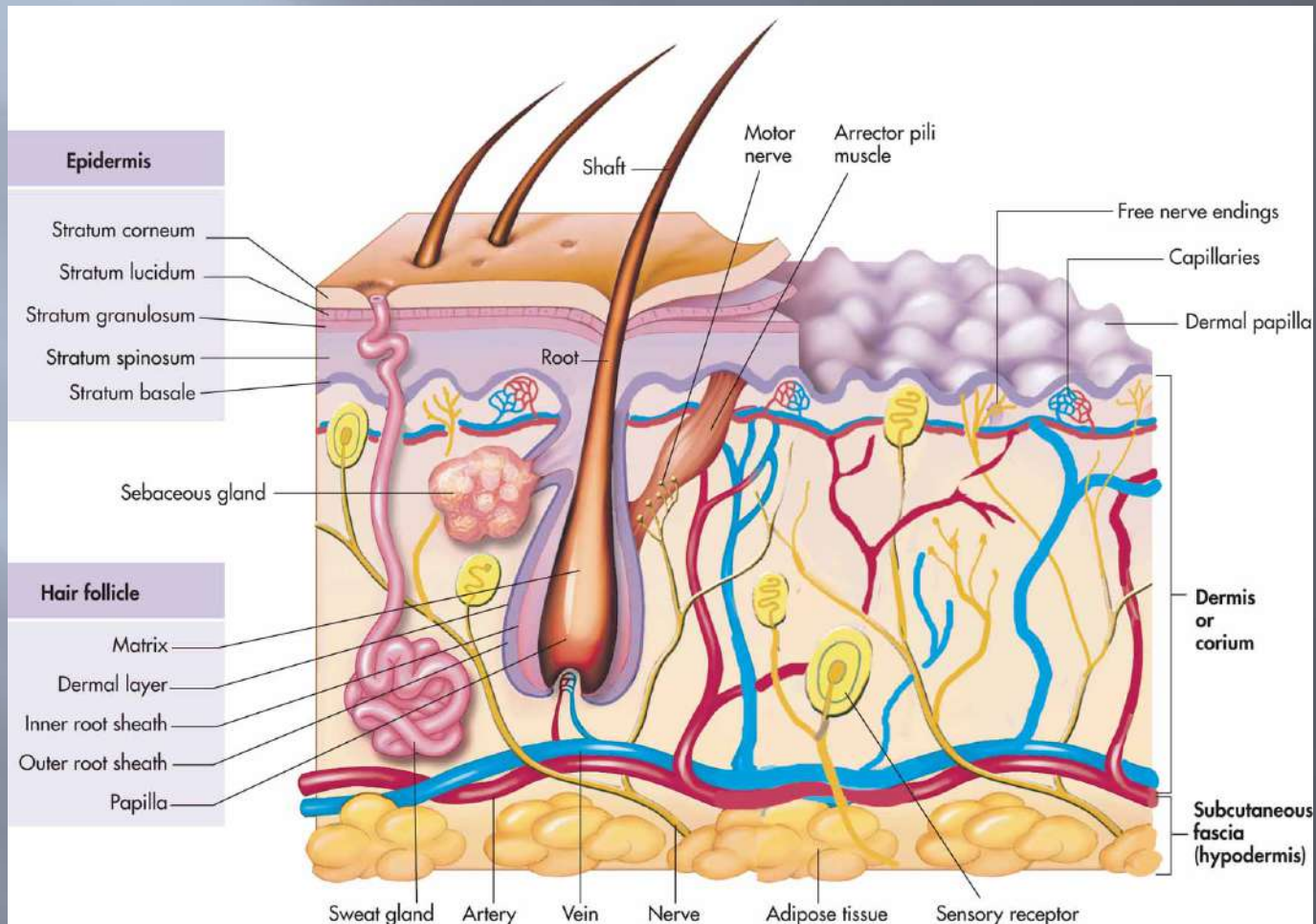
- ▣ Protection from pathogens
- ▣ Balances fluid levels
- ▣ Stores fatty tissue for energy supply
- ▣ Produces vitamin D (with help from sun)
- ▣ Provides sensory input
- ▣ Helps to regulate body temperature



The Skin

- Largest organ; weighs approximately 20 pounds; covers area about 20.83 sq.feet on an adult
- Cross section of skin has three layers:
 - Epidermis
 - Dermis
 - Subcutaneous Fascia

Three Layers Of Skin



Epidermis

- ▣ Outside layer; made up of five or six even smaller layers of tissue
- ▣ Contains no blood vessels or nerve endings
- ▣ Cells on surface constantly shed, being replaced with new cells from the stratum basale every 2-4 weeks
- ▣ Outermost layer of dead cells, called stratum corneum, which are flat, scaly, keratinized epithelial cells

Interesting Fact

- ▣ You slough off 500 million cells every day, or about 1½ pounds of dead skin a year, allowing for rapid repair in case of injuries

Pathology Connection: Skin Color and Disease

- ▣ Skin color can indicate disease
- ▣ **Yellow skin (jaundice)** may indicate liver disease where the liver can't break down bilirubin
- ▣ **Bronze color** may indicate adrenal gland disease; malfunctioning adrenal glands can cause skin to produce excessive melanin
- ▣ **Bruised skin** could indicate skin, blood, or circulatory problems

Jaundice



Bruising



Dermis

- ▣ Layer below the epidermis is thicker dermis layer

- ▣ Contains:
 - Capillaries
 - Collagenous/elastic fibers
 - Involuntary muscles
 - Nerve endings
 - Lymph vessels
 - Hair follicles
 - Sudoriferous glands (sweat)
 - Sebaceous glands (oil)

Interesting Fact

- Finger and toe prints arise from this layer



Sudoriferous Glands

- Two main types of **sudoriferous**, or **sweat**, glands
- **Apocrine glands**: found near hair follicles in groin and armpits; become active around puberty and are believed to act as sexual attractants
- **Eccrine glands**: found in greater numbers on palms, feet, forehead, and upper lip; are important in regulation of temperature

Interesting Facts

- ▣ We have 3 million sweat glands
- ▣ Sweat has no odor, but bacteria degrades substances in sweat over time into chemicals that give off strong smells commonly known as body odors

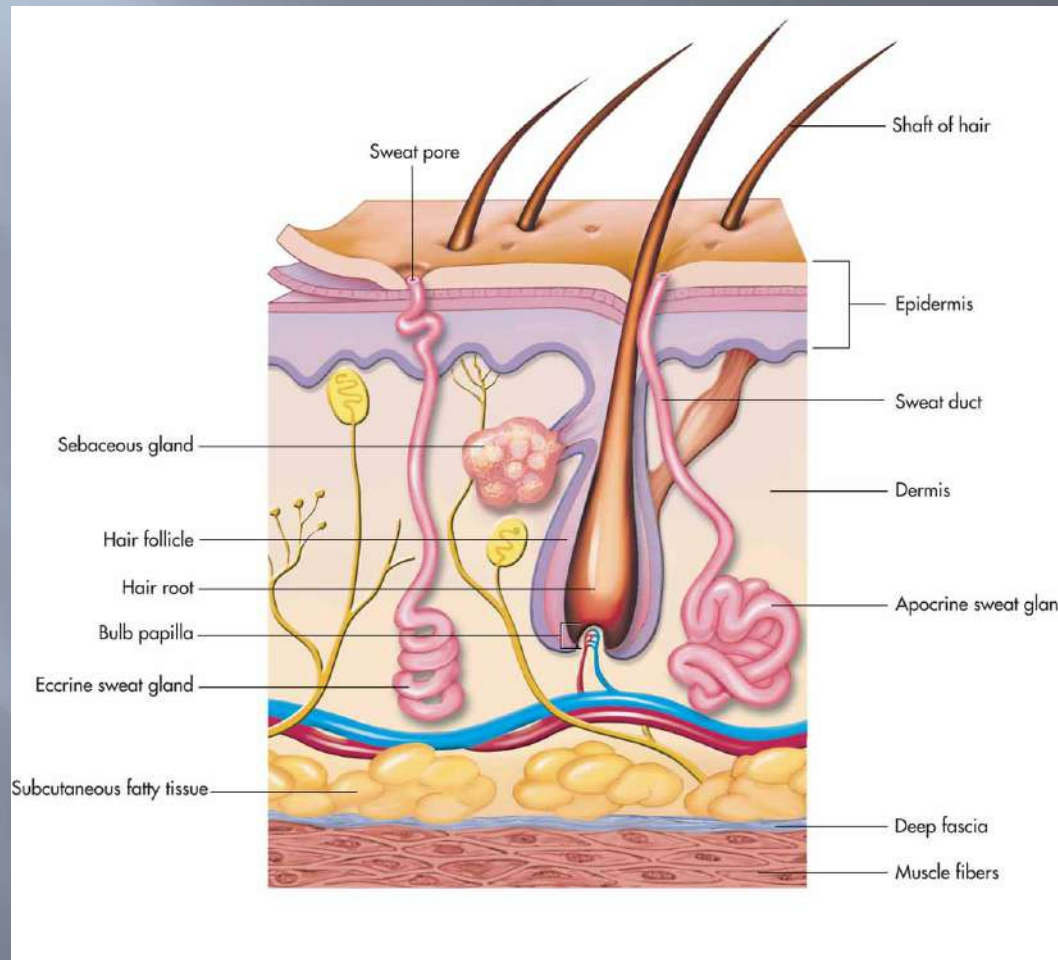


Sebaceous Glands

- ▣ Secrete oil, or sebum
- ▣ Sebum keeps skin from drying out and (due to its acidic nature) helps destroy some pathogens on skin's surface



Sweat and Sebaceous Glands



Subcutaneous Fascia

- Innermost layer of skin, also known as the hypodermis
- Composed of elastic and fibrous connective tissue and fatty tissue
- Lipocytes (fat cells) produce fat that acts as padding to protect deeper tissues and act as insulation for temperature regulation
- Fascia attaches to muscles of body

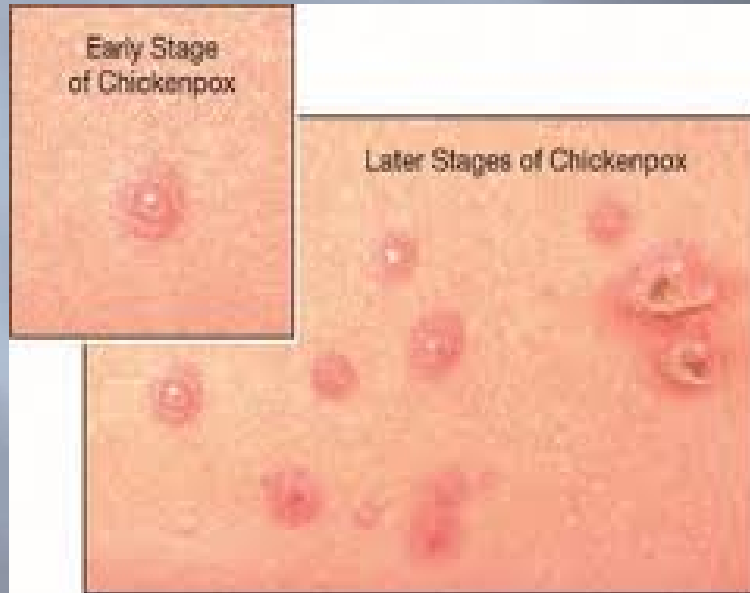
Pathology Connection: Herpes

- ▣ Lifelong viral infection that produces clusters of small fluid-filled sacs (vesicles/blisters)
- ▣ Signs and symptoms usually come and go; stress and compromised immune system can lead to symptom flare
- ▣ Several types of herpes

Herpes Varicella

- Also known as chickenpox
- Spread by airborne particles or direct contact
- Vesicles (blisters) can be found on face, trunk, and extremities
- Vesicles associated with intense itching

Herpes Varicella



Herpes Zoster

- Also known as shingles
- Develops when dormant chickenpox virus re-activates
- Causes extremely painful blisters/rashes that follow course of a sensory nerve
- Symptoms develop when stress, disease, trauma, or aging prevent immune system from keeping virus in check

Herpes Zoster





Herpes Simplex Type 1

- Causes “cold sores” or “fever blisters” around mouth or nose
- Commonly develops after common cold or fever

Herpes Simplex Type 1



Herpes Simplex Type 2

- Causes genital herpes
- Spread by direct contact
- Most contagious when in active stage; however, can be spread during remission

HPV: Human Papilloma Virus

- Causes warts (verruca); hypertrophy of keratin cells in skin
 - Common warts
 - Usually found hands and fingers
 - Spread by scratching and direct contact
 - Often disappear on their own
 - Plantar warts
 - Found on sole of foot
 - Tend to grow inward
 - Have relatively smooth appearance on surface
 - Can cause pain when walking
 - Treatment: removal by surgery or freezing

Common Wart



Plantar Wart



HPV cont.

▣ Genital warts

- Sexually transmitted and highly contagious
- Associated with cervical cancer
- Vaccine may help prevent cervical cancer associated with HPV

Fungal Infection: Tinea

- Tinea Pedis (athlete's foot)
 - Fungal infection of foot
 - Spread by direct contact with contaminated surfaces (like locker room floors)
 - Develops in warm, moist area between toes
- Tinea cruris (jock itch)
 - Fungal infection of groin area
 - Mainly affects men
 - Aggravated by increased perspiration, and tight fitting garments

Tinea cont.

▣ Tinea corporis (ringworm)

- Fungal infection of smooth skin areas
- Appearance: red, ring-shaped structure with pale center
- THERE IS NO ACTUAL WORM involved

▣ Tinea unguium

- Fungal infection under finger or toenails
- If untreated, results overgrown and thick nails with white/brittle appearance

Tinea Pedis



Tinea Corporis



Tinea Unguium



Cellulitis

- Infection of skin and subcutaneous tissue
- Caused by Staphylococcus
- Source of infection often wound of some kind

Cellulitis



Lyme Disease

- Etiology: Bacterial infection spread by deer tick bites
- Signs and symptoms:
 - “Bull’s eye” rash: red circle with lighter center; often very first presenting sign of infection; appears few days to several weeks following tick bite
 - Flu-like symptoms, fever, and chills
 - Malaise
 - Joint inflammation

Lyme Disease cont.

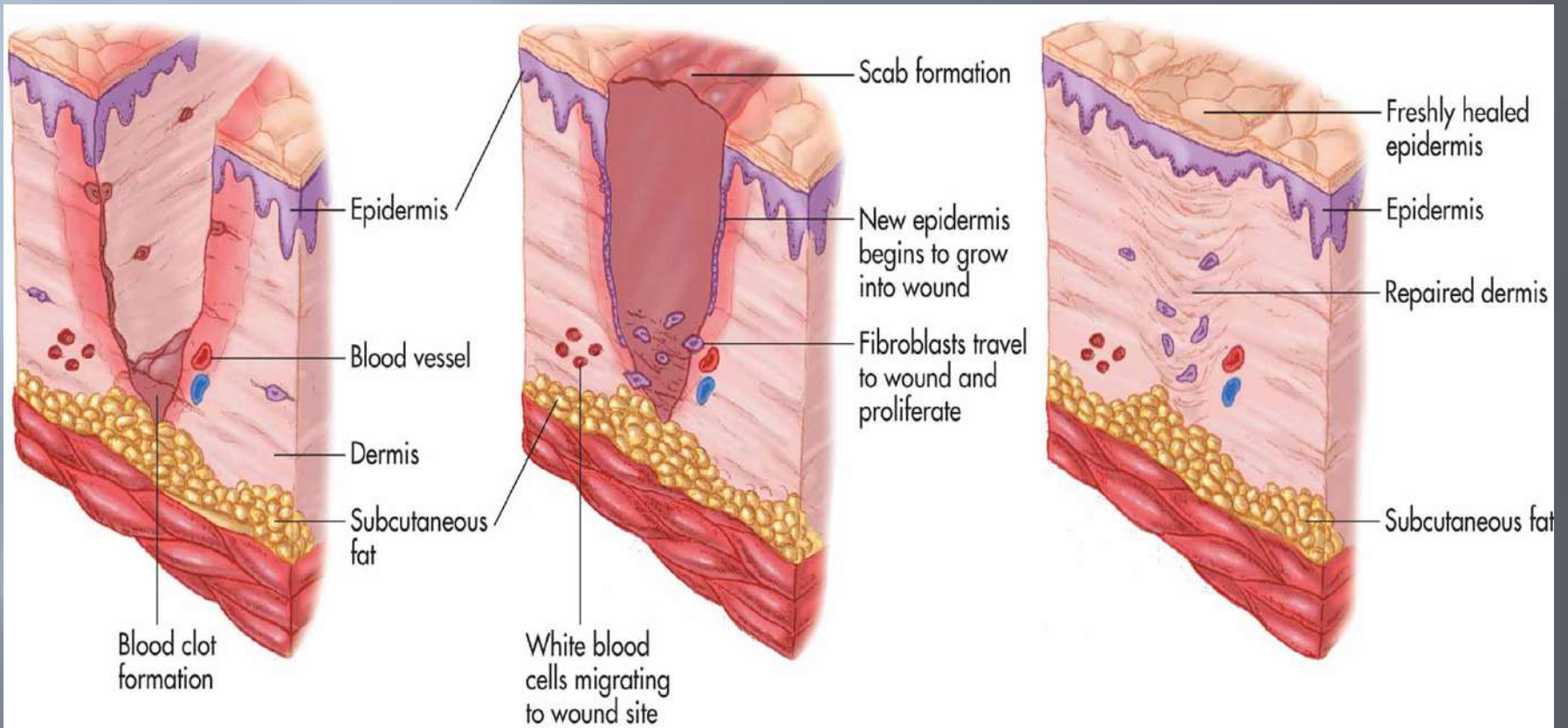
- ▣ Treatment (RX): antibiotics
- ▣ If untreated, can lead to neurological, cardiovascular problems, arthritis



How Skin Heals

- ▣ Injury or wound develops
- ▣ Wound fills with blood; blood contains clotting substances
- ▣ Clot forms causing scab
- ▣ WBCs enter and destroy any pathogens
- ▣ Fibroblasts come and begin pulling edges of wound together
- ▣ Basale layer hyper-produces cells for repair of wound

Wound Repair



Burns

- ▣ Types: heat, chemicals, electricity, radiation, and thermal
- ▣ Two factors affect assessments of damage:
 - Depth
 - Amount of area damaged

First Degree Burns

- ▣ First degree burns damage only to epidermis
 - S/S: redness and pain, but no blister
 - Pain subsides in 2–3 days; there is no scarring
 - Complete healing takes about one week

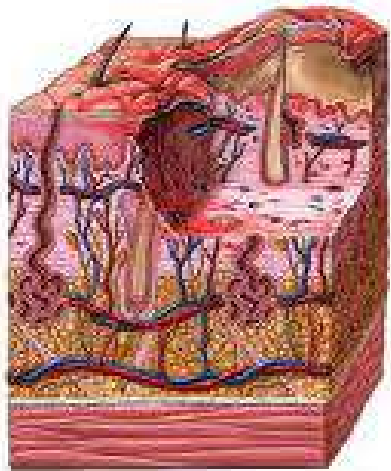
1st Degree Burn



2nd Degree Burn

- ▣ 2nd degree burns involve entire depth of epidermis and portion of dermis
 - S/S: redness, pain, and blistering
 - Extent of blistering dependent on depth of burn
 - Blisters heal within 10–14 days if no complications; deeper burns take 1–3½ months
 - Scarring in second degree burns is common

2nd Degree Burns



2nd degree burn

ADAM



3rd Degree Burns

- 3rd burns affect all three layers of skin
 - Surface of burn has leathery feel; color will range from black, brown, tan, red, or white
 - Pt feels no pain; pain receptors are destroyed
 - Also destroyed: sweat and sebaceous glands, hair follicles, and blood vessels

3rd Degree Burns



3rd degree burn

ADAM



4th Degree Burns

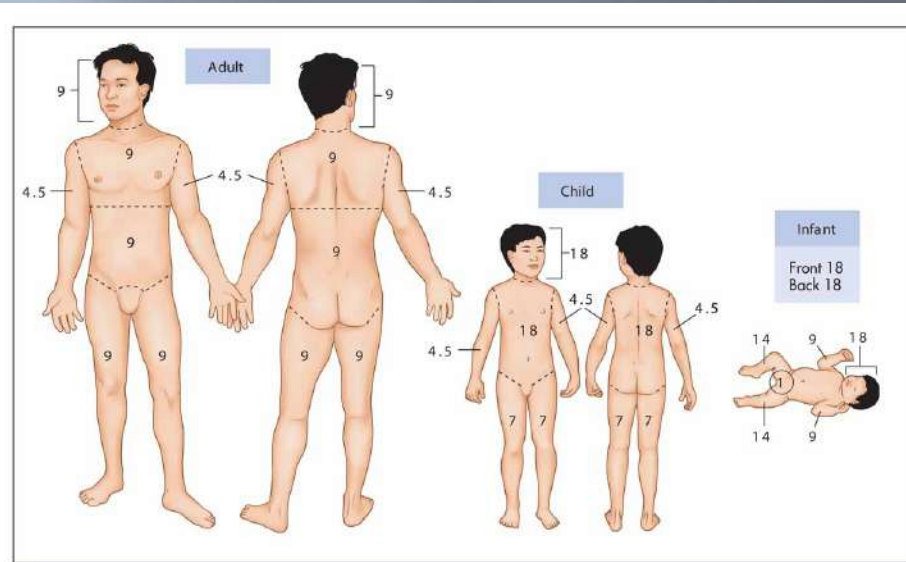
- Penetrate bone and cause bone damage



Rule Of 9's

- ▣ Used to estimate extent of area damaged by burns
- ▣ Body divided into regions, each given % of body surface area:
 - Head and neck: 9%
 - Upper limb: 9% ($2 \times 9 = 18\%$)
 - Front of trunk: 18%
 - Back of trunk and buttocks: 18%
 - Front of legs: 18%
 - Back of legs: 18%
 - Perineum (including anus and urogenital region): 1%

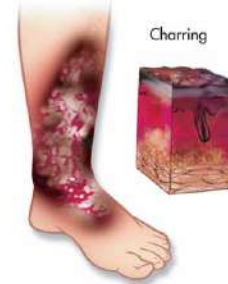
Assessing Degree of Burn



First Degree
Superficial/Partial thickness



Second Degree
Partial thickness



Third Degree
Full thickness

Burn Complications and Treatments

- Complications:
 - Bacterial infections
 - Fluid loss
 - Heat loss
- Treatments:
 - Debridement: Removing damaged/dead skin and tissue.
 - Skin Grafting: replacing skin with new skin: autograft: self vs. heterograft:donor

Hair

- ▣ Hair composed of fibrous protein called keratin
- ▣ Composed of shaft, root, and follicle
- ▣ Sebaceous gland associated with each hair follicle
- ▣ Color is dependent on amt. and type of melanin you produce

Pathology Connection: Alopecia

- ▣ Etiology: any type of hair loss
- ▣ Causes: genetic, chemotherapy, hormonal imbalance, stress, infection, and medication side effect



Pathology Connection: Pediculosis

- Etiology: lice infestation
- S/S: lice and nits (egg deposits)
- DX: visual inspection
- TX: Wash with medicated soap/shampoo, cleaning of all clothing, bedding, towels, combs, etc. to remove infestation

Pediculosis



Folliculitis

▣ Folliculitis

- Etiology: bacteria (usually staphylococcus)
- S/S: small pustules that form around base of hair follicle
- DX: visual examination, site culture
- TX: proper daily cleansing with antiseptic cleanser, oral antibiotics (chronic or severe cases)

Scabies

- Etiology: mites
- S/S: elevated, grayish-white lines (burrows), vesicle and pustule formation (due to bite, feces, ova of offending mite), intense itching
- DX: visual inspection
- TX: application of medicated cream, all infected individuals must be treated to prevent re-infection

Scabies



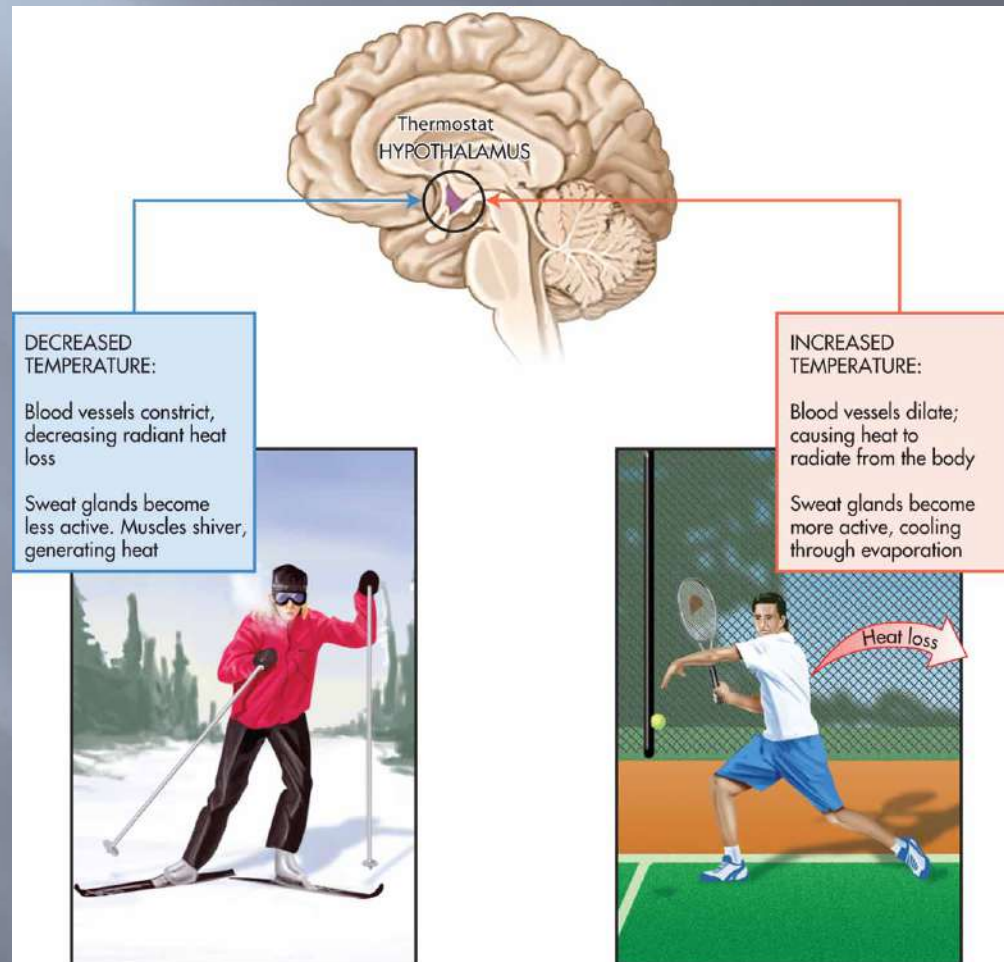
Temperature Regulation

- Blood vessel changes:
 - Vasodilation exposes heated blood to external cooling air
 - Vasoconstriction keeps cooling of blood to minimum when it's cold outside
- Sweat glands excrete water onto skin = cooling through evaporation
- By the time you feel thirsty you're already dehydrating; you can potentially secrete 12 liters of sweat in a 24 hour period

Temperature Regulation (cont.)

- ▣ Shivering causes muscle activity that produces heat
- ▣ Hairs on skin stand erect when arrector pili muscles contract; creates dead space insulating you, like a goose down jacket

Temperature Regulation



Skin Lesions

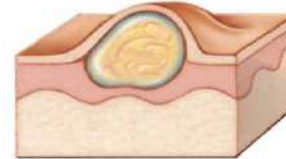
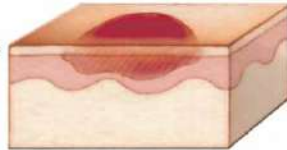
- Macule: discolored spot on skin
- Wheal (urticaria): localized evanescent elevation of skin that is often accompanied by itching
- Papule: solid, elevated area on skin
- Nodule: larger papule
- Vesicle: small fluid filled sac (blister)

Skin Lesions (cont.)

- Bulla: large vesicle
- Pustule: pus-filled lesion
- Ulcer: eating or gnawing away of tissue
- Crust: dry, serous, brown, yellow, red or green exudation
- Scale: thick, dry flake of cornified epithelial cells
- Fissure: crack-like slit that extends through epidermis into dermis

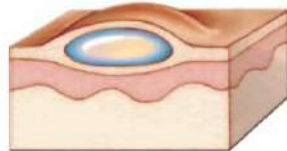
Skin Lesions

A **macule** is a discolored spot on the skin; freckle



A **pustule** is a small, elevated, circumscribed lesion of the skin that is filled with pus; whitehead

A **wheel** is a localized, elevation of the skin that is often accompanied by itching; urticaria



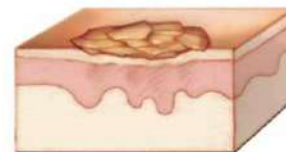
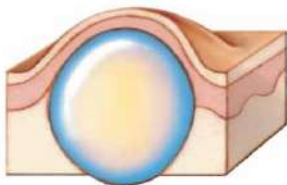
An **erosion** or ulcer is an eating or gnawing away of tissue; decubitus ulcer

A **papule** is a solid, circumscribed, elevated area on the skin; pimple



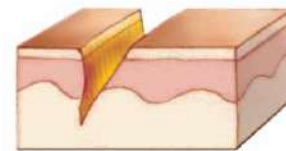
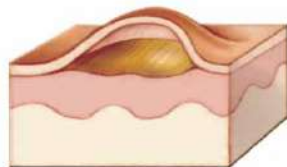
A **crust** is a dry, serous or seropurulent, brown, yellow, red, or green exudation that is seen in secondary lesions; eczema

A **nodule** is a larger papule; acne vulgaris



A **scale** is a thin, dry flake of cornified epithelial cells such as psoriasis

A **vesicle** is a small fluid filled sac; blister. A bulla is a large vesicle varicella (chickenpox)

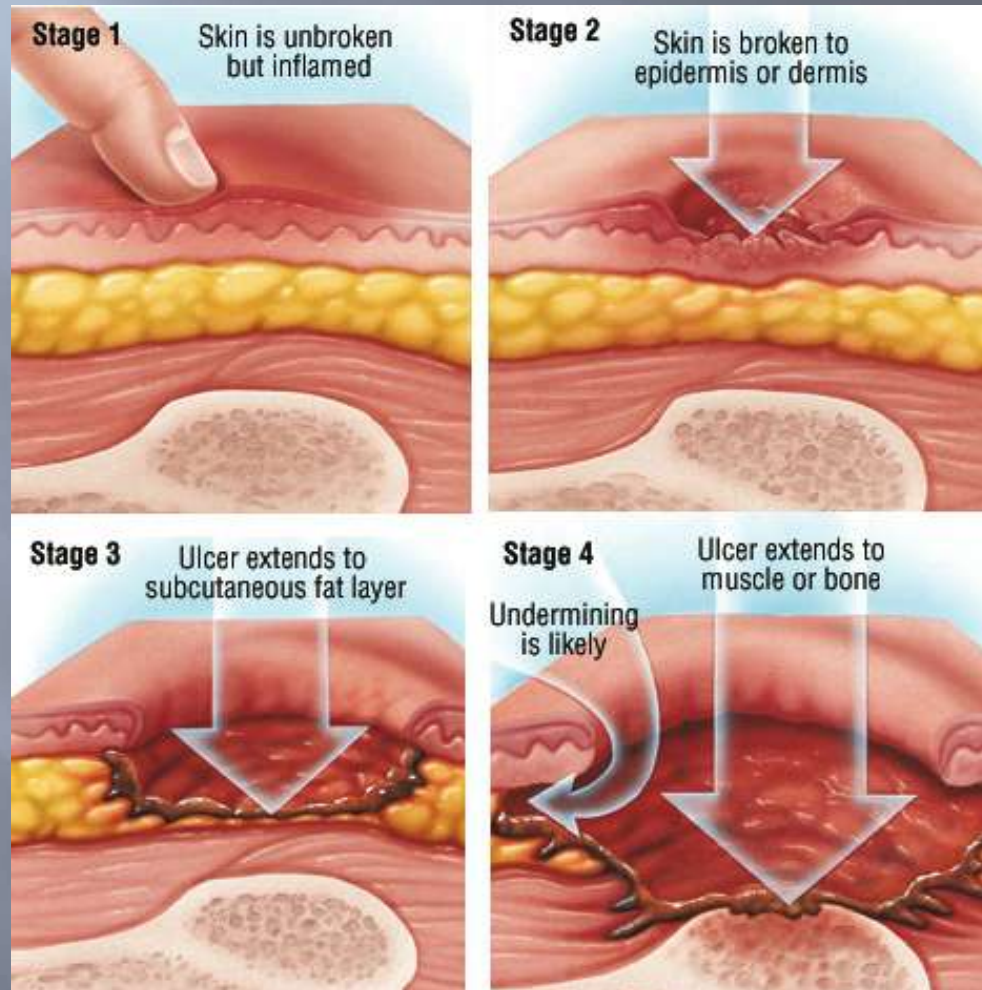


A **fissure** is a crack-like sore or slit that extends through the epidermis into the dermis; athlete's foot

Decubitis Ulcer

- Etiology: tissue injury from unrelieved pressure upon a specific area
- S/S: red, inflamed, crater-like lesion usually located over bony prominence
- DX: visual inspection, culturing of site for infection
- TX: preventative measures such as turning and padding important; treat infection of the sore

Decubitus Ulcer Stages



Stage 1 Decubitus Ulcer



Stage 2 Decubitus Ulcer



Stage 3 Decubitus Ulcer



Stage 4 Decubitus Ulcer



Psoriasis

▣ Psoriasis

- Etiology: possible genetic basis with attacks triggered by emotional stress, illness, sunlight, or skin damage
- S/S: red skin with silvery patches, dry cracking skin with crusting, can be painful
- DX: visual exam, patient hx
- TX: steroids, ultraviolet light

Psoriasis



Eczema

□ Eczema

- Etiology: genetic predisposition to allergies, stress
- S/S: skin inflammation, redness, vesicles, scales, crusting, pustules
- DX: visual exam, pt hx
- TX- no true cure: treat symptoms; eliminate allergen, reduce stress, topical corticosteroidal creams, skin moisturizers, antihistamines

Eczema



Malignant Melanoma

- ▣ Malignant melanoma
 - Etiology: occurs in melanocytes, excessive exposure to the sun
 - S/S: brown or black irregular patch that appears suddenly. A color or size change in a preexisting wart or mole may also be an indication
 - DX: biopsy
 - TX: surgical removal and the surrounding area; chemotherapy

Malignant Melanoma

