Sat Mar 22 04:05:25 2025

Integumentary System

Chapter 5

SAP 2a and SAP4d

- SAP 2a.
  - Relate the structure of the integumentary system to its functional role in protecting the body and maintaining homeostasis.

- SAP4d.
  - Examine various conditions that change normal body functions.

Objectives

- Describe how the skin contributes to the regulation of body temperature, protection, sensation, excretion and absorption, and synthesis of vitamin D.
- Describe the factors that normally contribute to skin color. Briefly describe how changes in skin color may be used as clinical signs of certain disease states.
- Explain why serious burns are life threatening. Describe how to determine the extent of a burn and differentiate first-, second-, and third-degree burns.
- Describe and attempt to explain the causes of changes that occur in the skin from birth to old age.

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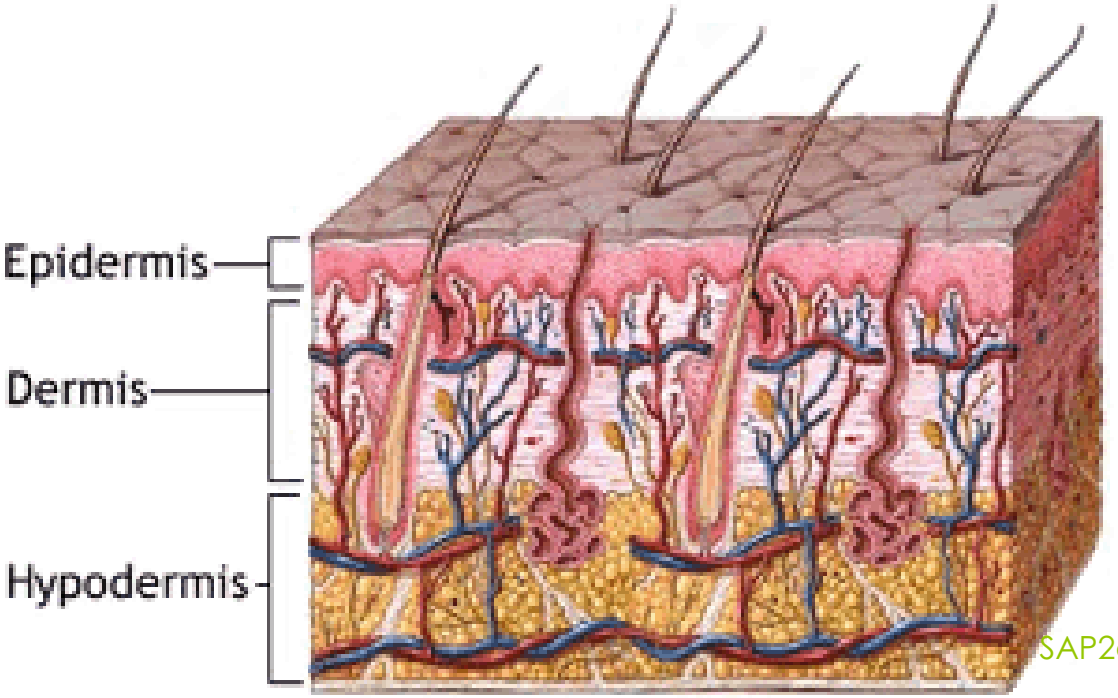
Integumentary System

- Includes skin, sweat and oil glands, hairs, and nails.



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Basic Functions

- Protects the body from mechanical, chemical, thermal, and bacterial damage
- Protects the body from ultraviolet radiation
- Protects the body from desiccation (drying out)
- Aids in body heat loss or heat retention
- Aids in excretion of urea and uric acid
- Synthesizes vitamin D

Structure of the Skin--Epidermis

- Made up of stratified squamous epithelium
- Composed of 5 layers called strata:
  - Stratum Basale
  - Spinosum
  - Granulosum
  - Lucidum
  - Corneum
- Does not have a blood supply of its own

- Made mostly of keratinocytes (keratin cells) that make the epidermis tough
- Contains melanin
  - Pigment for color
  - When in the sun, the melanocytes are stimulated to produce more melanin—tanning takes place
  - Freckles and mole are concentrated spots of melanin

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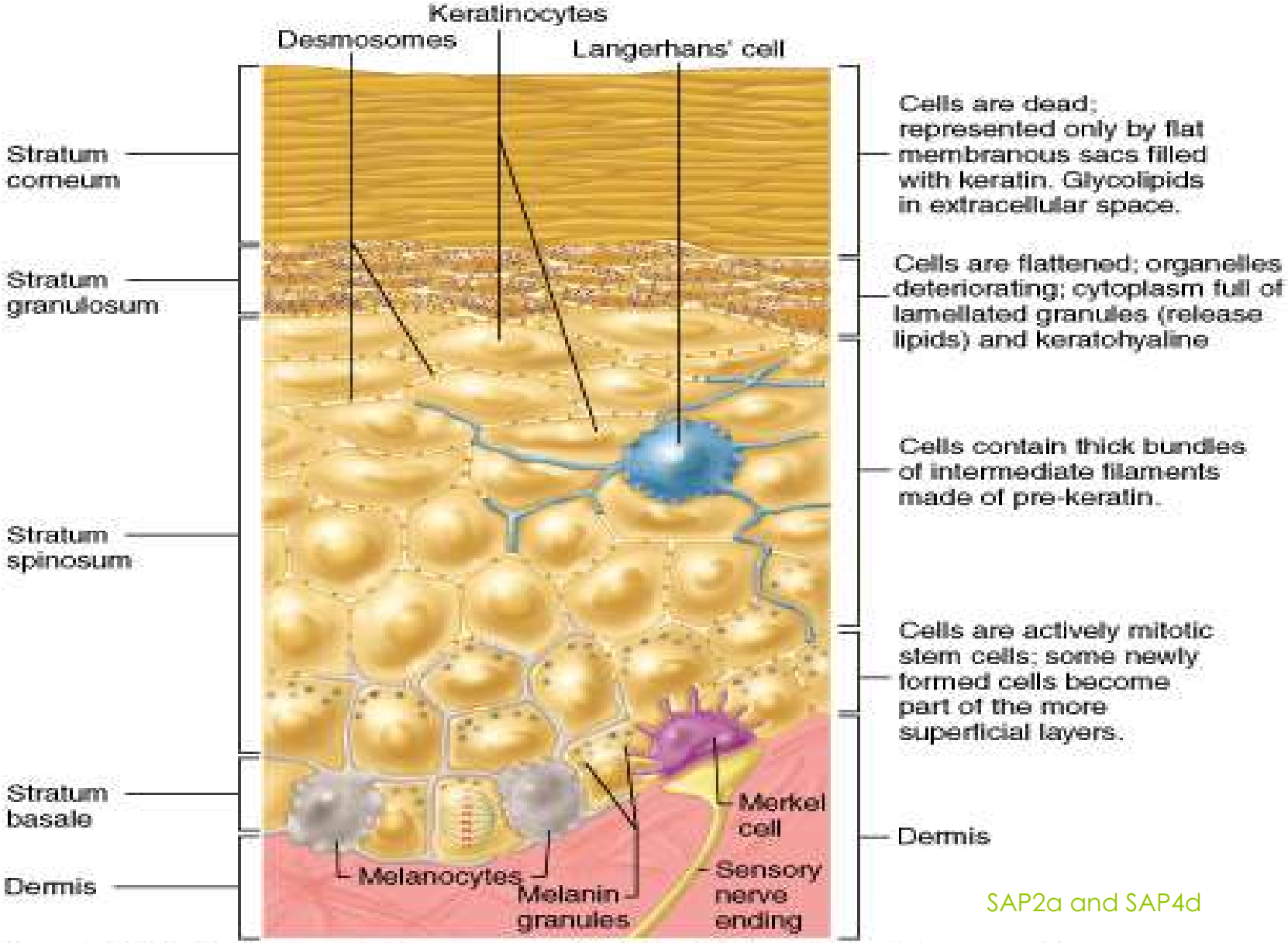

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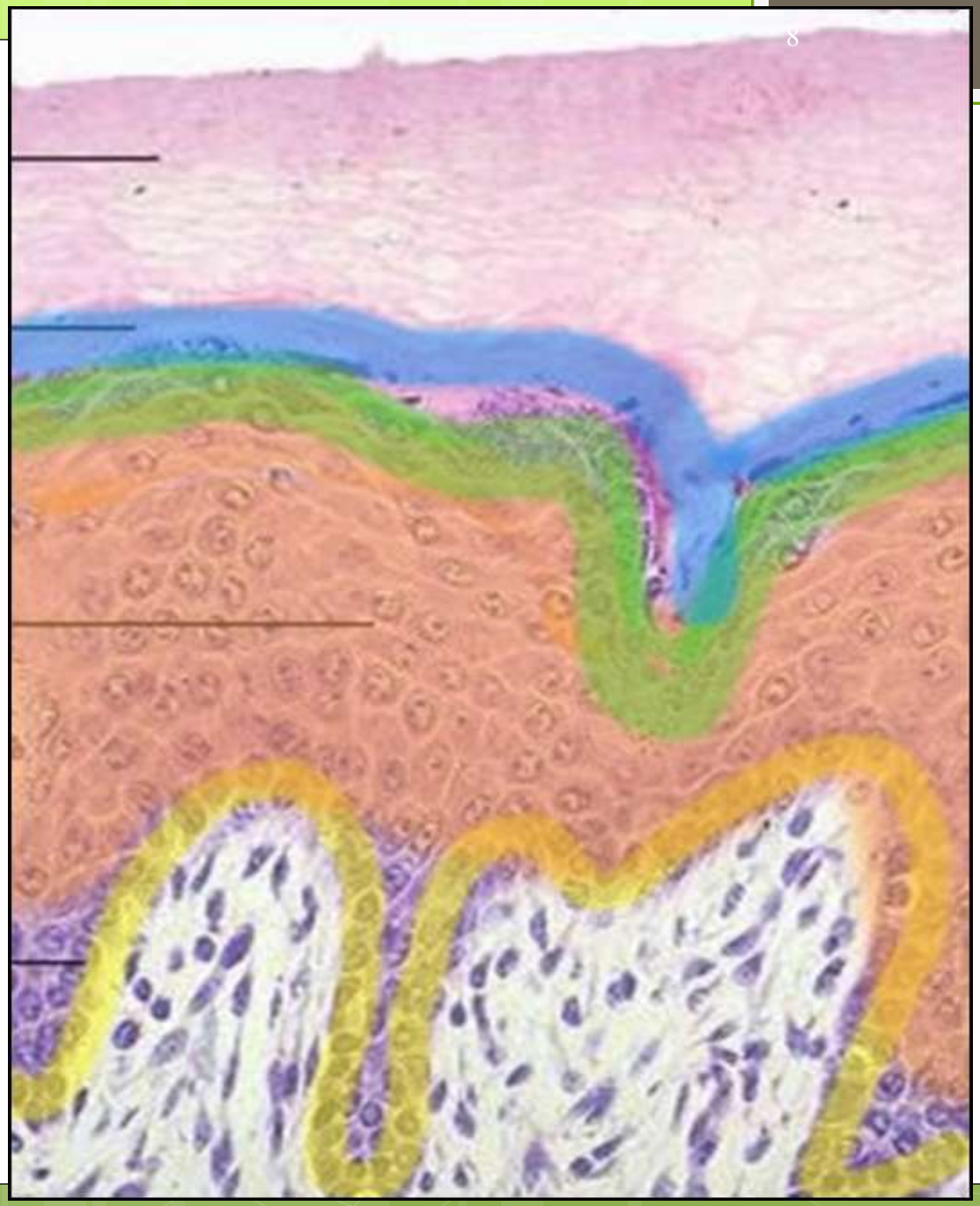

Yellow = stratum basale
Orange = stratum spinosum
Green = stratum granulosum
Blue = stratum lucidum
Pink/purple = stratum corneum

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Structure of Skin--Dermis

- Made up of dense connective tissue
- Deeper layer of skin
- Made up of two major regions
  - Papillary Layer
  - Reticular Layer
- Contains both collagen and elastic fibers
- Collagen provides the skins toughness
- Elastic fibers provide elasticity when young
- These fibers decrease as we age causing wrinkles or sagging.

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Dermis Layers

- Papillary Layer
  - Upper dermal region
  - Contains dermal papillae (fingerlike projections)
  - Furnish nutrients, houses pain and touch receptors and called Meissner's corpuscles
  - Give the make-up of fingerprints
    - Unique to every individual
- Reticular Layer
  - Deepest skin layer
  - Contains blood vessels, sweat and oil glands, and deep pressure receptors called Pacinian corpuscles

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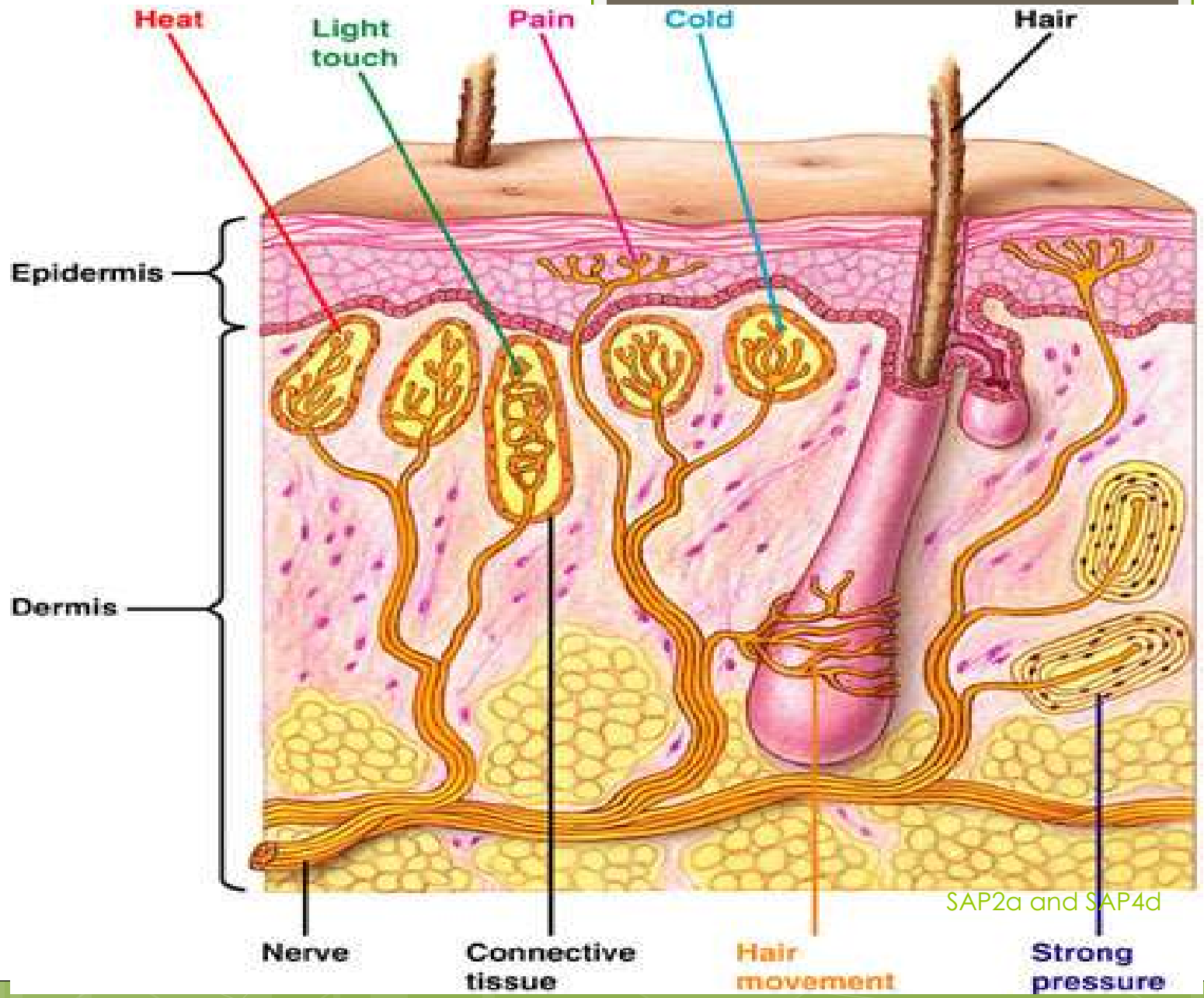

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THINK CRITICALLY

- The air is 80°F and the lake temperature is 70°F. Why do you first feel cold when you enter the water? Why do you feel chilled when exiting the water?

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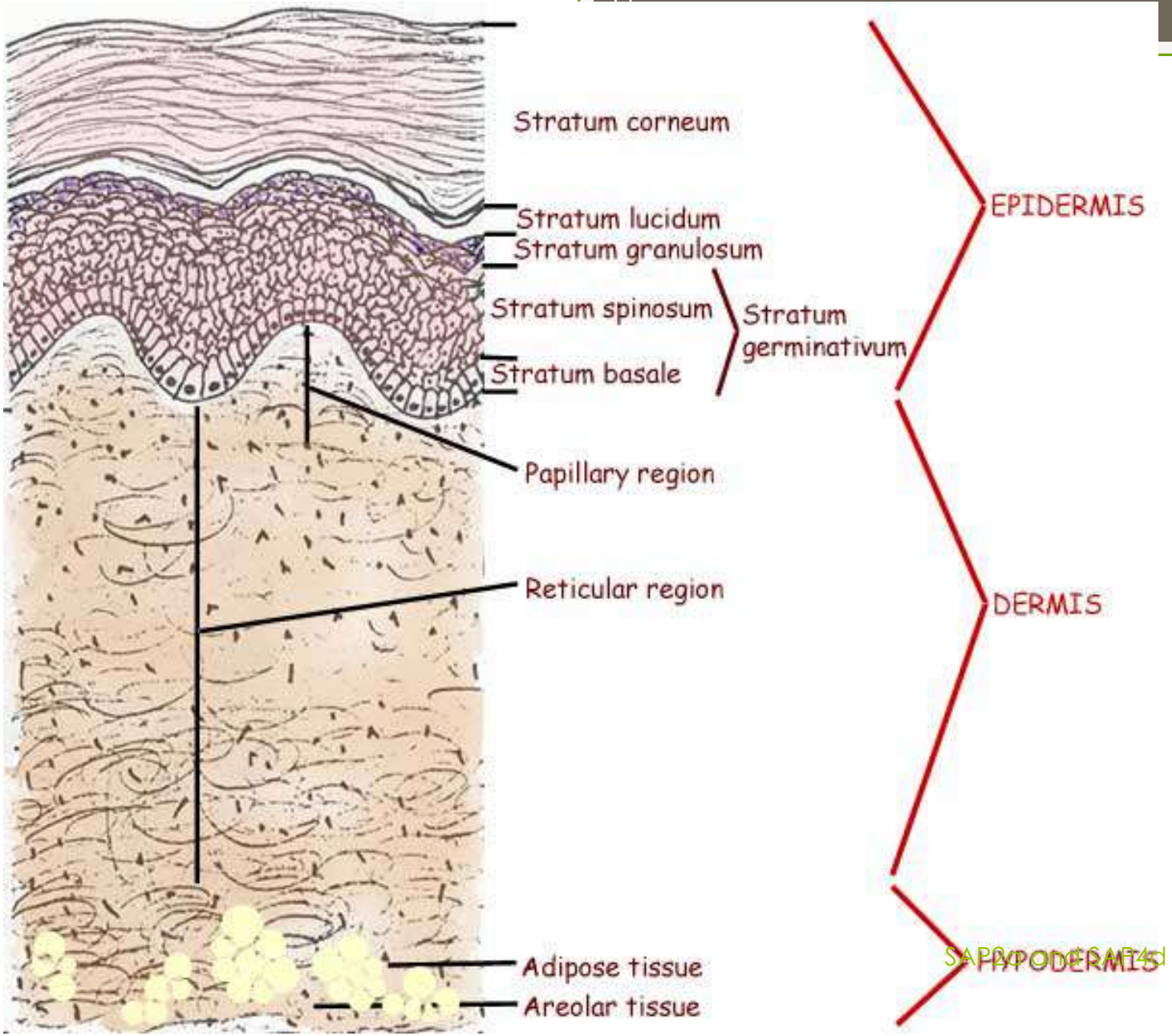
Structure of Skin--Hypodermis

- Hypodermis
- Deeper layer under the dermis
- Also known as the subcutaneous tissue
  - Actually adipose tissue
  - Not actually part of the skin
  - Anchors skin to underlying organs
  - Serves as a shock absorber and insulator


Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Stratum germinativum
EPIDERMIS
Papillary region
Reticular region
DERMIS
Adipose tissue
Areolar tissue
HYPODERMIS

Think Critically

You scraped you knee slightly but you notice that you are not bleeding and you do not feel much pain. What layer of the skin was injured? Describe differences in blood supply and pain receptors between the epidermis and the dermis.

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Appendages of Skin—Cutaneous Glands

They release secretions at the skin surface

- Sebaceous (Oil) Glands
  - Found all over the skin except—palms of hands and soles of feet
  - Sebum is the product of these glands
  - Kills bacteria, keeps skin soft and moist
  - Prevents hair from becoming brittle
- Sudoriferous (sweat) Glands
  - Two Types of these glands
    - Eccrine
      - Produce sweat
      - Very important in heat regulation
    - Apocrine
      - Found in mostly the axillary and genital areas
      - Yellowish color
  - Inhibits bacterial growth

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Ceruminous Gland

- Found in the ears
- Modified eccrine glands
- Secretions called cerumen
- Secretes the wax found in ears
- Along with tiny hairs, traps foreign particles

Appendages of Skin--Hair

- Hair and Hair Follicles 
  - Is a flexible epithelial structure produced by a hair follicle
    - Root
      - The part enclosed in the follicle
    - Shaft
      - Part projecting from the surface of the scalp or skin
  - Hair follicles have an epidermal sheath (root and bulb) and a dermal sheath
    - Dermal surrounds epidermal

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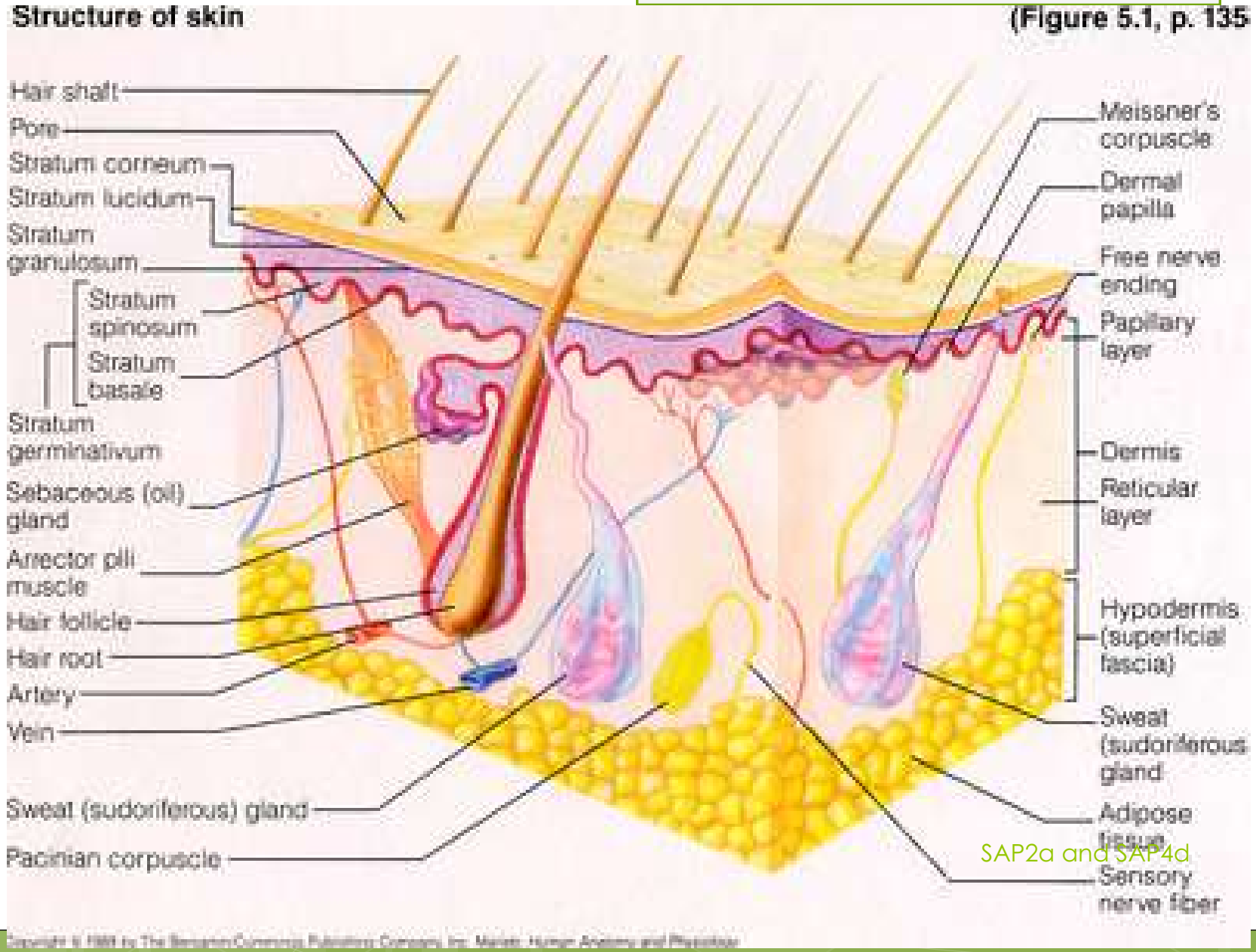
Hair



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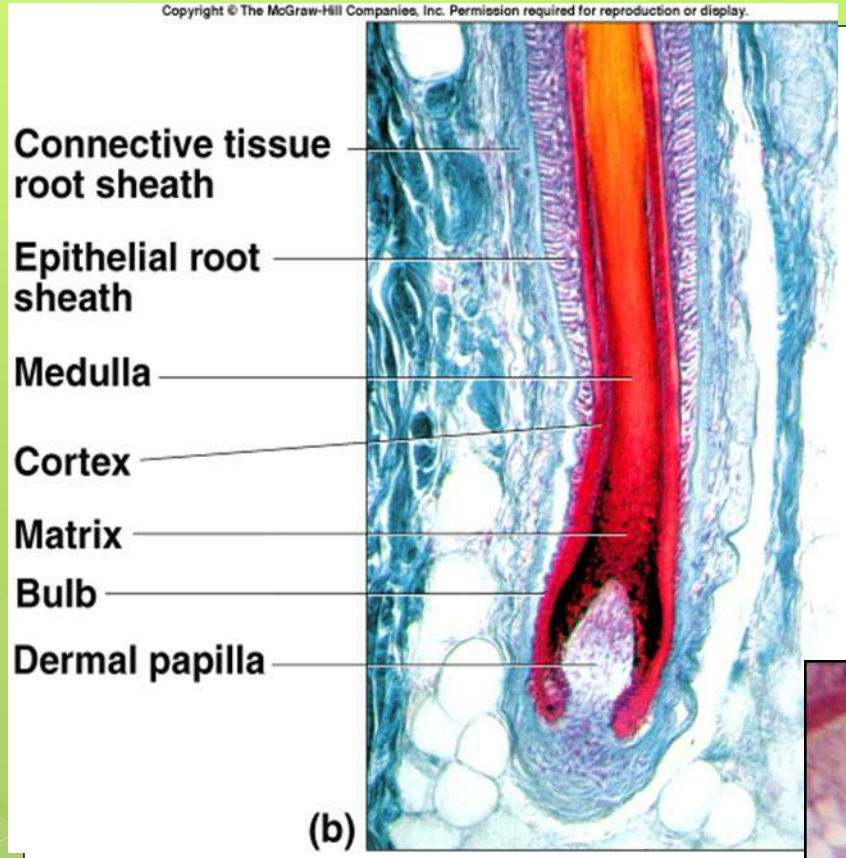
Appendages of Skin--Hair

- Each hair contains a muscle connection at the base called the arrector pili
- Arrector pili connects each side of the hair follicle to the dermal tissue
- When these muscles contract, the hair is pulled upright and we get goose bumps
- This is a homeostatic reaction to increase body temperature when cold.

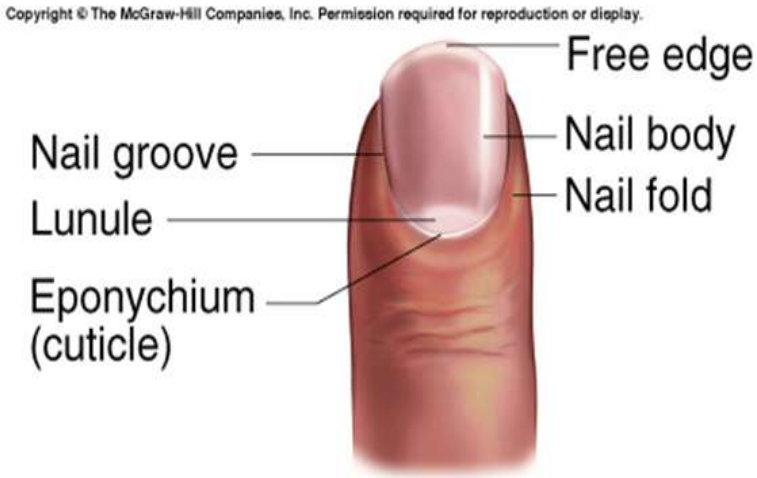


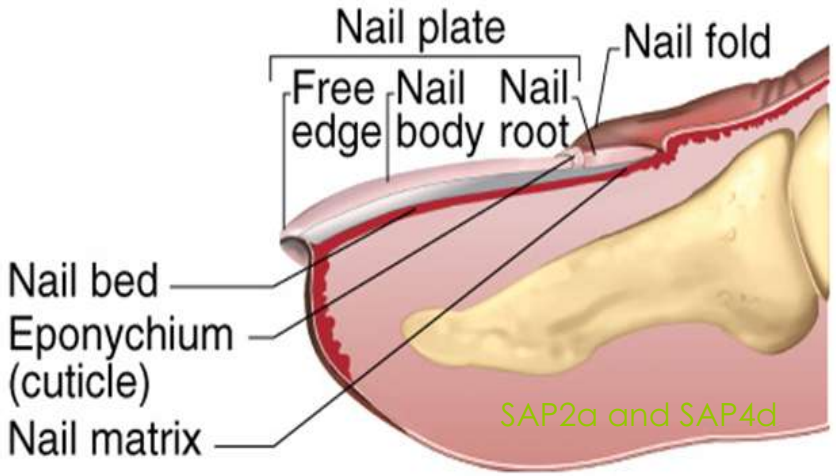
THINK CRITICALLY

- Why exactly can animals with thick fur, such as Alaskan huskies, resist extremely cold temperatures?
- Humans are often called the "naked apes." Although we have extensive hair follicles all over our body, why do you suppose we lack body hair?

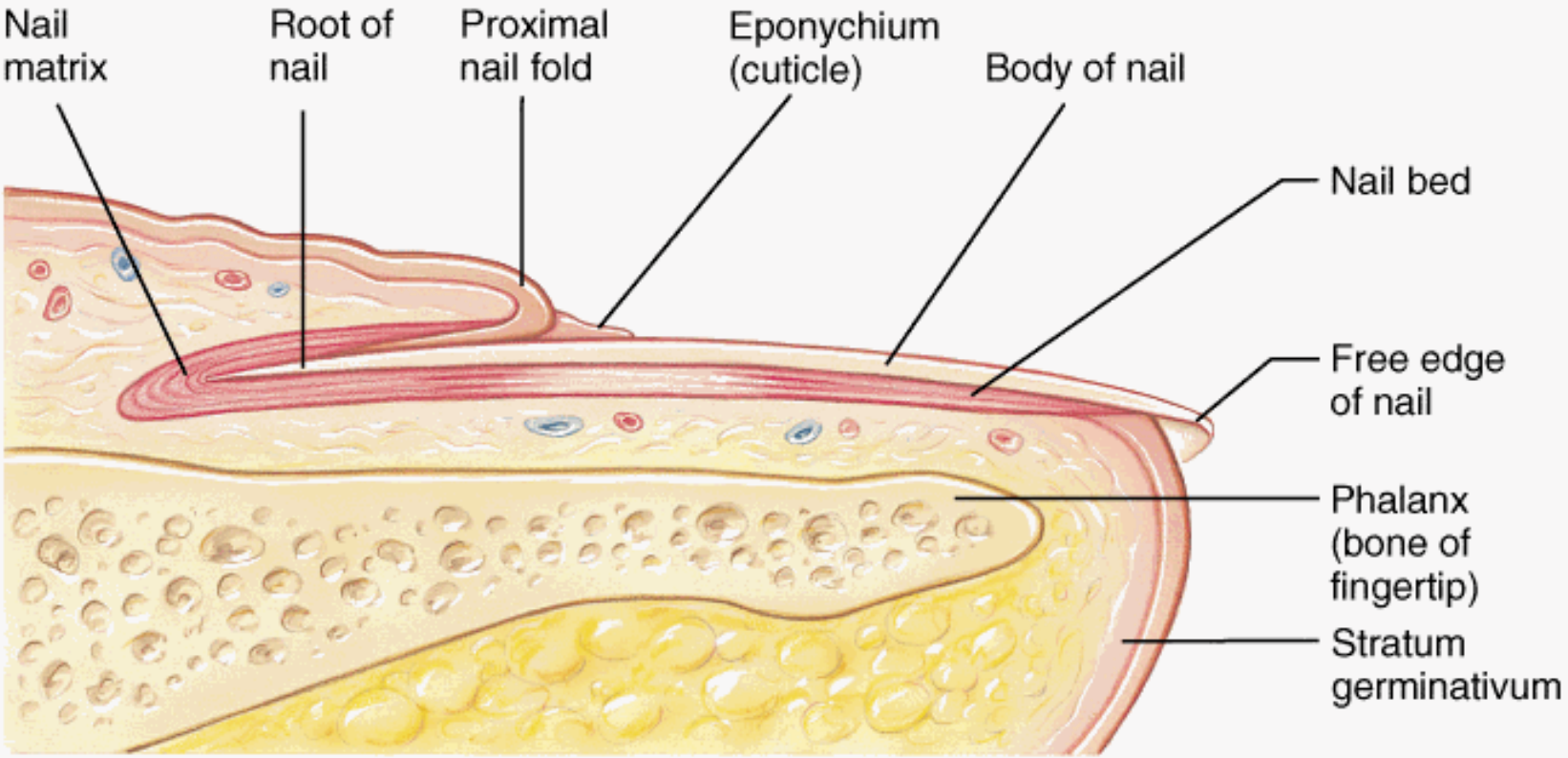
Appendages of Skin--Nails

- Each nail has a free edge, a body, and a root
- Nail matrix is where cells divide by mitosis
- Nails help to grasp and manipulate small objects
- Provide protection against trauma to the end of digits and allow us to scratch





Nail



(b)

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THINK CRITICALLY

Six months ago, Chef Eduardo sliced through the end of his right thumbnail. Although the surrounding nail grows normally, this part of his nail remains split and doesn't seem to want to "heal." what has happened to cause this?

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Skin Color

- Three Contributors to skin color
  - Amount and kind of melanin
  - Amount of carotene
  - Amount of oxygen bound to hemoglobin

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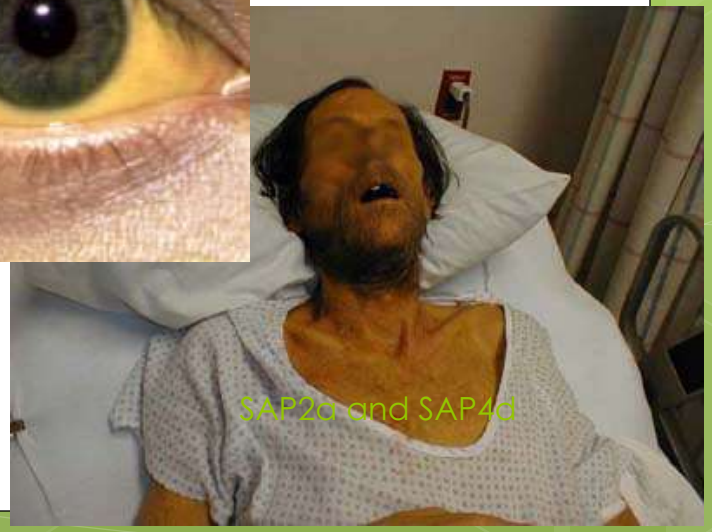
Skin Color and Disease

- Cyanosis—when oxygen is poorly circulated in the blood and the skin of Caucasians appear blue
- Bruises—blue or black coloring where blood has escaped circulation

Skin Color and Disease

- Albinism—skin lacks pigment melanin and appears white in color—not peachy like Caucasians

- Jaundice—yellowing of the skin due to liver disorder



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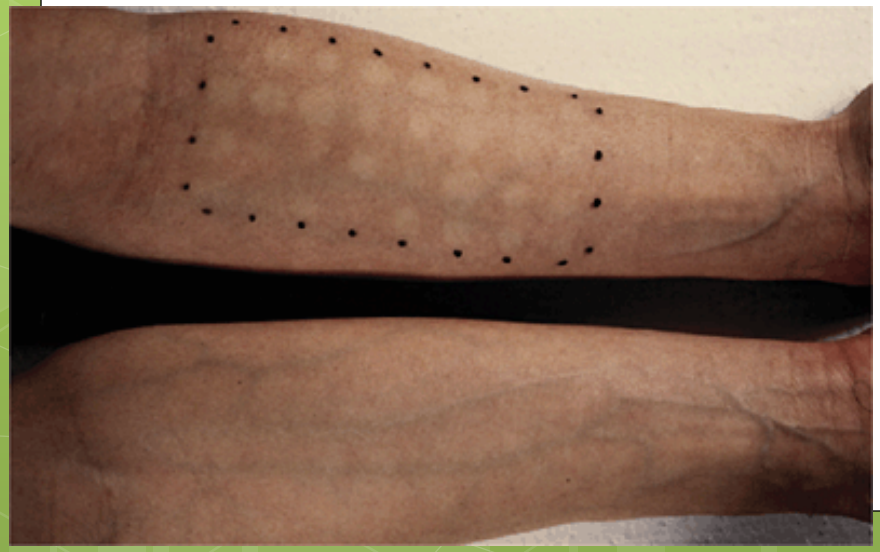
Skin Color and Disease



- Also influenced by emotional stimuli and some alterations of color indicate certain diseases
  - Erythema—redness such as blushing
  - Pallor or blanching—paleness due to fear, anger, etc.

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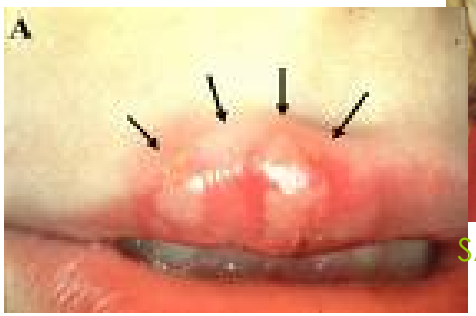
Homeostatic Imbalances

Most common skin disorders result from allergies or bacterial, viral, or fungal infections

- Athlete's Foot—itchy, red peeling condition of skin between toes caused by a fungal infection
- Boils and Carbuncles—inflammation of hair follicles and sebaceous glands caused by bacterial infections
- Cold Sores—small fluid filled blisters that itch and sting caused by herpes simplex infection



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Homeostatic Imbalances

Most common skin disorders result from allergies or bacterial, viral, or fungal infections

- Contact Dermatitis—itching, redness, and swelling of the skin, progressing to blistering
- Impetigo—a pink, water-filled raised lesion that develops a yellow crust and ruptures. Common in elementary children
- Psoriasis—reddened epidermal lesions covered with dry, silvery scales, cause is unknown

Burns

- A burn is tissue damage and cell death caused by intense heat, electricity, UV radiation, or certain chemicals
- Two life threatening problems result from burns
  - Loss of fluids
  - Onset of infection

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Burns

- The body loses its supply of fluids containing proteins and electrolytes. This can lead to a shut down of kidneys and circulatory shock.
- The amount of fluid loss can be estimated by using the Rule of Nines
  - Divides the body into 11 areas, each accounting for 9 percent of the total body surface area

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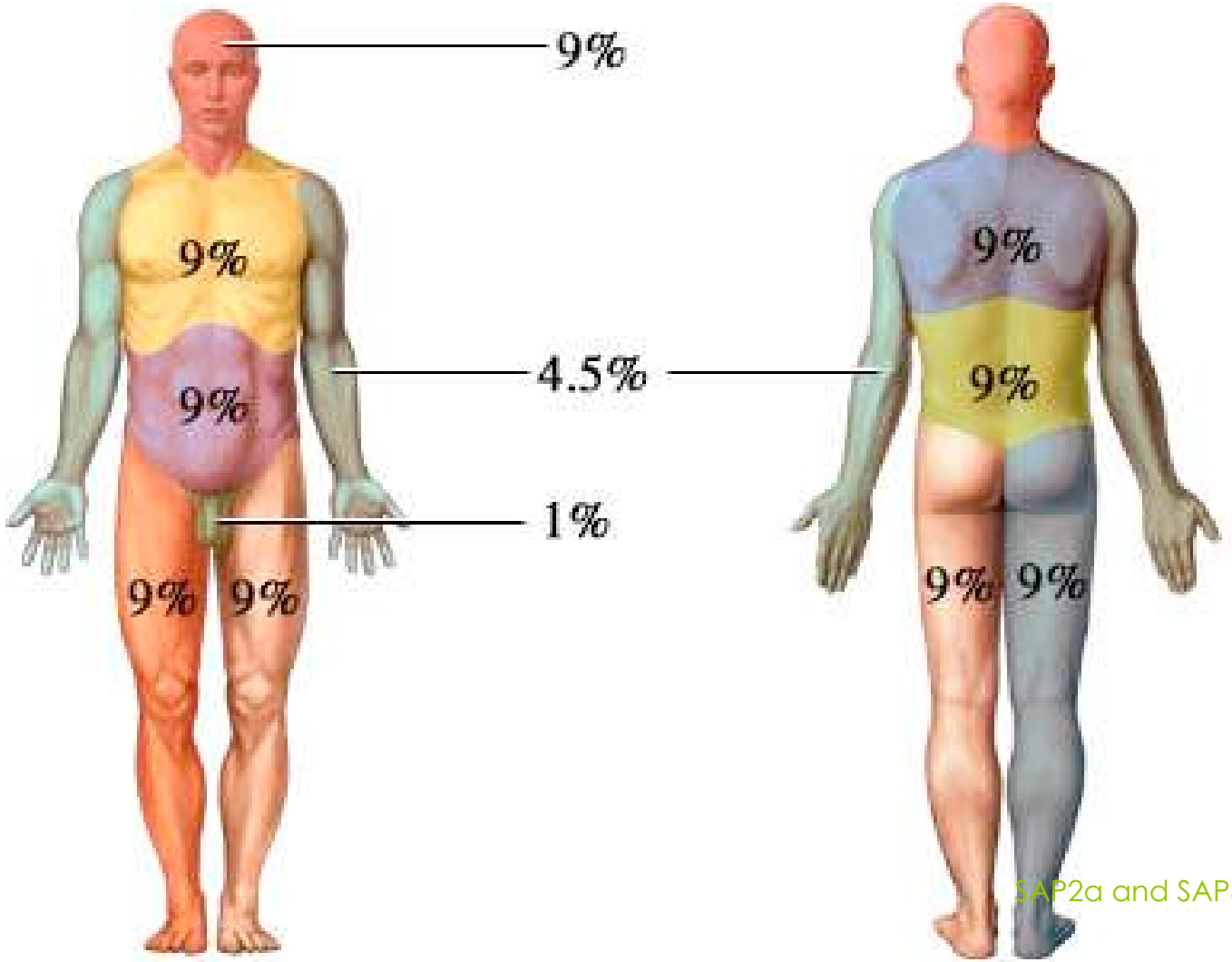
Rule of Nines



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Burns

- Infection later becomes the most important threat and is the leading cause of death in burn victims
- Burned skin is sterile for 24 hours but, after that pathogens easily invade areas where the skin has been destroyed
- After 1 to 2 days the victim's immune system begins to shut down

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Burns

- Classified according to severity
  - First degree—only the epidermis is damaged, the area becomes red and swollen EXAMPLE: Sunburns
  - Second degree—involves injury to the epidermis and the upper dermis. The skin is red and blisters appear
  - Third degree—destroy entire thickness of skin—area appears gray and there are no pain receptors, regeneration is not possible

Burns

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

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Table 32.1 Classification of Burns

Severity of burn	Damage	Effect
	Cells in the epidermis are injured and may die.	• Redness and swelling • Mild pain
	Cells deeper in the epidermis die. Cells in the dermis are injured and may die.	• Blisters • Pain
	Cells in the epidermis and dermis die. Nerve cells and muscles cells are injured.	• Skin function lost • Healthy skin needs to be transplanted • No pain because of nerve cell damage

Third-degree Second-degree First-degree

Drag each option to its corresponding Effect

Reset Submit Show me

Think Critically

- A victim of a fire is admitted to the emergency room. You observe considerable damage to the epidermis and dermis of both arms and the front and back portions of the trunk. You also note patches of charred skin and insensitivity to touch.
  1. What type of burn is indicated by these characteristics?
  2. Using the rule of nine, estimate how much of the person's body is burned.
  3. What is the probability of scarring? Explain your answer.

- Individuals living in Ohio may be able to go out into the sun for three hours and not burn, but if they go to Florida during spring break, they may get a sunburn after only two hours. Why?

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This section is GRAPHIC, if you need to put your head down or step out that is fine!

DO NOT CAUSE A SCENE OR DISRUPT THE CLASS, A PRODUCTION IS NOT NEEDED!!

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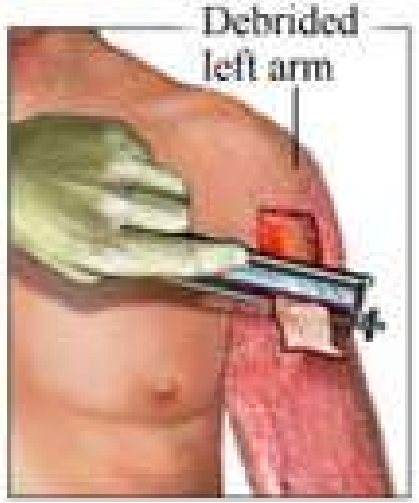
Skin Grafting

A. A mesher machine is used to enlarge the size of the skin graft

B. The meshed skin grafts are stapled into place over the debrided wound

Anterior view of right arm



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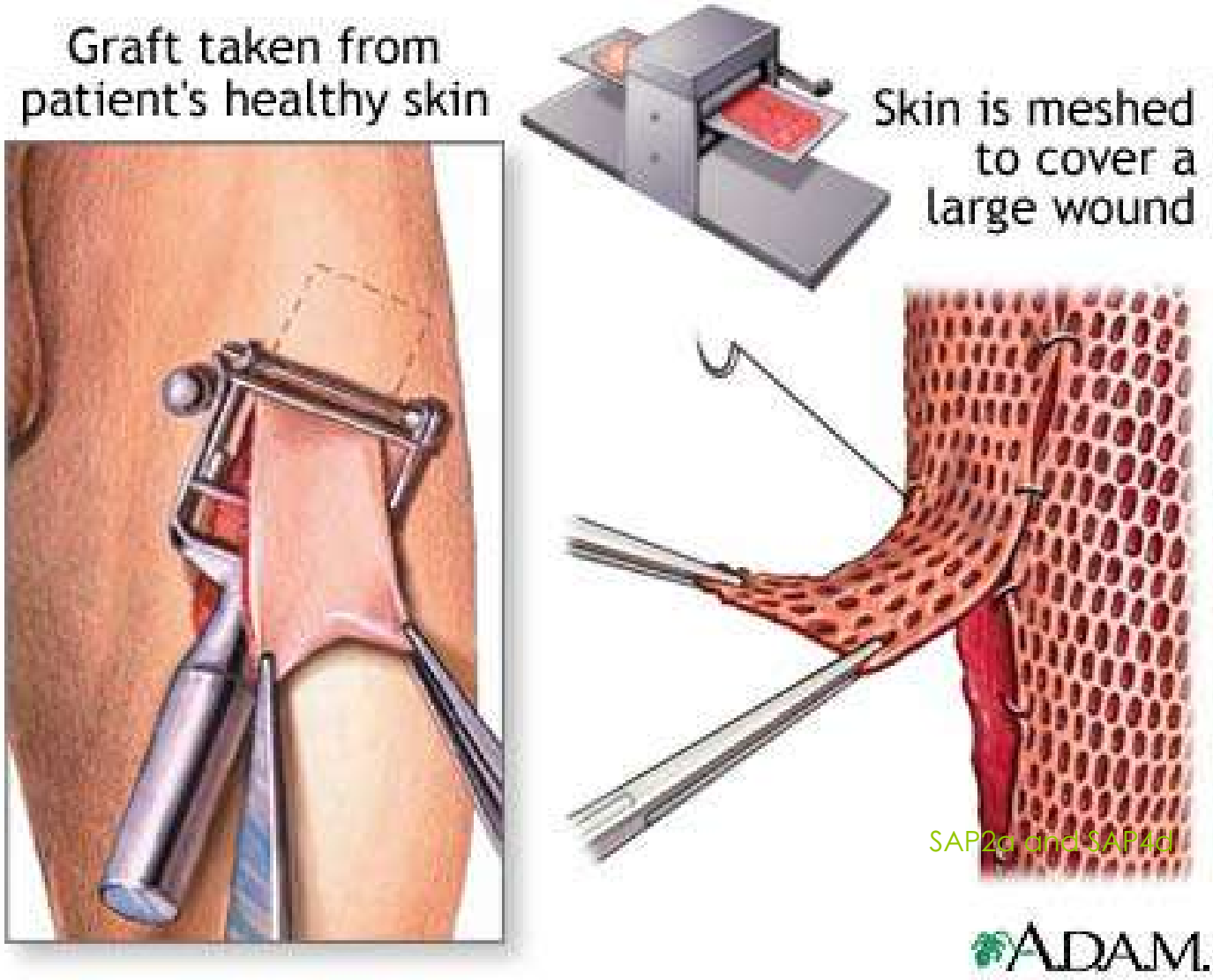
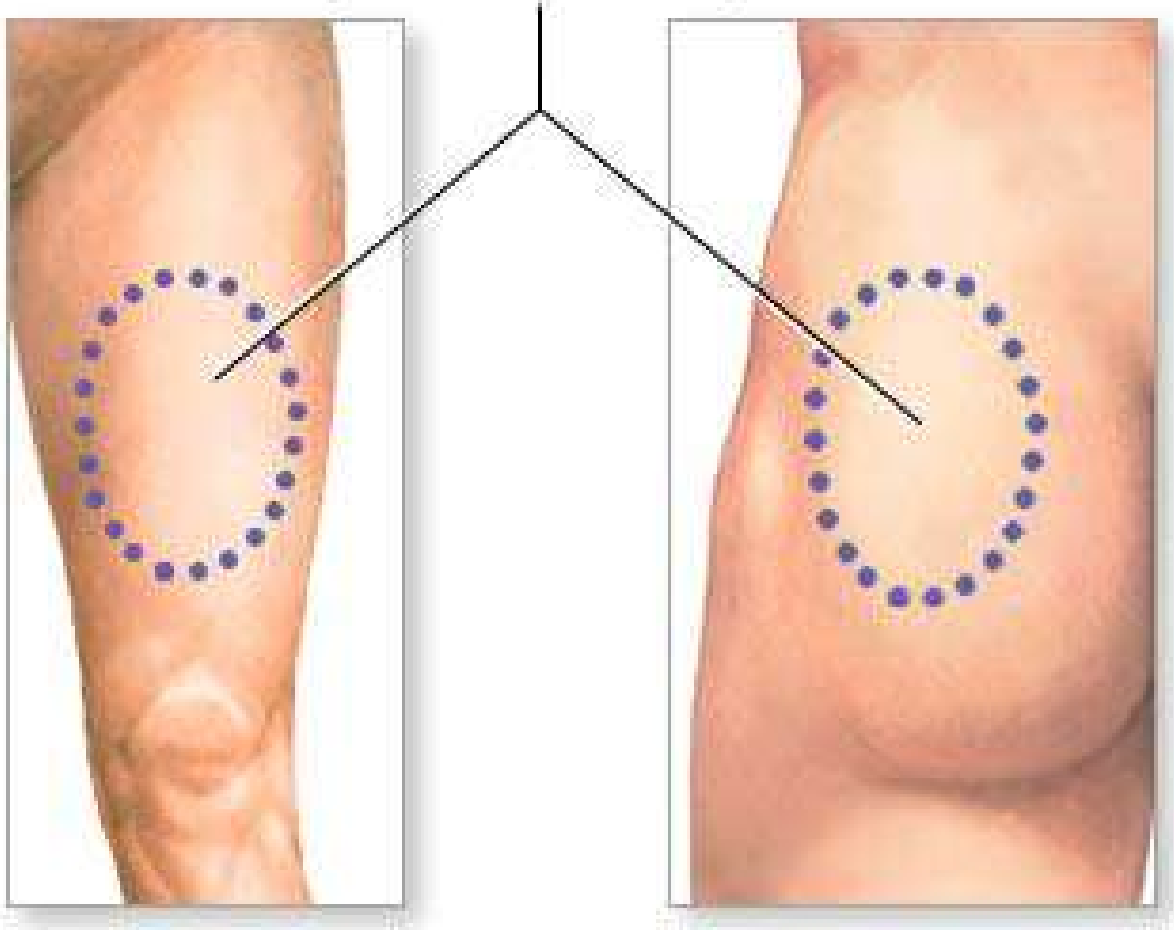
Debriding


Graft taken from patient's healthy skin
Skin is meshed to cover a large wound
SAP2a and SAP4d
A.D.A.M.

Common sites for skin graft harvesting



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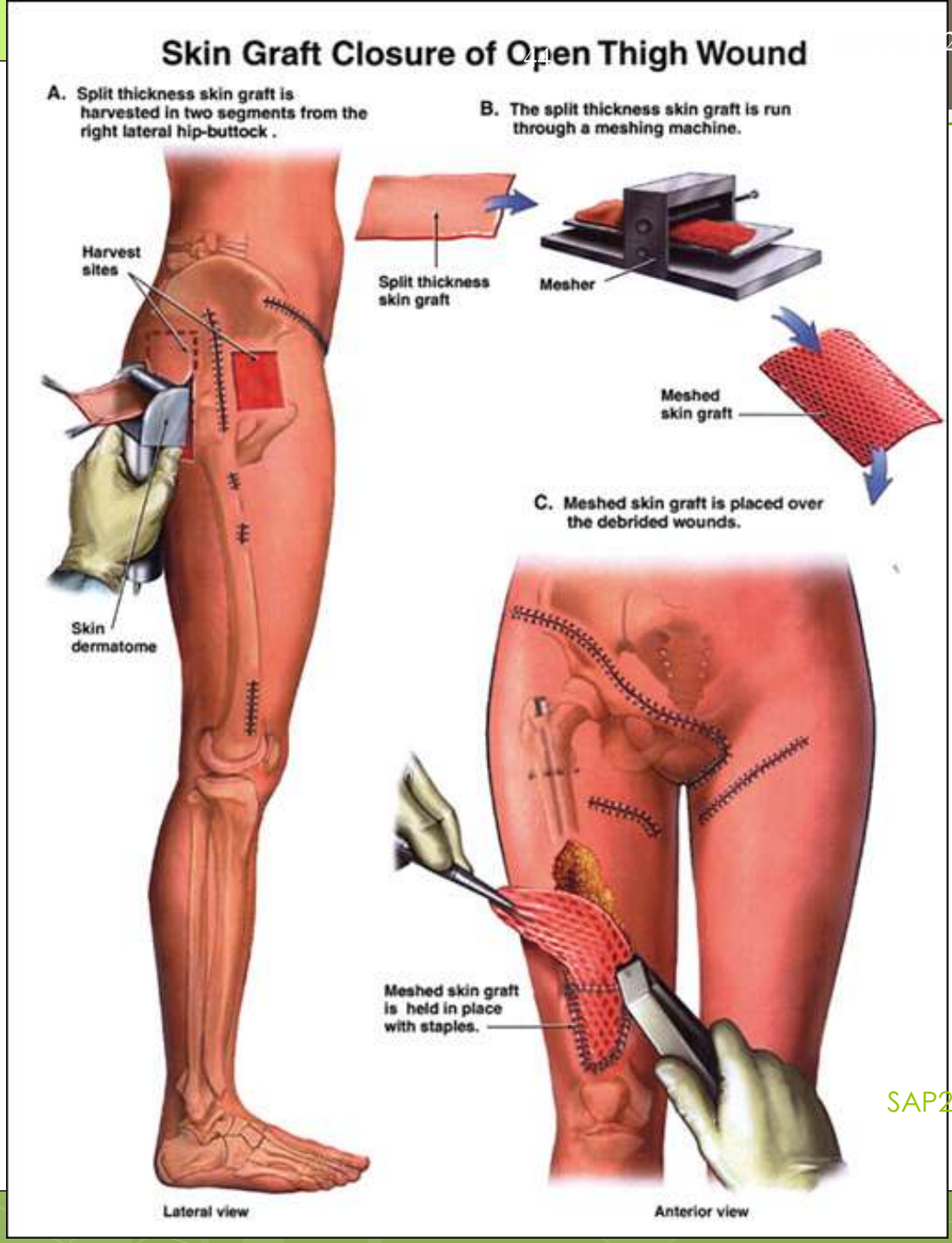

SAP2a and SAP4d

SAP2a and SAP4d

SAP2a and SAP4d

SAP2a and SAP4d

Before & After Skin Graft

Skin Cancer

- Cause of most skin cancer is not known, but the most important risk factor is over exposure to UV radiation
- Most cancers have an underlying cause that increases cell production in an area of the body.
- These cells contain mutations, which when accumulated, cause tumors where cancer grows and lives.

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Basal Cell Carcinoma

- The least malignant and most common skin cancer
- Lesions occur most often on sun exposed areas of the face
- Cells of stratum germinativum can no longer form keratin
- Relatively slow growing and is 99% curable in most cases when the lesion is removed surgically

Squamous Cell Carcinoma

- Appears most often on the scalp, ears, dorsum of the hands, and lower lip
- Grows rapidly and is believed to be sun induced
- Cancer cells in the stratum spinosum

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Malignant Melanoma

- Accounts for about 5% of skin cancers
- Can begin wherever there is pigment and most appear spontaneously
- Cancer of melanocytes
- Appears a spreading brown to black patch that many mistake as a mole
- Chance for survival is 50%

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http://gisttumo-r.com/what-does-melanoma-look-like

ABCD Rule

- ABCD RULE used for recognizing a melanoma
- A—Asymmetry—the two sides of the spot do not match
- B—Border irregularity—the borders of the lesion are not smooth
- C—Color—the pigmented spot contains areas of different colors
- D—Diameter—the spot is larger than 6 mm in diameter (the size of a pencil eraser)

Normal Mole	Melanoma	Sign	Characteristic
		Asymmetry	when half of the mole does not match the other half
		Border	when the border (edges) of the mole are ragged or irregular
		Color	when the color of the mole varies throughout
		Diameter	if the mole's diameter is larger than a pencil's eraser

Photographs Used By Permission: National Cancer Institute

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Aging

- Adolescence develop acne
- Pronounced aging effects do not typically occur until people reach their late forties.
  - The effects of aging include wrinkling, decrease of skin's immune responsiveness, dehydration and cracking of the skin, decreased sweat production, decreased numbers of melanocytes resulting in gray hair and atypical skin pigmentation, loss of subcutaneous fat, a decrease in skin thickness, and an increased susceptibility to pathological conditions.
  - Growth of hair and nails decreases during the second and third decades of life; nails may also become more brittle with age.

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Membranes

Body membranes fall into 2 categories:

1. Epithelial Membranes
   - Includes the cutaneous, mucous, and serous

2. Connective Tissue Membranes
   - Represented by synovial membranes

These categories are classified by their tissue makeup.

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Epithelial Membranes

- **Cutaneous Membrane**

a. Also called the Skin

b. Composed of the epidermis and the dermis

i. Epidermis—stratified squamous epithelium

ii. Dermis—mostly dense connective tissue

c. Dry membrane exposed to the air

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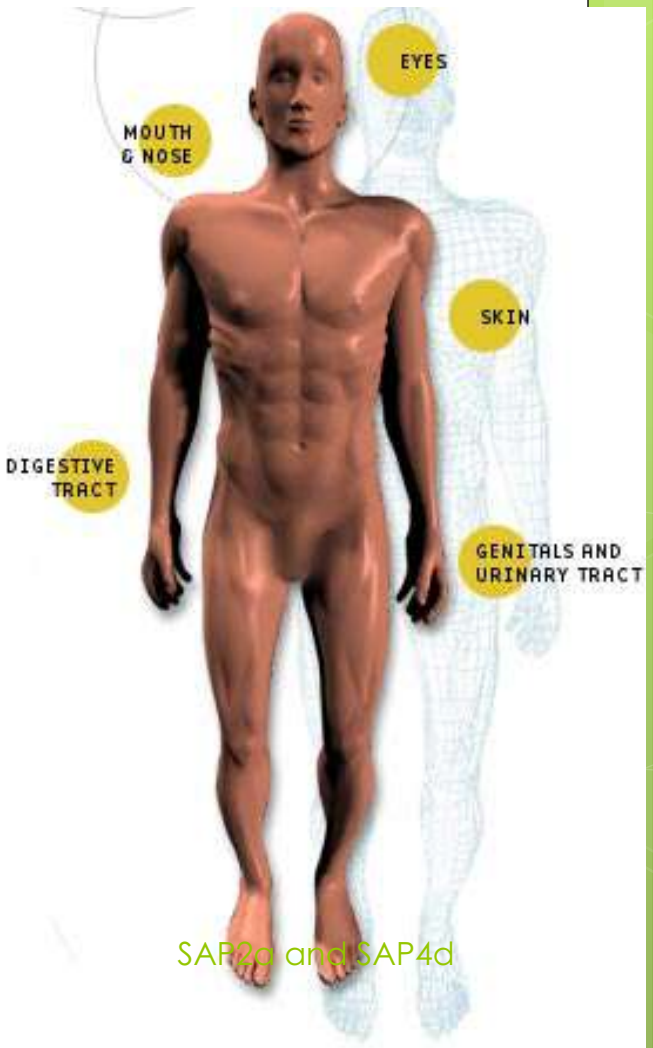
Epithelial Membranes

- **Mucous Membrane**

a. Composed of epithelium resting on a loose connective tissue—called LAMINA PROPRIA

b. Lines all body cavities that open to the exterior—the hollow organs

They are wet membranes that are always bathed in secretions



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Epithelial Membranes

- **Serous Membranes**

a. Composed of a layer of simple Squamous epithelium resting on a thin layer of areolar connective tissue

b. Line body cavities that are closed to the exterior

Serous Membranes Occur in Pairs

-Parietal layer lines a portion of the ventral body cavity wall

-Visceral layer covers the outside of organs within the cavity

-Think of your hand pushing into a balloon

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Epithelial Membranes—Serous

- Layers are separated by serous fluid
- Allows the organs to slide across the cavity walls and one another without friction
- Names of the membranes depend on their location:

1. Peritoneum— lines abdominal cavity
2. Pleura—lines the lungs
3. Pericardium— lines the heart

Connective Tissue Membranes

Connective Tissue Membranes

- Composed of connective tissue and contain no epithelial cells
- Line the fibrous capsules surrounding joints

-Provides a smooth surface and secretes a lubricating fluid

-Also lines tendon sheaths

THINK CRITICALLY

- Nancy has a dry skin condition and prefers to take her bath in the evening. Would it be more effective for her to apply a skin care lotion such as Keri lotion in the morning or in the evening after taking a bath? Why?

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