Chapter Six: Integumentary System

• Types of membranes
  o Epithelial membranes
    ▪ Serous membranes – double layer membrane that is closed to the exterior. It lines the walls or cavities that surround viscera and cover the viscera. The outer membrane that lines the walls or cavities is called the parietal layer while the inner membrane that lines the viscera is called the visceral layer. The parietal layer folds back on itself to form the visceral layer and between the layers are a fluid called serous fluid to lubricate to prevent the viscera from “sticking” to the cavity.
    ▪ Pericardium – pertains to the heart. Parietal pericardium lines the cavity while visceral pericardium lines the heart.
    ▪ Peritoneum – pertains to the abdominal region. Parietal peritoneum vs. visceral peritoneum
    ▪ Pleural – pertains to the lungs. Parietal pleural vs. visceral pleural
  ▪ REFER TO FIGURE 1.8
    ▪ Mucous membranes – membrane that is exposed to the outside. Mucous membrane secretes a substance, mucous, that aids to absorbs or trap particles.
  ▪ REFER TO FIGURE 16.1
    ▪ Cutaneous membranes – pertains to the skin. This chapters deals with this type of epithelial membrane
  o Connective membranes -
    ▪ Synovial membranes are found in synovial joints
    ▪ REFER TO FIGURE 7.35

• Characteristics of skin
  o Covering – mechanical barrier for the body and create a barrier between internal environment from external environment
  o Temperature regulator – aids the body for maintaining optimal body temperature for homeostatic balances
  o Provides protection – absorbs harmful rays such as UV rays
  o Prevent water loss – contains proteins and lipids that lock moisture inside of the body
  o Houses sensory receptors – possesses specialized nerve endings and general free nerve endings to provide information about the environment
  o Excretes wastes – aids to remove metabolic wastes and excessive electrolytes through pores of the skin
  o Synthesizes chemicals – aids the body to absorb calcium by synthesizing vitamin D

• Regions of the skin
  o REFER TO FIGURE 6.1 & 6.2
  o Epidermis – top region of the skin that consists of stratified squamous cells and specialized cells called melanocytes
    ▪ Lacks blood vessels
    ▪ Epidermal layers (from the bottom or basement membrane to the top surface of the skin)
      ▪ Basal strata – deepest layer that touches the basement membrane. Only layer that is vascular due to the blood vessels in the dermal region and is able to undergo mitosis to create new epidermal cells
      Melanocytes are specialized cells that are located in the basal strata with extensions that invade in the other layers of the epidermis. The melanocytes produce a color pigment called melanin. Melanin helps to contribute to skin color and absorbs harmful rays to protect the body
• REFER TO FIGURE 6.3
  • Spinosum strata – layer right above the basal strata that contains the newly divided cells
  • Granulosum strata – layer above the spinosum strata that consists of cells that are starting to die since the epidermis is avascular (no blood vessels). Granules start to appear and be visible in the cytoplasm.
  • Corneum strata- top layers of the epidermis that consists of dead cells containing keratin. Keratin is a protein that serves to prevent water loss from the skin.
  • OPTIONAL strata: Lucidum strata is a layer of epidermis that is only present in thicker parts of the skin such as the soles of feet and palms of hands. The lucidum is between the granulom and corneum and causes the corneum to become thicker.

ο Dermis - intermediate region of the skin that consists of loose connective tissue and accessory structures of the skin such as hair follicle, sebaceous gland, sweat gland, blood vessels, nerve fibers
  ▪ Regions of the dermis
    • REFER TO FIGURE 10.1 for touch and pressure receptors
      • Papillary region – superior region of the dermis and binds to the basement membrane of the epidermis. The dermal papillae is the uneven edge of the dermis that connects to the basement membrane. The papillary region contains specialized nerve ending called, Meissner’s Corpuscle. The Meissner’s Corpuscle is a modified nerve ending that detects light touch. The papillary region also contains free nerve endings that radiate into the epidermis to detect all types of stimuli.
      • Reticular region – inferior region of the dermis that contains most of the accessory structures of the skin and contains modified nerve endings called Pacinian Corpuscle. The Pacinian Corpuscle detects mechanical or heavy pressure.

ο Subcutaneous layer or hypodermis – deepest region of the skin that contain connective tissue, insulating adipose tissue, and major blood vessels. The hypodermis binds the skin to the underlying organ.

• Normal Skin Color Determinants
  • Factors
    ▪ Genetic – melanin size and melanin color is determined and controlled by genes
    ▪ Environmental – outside factors such as sun exposure, diet, and light exposure from X-rays can affect the melanin production and pigments from vegetables such as beta carotene can be displayed on the skin
    ▪ Physiological – circulation in the dermal blood vessels and whether or not the blood vessels dilate or constrict and temporarily affect skin tone

• Accessory Structures of the skin
  • Hair follicle has a growing region called the hair bulb or hair root located in the reticular region of the dermis. As new cells grow from the hair root, the older cells are pushed upward as the hair shaft. The functions of the hair follicle are warmth and protection. Presence of hair traps heat closer to the body. Eyelashes function to keep particles out of the eyes. Hair color is determined by melanin.
  • REFER TO FIGURE 6.5
  • Arrector pili muscle is a dermal muscle attached to the hair follicle and moves the hair follicle.
- Sebaceous glands is located lateral to the hair follicle and produces an oily substance, sebum. Sebum functions to make the hair shaft and skin soft and pliable as well waterproof. Sebum also decreases the pH value of the skin in order to reduce the microbes on the skin.

- REFER TO FIGURE 6.7

- Sweat glands are widely distributed throughout the body. Sweat is produced from the sweat glands and leaves the body through sweat pores. The composition of sweat consist of water, metabolic wastes, and electrolytes. The functions of sweat are to remove excessive heat, wastes, and inhibit microbes.
  - Types of sweat glands
    - Eccrine sweat glands are widespread and respond to heat and stress. The eccrine glands are small sweat glands.
    - Apocrine sweat glands are located in the auxiliary regions (armpits) and groin region and respond to heat, stress, and emotional/sexual arousal. The apocrine sweat glands are large sweat glands and usually attached to the hair follicles. Due to the moisture and closed regions of the body, odor is associated with these sweat glands. The composition of the sweat is the same as eccrine sweat glands. The odor is produced by the microbes that reside on the skin in these regions as they utilize the sweat from the glands.
  - Modified sweat glands
    - Ceruminous glands are located in the ear canal and produce wax to trap particles in the ear canal.
    - Mammary glands are located in the thoracic region and produce milk.

- Nails are scale-like modifications of the epidermis. Nails are fully keratinized. The anatomy of the nail consist of a free edge (finger tip), body, and the growing region, lunula. The actively growing region, the lunula, is the crescent-shaped structure near the cuticle. The nail lacks melanocytes but the body of the nail appears to have pink tone due to the dermal blood vessels underneath.

- REFER TO FIGURE 6.4

- Regulation of Body Temperature – vital for maintaining metabolic reactions
  - Dealing with excessive heat exposure
    - Sweat glands activated to remove excess heat and moisture to the surface of the skin
    - Dermal blood vessels will dilate to increase the amount of heat escaping the skin
  - Dealing with excessive cooling exposure
    - Sweat gland deactivated
    - Dermal blood vessels will constrict to keep heat closer to the body.
    - Arrector pili muscles contract to generate heat and cause the hair follicle to stand straight to trap heat to the surface of the skin.

- Skin Homeostatic Imbalances
  - Inflammation is a normal response by the body to an injury to the skin. The common characteristics of inflammation are red, swollen, and heat. Inflammations cause the blood vessels at the injury site to dilate to bring more white blood cells to the region to fight any possible pathogens; and thus, that physiological process causes the main characteristics of the inflammation.
  - Burns
    - Types of burns
      - First degree burn or partial burn is an injury to the epidermis. Inflammation occurs and healing is quick. Temporary discomfort may occur but healing will take 2-3 days. The injury occurs on the layers of the epidermis but the basale strata is intact so that the strata can regenerate new epidermal cells. The damaged cells will slough off when new cells are formed. Sunburn is a first degree burn.
• Second degree burn or partial burn in an injury to the epidermis and dermis. Inflammation occurs and healing takes longer that first degree burn. The injury affects the layers of the epidermis and the components of the dermis. Blisters, pain, and redness will occur. Not only the epidermis has to heal, but the fibroblasts of the dermis have to repair the connective tissue of the region. New nerves may have to grow new branches and the hair follicle may have to regrow the hair shaft. Sweat gland and sebaceous gland will also have to repair. A cooking burn is an example of a second degree burn.

• Third degree burn or full thickness burn is an injury to all three regions of the skin. Inflammation occurs to the tissue surrounding the injury. The skin will not be able to self-repair so medical attention is needed. Skin grafting is necessary and extensive scarring will occur at the site of the burn. Complete burn to a body part is an example of this type of burn.

  ▪ Rule of nine is a method of calculating how much body fluid and electrolytes are lost due to the burn. Each region of the body represents 9% or multiple of 9% of body fluids and electrolytes. Physicians can examine the body parts burned and estimate total body fluids lost.
  - Lacerations are cuts to the skin. The repair includes inflammation, bleeding, clotting to create a scab, and repair of the skin under the scab. Superficial cuts are less injury and therefore quicker to heal. Deeper cuts are more severe and may need medical attention to have proper healing and prevent infection.
  - Skin cancer is over-exposure to harmful rays that will cause DNA damage to the cells of the skin. Tumor cells will develop and will undergo mitosis to create more tumor cells.

  ▪ REFER TO TOPIC OF INTEREST: SKIN CANCER - p. 121
  ▪ Basal cell carcinoma is cancer induced by chronic sun exposure and that occurs when some of the basale strata cells become cancerous. Symptoms included elevated and fluid-filled lesions and tumor cells may invade the dermis but does not spread or metastasize. Treatment and healing is fast. Removal of the tumor cells and lesions will remove the cancer.
  ▪ Squamousal carcinoma is cancer induced by chronic sun exposure and affects the spinosum strata of the skin. The lesions are flat and scaly. The tumor cells can spread to lymph nodes. Surgery and therapy are needed to eliminate the cancer.
  ▪ Melanoma is cancer induced by intense exposure to the sun and damages the melanocytes. This type of skin cancer is malignant and will spread to other parts of the body. Extensive surgery and treatments. Routine examinations are necessary. Follow the ABCD’s of examination of moles on the skin. A stands for asymmetrical—is the mole symmetrical? B stands for border – is the edges of the mole irregular and elevated? C stands for color – is the mole multicolor? D stands for diameter – is the mole larger in diameter than the size of a pencil eraser? If more than two questions are answered by a yes, then medial examination is recommended.