CHAPTER 4 – SKIN & BODY MEMBRANES

I. Epithelial membranes – “covering & lining membranes” epithelial sheet + connective tissue
   A. Cutaneous membrane “skin”
      1. Superficial epidermis – keratinizing stratified squamous epithelium
      2. Dermis – dense fibrous connective tissue
      3. Exposed to air – dry membrane
   B. Mucous membranes “mucosa”
      1. Epithelium resting on a loose connective tissue membrane called a lamina propria
      2. Lines all body cavities that open to the exterior (respiratory, digestive, urinary, reproductive)
      3. Stratified squamous or simple columnar
      4. “Wet” or moist membranes
      5. Absorption & secretion
   C. Serous membranes “serosa”
      1. Layer of simple squamous resting on areolar connective tissue
      2. Line body cavities closed to the exterior
      3. Occur in pairs
         a. Parietal layer – lines wall of ventral body cavity
         b. Visceral layer – covers the outside of the organs
      4. Separated by serous fluid, allows the organs to slide easily across the cavity walls & each other
      5. Names
         a. Peritoneum – abdomen
         b. Pleura – lungs
         c. Pericardium – heart

II. Connective tissue membranes are referred to as synovial membranes, composed of soft areolar connective tissue and no epithelial cells, they line fibrous capsules surrounding joints (creates joint cavities), provide smooth surface & secrete lubricant, also line bursae & tendon sheets

Integumentary System – skin, oil & sweat glands, hair, nails

I. Basic skin functions
   A. Keeps water/molecules in
   B. Keeps water/unwanted stuff out
   C. Protection (Table 4.1 Pg. 114) - keratin makes a hardened layer
   D. Heat loss/retention
   E. Excretion of urea, salts, water (sweat)
   F. Synthesize vitamin D from cholesterol
   G. Cutaneous sensory receptors located in the skin (touch, pressure, temp., pain)

II. Structure of skin
   A. Epidermis
      1. Stratified squamous epithelium capable of keratinization
      2. Composed of 5 zones or layers called “strata”
      3. Avascular – relies on diffusion from tissue underneath
      4. Most cells are keratinocytes – cells that produce keratin, make skin tough and waterproof
II. Structure of Skin (cont.)
A. Epidermis (cont.)
5. Layers (from inside to outside)
   a. **Stratum Basale** “stratum germinativum” - deepest, closest to the dermis, most adequate nourishment by diffusion, constantly undergoing division by mitosis (millions produced daily), pushed up to superficial layers, contains *melanocytes* – cells that make melanin so you can tan, cells eat the pigment and form a protective umbrella, freckles & moles are a concentration of pigment in one spot
   b. **Stratum Spinosum**
   c. **Stratum Granulosum**
   d. **Stratum Lucidum** – occurs where skin is hairless & extra thick, palms of the hands and soles of the feet, clear, dead, keratinized
   e. **Stratum Corneum** – 20 to 30 layers thick, ¾ of epidermis thickness, shingle like dead cells filled with keratin (lots of it) “cornified or horny cell,” overcoat for the body, protects deeper cells, flakes and rubs off slowly, new epidermis every 25-45 days
B. Dermis
1. Strong stretchy envelope that hold the body together, leather is the treated dermis of animals
2. **Papillary layer**
   a. Upper dermal region
   b. Uneven & has finger like projections called *dermal papillae*
   c. Contains capillary loops, pain receptors (free nerve endings), touch receptors (*Meissner’s corpuscles*)
   d. Makes fingerprints & has a lot of sweat glands
3. **Reticular layer**
   a. Deepest skin layer
   b. Contains blood vessels, sweat & oil glands, deep pressure receptors (*Pacinian Corpuscles*)
4. Collagen & elastic fibers found throughout
5. Abundant blood supply – maintains body temperature & homeostasis
6. Homeostatic Imbalance; **decubitus ulcers** – bed sores, bedridden patient, too much pressure on one spot on the skin, especially over bony projection, cells begin to die and skin ulcerates
C. **Hypodermis** – subcutaneous tissue composed of adipose tissue (fat)

III. Skin color
A. **Melanin** in epidermis, a pigment that ranges in color from yellow to brown to black
B. **Carotene** in stratum corneum & subcutaneous tissue, an orange-yellow pigment
C. **Hemoglobin** – pigment in red blood cells in dermal blood vessels, “flush – rosy glow”
D. Homeostatic Imbalance; **cyanosis** – poor oxygen to hemoglobin makes caucasians appear blue (especially visible during heart failure & breathing disorders)
E. Emotional influences & certain colors indicate certain diseases
   1. Redness “erythema” – blushing, fever, hypertension
   2. Pallor “blanching” – fear, anemia, low blood pressure
   3. Jaundice “yellow cast” – yellow skin due to liver disorder
   4. Bruises “black & blue marks” – blood escaped from tissue and clotted in tissue space, clot is called a hematoma, may also be a sign of vitamin C deficiency
IV. Appendages of the skin – cutaneous glands, hair and hair follicles, and nails.

A. Cutaneous glands, all are **exocrine glands** that release secretions to the skin surface via ducts, formed by the cells of the stratum basale, but located almost entirely within dermis.

1. **Sebaceous** (oil) glands
   a. Found all over except palms and soles
   b. **Sebum** – mixture of oily substances and fragmented cells, acts as lubricant to keep skin soft and moist, helps to kill bacteria
   c. Homeostatic imbalance
      i. **Whitehead** – duct blocked by sebum
      ii. **Blackhead** - whitehead oxidizes and dries out, it darkens
     iii. **Acne** – active infection of sebaceous glands
      iv. **Seborrhea** – “cradle cap” in infants, over activity of sebaceous glands, starts pink and becomes a yellow to brown crust, just needs careful washing

2. **Sweat glands** (sudoriferous glands) – respond to high temperature and hormones
   a. All over, about 2.5 million
   b. **Eccrine glands** – all over (everywhere with hair), very numerous, produce sweat (water, some salts, vitamin C, metabolic wastes, lactic acid), acidic to kill bacteria, reach skin via sweat pore, heat-regulating (secrete sweat when temp is high and sweat evaporates carrying body heat away)
   c. **Apocrine glands** – in axillary and genital areas, large, ducts empty into hair follicles, secretion contain everything from sweat plus proteins and fatty acids, yellowish, musky smell if bacteria eat the proteins, influenced by androgens (male sex hormones)

B. **Hair and hair follicles**

1. **Hair** – a flexible epithelial structure produced by the hair follicle
2. **Root** – part enclosed by the follicle
3. **Shaft** - the part sticking out, dead, keratinized, all protein
4. **Matrix** – growth zone, in stratum basale, divides to make hair cells
5. **Medulla** – central core of hair, surrounded by cortex, which is enclosed by cuticle (the outer most layer, which is shingle like.
6. Hair pigment is made by melanocytes in hair bulb – anything from blond to black
7. **Hair follicles** – compound structure, inner epidermal sheath, outer dermal sheath is dermal connective tissue
8. **Arrector pili** – smooth muscle cells, connect hair follicle to dermal tissue, contract and pull the hair upright (“goose bumps”), due to fear or cold

C. **Nails**

1. Scale like modification of the epidermis (hooves or claws in other animals), made up of keratin
2. Each nail has a free edge, a body (attached), and root (embedded in the skin)
3. Cuticle is proximal, nail folds are lateral
4. Nail bed under nail, nail matrix proximal is responsible for growth
5. **Lunula** – white crescent

V. Homeostatic imbalances in the skin

A. Infections and allergies

1. **Athlete’s foot** (tinea pedis) – itchy, red, peeling condition of skin between the toes from fungus
2. **Boils & carbuncles** – inflammation of hair follicles and sebaceous glands, back of neck, staphylococcus aureus bacterial infection.
3. **Cold Sores** (fever blister) – herpes simplex, blisters, itch and sting, around lips, activated by emotional upset, fever, UV radiation.
V. Homeostatic imbalances in the skin (cont.)
A. Infections and allergies (cont.)
4. **Contact Dermatitis** – itching, redness, swelling of skin that progresses to blistering, allergic response to chemicals
5. **Impetigo** – caused by staphylococcus, very contagious, pink, water filled, raised lesions, then develop yellow crust, common in elementary school
6. **Psoriasis** – chronic condition, overproduction of skin cells, red lesions covered by dry silvery scales, autoimmune disorder, triggered by trauma, infection, hormonal changes, and stress

B. **Burns** – tissue damage and cell death caused by intense heat, electricity, UV radiation, chemicals
1. Dangerous because the body loses its precious supply of fluids containing proteins and electrolytes, dehydration and electrolyte imbalance follow, can lead to shutdown of kidneys and circulatory shock.
2. **Rule of Nines** – used to figure out how much fluid needs to be replaced based on how much of the body surface is burned.
3. Later, infection becomes the most important threat and is the leading cause of death
4. **First-degree burns** – only epidermis is damaged, red and swollen (sunburn)
5. **Second-degree burns** – injury to the epidermis and upper region of dermis, red, painful, blisters, regeneration still occurs (1st and 2nd are called partial-thickness burns)
6. **Third-degree burns** – (full-thickness burns) area looks blanched or blackened, no pain because nerve endings are destroyed, no regeneration, need skin graft. Primary cause of death is dehydration, secondary is infection.

C. Skin cancer
1. **Basal cell carcinoma** – least malignant and most common, cells of stratum basale, occur on sun exposed areas, appear as shiny and dome shaped nodules with grey edge, 99% cure rate
2. **Squamous cell carcinoma** – cells of stratum spinosum, scaly, reddened papule (small rounded elevation) that turns into an ulcer, common on scalp, ears, dorsum of hands, lower lip, can metastasize to adjacent lymph nodes, removed surgically or radiation therapy, if caught early, chances of complete cure is good
3. **Malignant melanoma** – cancer of melanocytes, 5% of skin cancers, metastasizes to local lymph nodes and blood vessels, 50% chance survival, surgical removal and immunotherapy
4. **ABCD Rule** – a way of checking moles of signs of melanoma
   (A) **Asymmetry** – the two sides do not match
   (B) **Border irregularity** – borders are not smooth, exhibit indentations
   (C) **Color** – different colors (blacks, browns, tans, sometimes blues and reds)
   (D) **Diameter** – larger than 6 mm in diameter (size of a pencil eraser)

VI. Developmental aspects of skin and body membranes
A. **Lanugo** – downy type hair in infants before birth
B. **Vernix caseosa** – babies at birth are covered with this white cheesy substance produced by the sebaceous glands, protects baby in the womb
C. **Milia** – accumulations of sebaceous glands that look like white spots on babies’ nose and forehead, appear because the skin is very thin, disappear third week after birth as skin thickens, more subcutaneous fat
D. **Dermatitis** – skin inflammation
E. **Alopecia** – hair loss or baldness - male pattern baldness – mostly in men, genetic, age related
F. **Grey hair** – genetic trigger, stop producing melanin within the hair follicle. Also can result from anxiety, stress, low protein diet, fungal infection, chemo, and other drugs.
G. **Aging** – as the amount of subcutaneous tissue (especially adipose) decreases it leads to cold intolerance in older adults, skin also becomes drier due to a decrease in oil production (also gets more itchy), skin also get thinner making it easier to bruise and injure, bags form under eyes from decreasing elasticity, jowls start to sag. Smoking and sun damage speed up aging of skin. Prevention/slowing down aging – don’t smoke, use sunscreen, good nutrition, plenty of fluids, and cleanliness.