Chapter 5:
The Integumentary System – Dermis and Skin Coloring
The Dermis

- 2\textsuperscript{nd} major skin region.
- Strong, flexible connective tissue
- Binds the entire body together like a stocking
- Your “hide” and corresponds to animal hides used to make leather products
- Richly supplied with nerve fibers, blood vessels, and lymphatic vessels
- Major portions of hair follicles and oil/sweat glands (derived from epidermis) reside here
The Dermis – Papillary Layer

- Superficial layer
- Areolar C.T.
- Thin layer
- Composed of (areolar) connective tissue
The Dermis – Papillary Layer

- Superior surface has peg-like projections called **dermal papillae**.
  - Increase surface area where epidermal cells receive oxygen and nutrients from dermal capillaries
The Dermis – Papillary Layer

• On the palms of the hands and the soles of the feet, the dermal papillae lie on larger mounds called **dermal ridges** → these form the epidermal ridges (fingerprints)
The Dermis – Reticular Layer

- Deep layer
- Accounts for 80% of dermal thickness.
- Composed of dense irregular connective tissue
- Responsible for the lines on your palms, wrist, etc.
- Stretch marks → extreme stretching of dermis to cause a tear
The Dermis – Reticular Layer

- **Cleavage or Tension Lines**
  - Collagen and elastic fibers at any one location are arranged in parallel bundles
  - Bundles are aligned to resist the applied forces
  - Clinical significance:
    - Parallel cut → cut will remain closed, heal faster, and less scaring
    - Perpendicular cut → cut will be pulled open, heal slower, more scaring
The Dermis – Reticular Layer

• Flexure Lines
  – Dermal folds that occur near joints, where the dermis is tightly secured to deeper structures
  – Skin can’t slide easily to accommodate motion – so the fold occurs
  – Ex. Lines in your Palms.
Tattoos!

- Very fine needles inject inks into the dermis.
- The color is permanent because dermal cells aren’t shed.
- To remove → a laser is used to shatter the ink molecules and then the immune system removes the debris.
- Before lasers → tattoo was scraped, frozen, or cut away! OUCH!!
Skin Color

• Due to:
  1. Pigment composition and concentration
  2. Dermal blood supply

• Skin Color:
  – Skin comes in different colors!! 😊
  – Distribution of skin color is not random!
  – Darker skinned people live near the equator need most protection from the sun
  – Lighter skinned people live near the poles
Skin Color - Pigments

• Melanin
  – Color → Yellow → reddish brown → black
  – No matter how dark or light skinned a person is, they have about the same number of melanocytes!!
Albinism

- Mutant gene that makes melanin is inherited → melanocytes don’t work correctly → individual has non-pigmented skin.
- Affects people of all races and many species of animals.
Skin Color - Carotene

• Orange-yellow pigment

• Located:
  – S. corneum of light-skinned individuals
  – Adipose tissue of hypodermis (gives fat its yellow color)
    • If eat too much → then skin can have an orange cast because the pigment will accumulate in adipose tissue
  – Orange colored vegetables

• Can be converted to vitamin A
  – Required for:
    • Normal maintenance of epithelia
    • Synthesis of photoreceptor for pigments in the eye
Jaundice

- Most often seen in newborns → yellowish skin
- Caused by blood incompatibility or immature liver → an accumulation of bilirubin in skin.
- Cured by → sunlight! Enables the body to break down the bilirubin.
Skin Color – Dermal Circulation

• Blood → contains pigment **hemoglobin**
  – Binds and transports oxygen
  – When oxygen is bound → bright red
  – When oxygen isn’t bound → dark red

• Most apparent in lightly pigmented individuals
  – Lots of blood flow (inflammation) → bright red
  – When circulation is reduced → pale
  – Sustained reduction in circulation → very dark red (blue/purple)
  – Because Caucasian skin contains only small amounts of melanin, the epidermis is nearly transparent and allows hemoglobin’s color to show through
Epidermis and Vitamin \( D_3 \)

- Limited sun exposure is very beneficial!!
- Epidermal cells exposed to UV radiation
  - Vitamin \( D_3 \) is converted into calcitriol which is necessary for calcium (bones) and phosphorus (muscle contraction) absorption in the small intestine.
  - An inadequate supply of calcitriol leads to impaired bone maintenance and growth.