Ex. 7: Integumentary

Skin or Integument

- Consists of three major regions
  - Epidermis – outermost superficial region
  - Dermis – middle region
  - Hypodermis (superficial fascia) – deepest region
### Skin

**Epidermis**

- Composed of keratinized stratified squamous epithelium, consisting of four distinct cell types and four or five layers
- Cell types include keratinocytes, melanocytes, Merkel cells, and Langerhans’ cells
- Outer portion of the skin is exposed to the external environment and functions in protection
Cells of Epidermis

- Keratinocytes – produce the fibrous protein keratin
- Melanocytes – produce the brown pigment melanin
- Langerhans’ cells – epidermal macrophages that help activate the immune system
- Merkel cells – function as touch receptors in association with sensory nerve endings

Layers of Epidermis

**Stratum Basale**

- Deepest epidermal layer firmly attached to the dermis
- Consists of a single row of the youngest keratinocytes
- Cells undergo rapid division, hence its alternate name, stratum germinativum
**Stratum Basale**

- Cells contain a weblike system of intermediate filaments attached to desmosomes
- Melanin granules and Langerhans’ cells are abundant in this layer

**Stratum Spinosum**

- Cells are dead; represented only by flat membranous sacs filled with keratin. Glycolipids in extracellular space.
- Cells are flattened; organelles deteriorating; cytoplasm full of lamellated granules (release lipids) and keratohyaline granules.
- Cells contain thick bundles of intermediate filaments made of pre-keratin.
- Cells are actively mitotic stem cells; some newly formed cells become part of the more superficial layers.

**Stratum Granulosum**

- Thin; three to five cell layers in which drastic changes in keratinocyte appearance occurs
- Keratohyaline and lamellated granules accumulate in the cells of this layer
**Stratum Lucidum**
- Thin, transparent band superficial to the stratum granulosum
- Consists of a few rows of flat, dead keratinocytes
- Present only in thick skin

**Stratum Corneum**
- Outermost layer of keratinized cells
- Accounts for three quarters of the epidermal thickness
- Functions include:
  - Waterproofing
  - Protection from abrasion and penetration
  - Rendering the body relatively insensitive to biological, chemical, and physical assaults

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**The Dermis**

- Second major skin region containing strong, flexible connective tissue
- Cell types include fibroblasts, macrophages, and occasionally mast cells and white blood cells
- Composed of two layers – papillary and reticular
The Dermis

• Papillary layer
  – Areolar connective tissue with collagen and elastic fibers
  – Its superior surface contains peglike projections called dermal papillae
  – Dermal papillae contain capillary loops, Meissner’s corpuscles, and free nerve endings
The Dermis

- Reticular layer
  - Accounts for approximately 80% of the thickness of the skin
  - Collagen fibers in this layer add strength and resiliency to the skin
  - Elastin fibers provide stretch-recoil properties

The HypoDermis

- Not part of the skin
- Subcutaneous layer deep to the skin
- Composed of adipose and areolar connective tissue
Skin Color

- Three pigments contribute to skin color
  - Melanin – yellow to reddish-brown to black pigment, responsible for dark skin colors
    - Freckles and pigmented moles – result from local accumulations of melanin
  - Carotene – yellow to orange pigment, most obvious in the palms and soles of the feet
  - Hemoglobin – reddish pigment responsible for the pinkish hue of the skin

The Sweat Glands

- Different types prevent overheating of the body; modified glands also secrete cerumen and milk
  - Eccrine sweat glands – found in palms, soles of the feet, and forehead
  - Apocrine sweat glands – found in axillary and anogenital areas
  - Ceruminous glands – modified apocrine glands in external ear canal that secrete cerumen
  - Mammary glands – specialized sweat glands that secrete milk
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Sebaceous Glands

- Simple holocrine, alveolar glands found all over the body
- Soften skin when stimulated by hormones
- Secrete an oily secretion called sebum
- Most glands have ducts that empty into hair follicles
### Hair

- Filamentous strands of dead keratinized cells produced by hair follicles
- Contains hard keratin which is tougher and more durable than soft keratin of the skin
- Made up of the shaft projecting from the skin, and the root embedded in the skin
- Consists of a core called the medulla, a cortex, and an outermost cuticle
- Pigmented by melanocytes at the base of the hair

### Hair Function/Distribution

- Functions of hair include:
  - Helping to maintain warmth
  - Alerting the body to presence of insects on the skin
  - Guarding the scalp against physical trauma, heat loss, and sunlight
- Hair is distributed over the entire skin surface except
  - Palms, soles, and lips
  - Nipples and portions of the external genitalia
Hair Structure

Hair Follicle

- Root sheath extending from the epidermal surface into the dermis
- Deep end is expanded forming a hair bulb
- A knot of sensory nerve endings (a root hair plexus) wraps around each hair bulb
- Bending a hair stimulates these endings, hence our hairs act as sensitive touch receptors
BURNS

- First-degree – only the epidermis is damaged
  - Symptoms include localized redness, swelling, and pain
- Second-degree – epidermis and upper regions of dermis are damaged
  - Symptoms mimic first degree burns, but blisters also appear
- Third-degree – entire thickness of the skin is damaged
  - Burned area appears gray-white, cherry red, or black; there is no initial edema or pain (since nerve endings are destroyed)

Severity of Burns

- Rules of Nines Estimates the severity of burns
- Burns considered critical if:
  - Over 25% of the body has second-degree burns
  - Over 10% of the body has third-degree burns
  - There are third-degree burns on face, hands, or feet