The Integumentary System

Chapter 5

Integumentary System

• Structure
  – Epidermis
  – Dermis
• Functions of the skin

The “Birthday Suit”

• Combination of 4 main tissues
  – Epithelial – outer layer
  – Connective – underlies dermis
  – Smooth Muscle – goose bumps
  – Nervous – sensory receptors
• Structure allows it to carry out many functions
  – Protection, hydration, sensation, hair to color
• Very durable

Functions of the Skin

• Protection
• Temperature regulation
• Sensations
• Storage of chemical compounds
• Excretion of wastes
• Synthesis of compounds
• Determines characteristics

Structure of the Skin

• 2 principal parts
  – Epidermis
  – Dermis
• Beneath the dermis
  – Hypodermis

Epidermis

• Stratified squamous epithelium
• Avascular
• Approximately every month we shed entire skin surface
• Consists of keratinocytes
Layers of the Epidermis (bottom to top)
- **Stratum germinativum** (stratum basale)
  - Stem cells
- **Stratum spinosum**
  - Cells look spiny
- **Stratum granulosum**
  - Cells die
- **Stratum lucidum**
  - Found only in thick skin
- **Stratum corneum**
  - Multiple layers

Variations in Skin Color
- **Pigments**
  - **Melanin**
    - Produced by melanocytes
    - Protects skin from UV rays
  - **Carotene**
- Lack of pigment
  - **Albino**
- Dermal blood supply

Diagnostic Skin Colors
- **Cyanosis**
  - Bluiness
  - Lack of oxygen
- **Erythema**
  - Redness
  - Increased blood flow
- **Pallor**
  - Pale or ashen
  - Reduced blood flow
- **Albinism**
  - White
  - Genetic lack of melanin
- **Jaundice**
  - Yellow
  - Liver and bilirubin
- **Hematoma**
  - Bruise

Epidermis and Dermis
- **Epidermis** is avascular
- **Dermis** is highly vascular
- Epidermis receives nourishment from dermis
- Cells far away from nourishment die

Dermis
- Largest part of the skin
- Connective tissue
- Contains
  - Blood vessels
  - Nerves
  - Accessory structures
- 2 layers
  - Papillary layer
  - Reticular layer

Papillary Layer
- Most superficial layer
- Loose connective tissue
- Surface area increased by papillae
  - Form fingerprints
Reticular Layer

- Deeper layer
- Dense, irregular connective tissue
- Contains
  - Blood vessels
  - Glands
  - Deep pressure receptors

Subcutaneous Layer

- Loose connective tissue
  - Packed with adipocytes
- Binds dermis to deeper tissue
  - Stabilizes position of skin
- Adipose storage
- Aka hypodermis, superficial fascia

Epidermal Derivatives

- Hair
- Glands
- Nails

Hair (Pili)

- Came with mammals
- Embryological development & distribution
- Life span of hair
- What does hair do for mammals?

Functions of Hair

- Protection
- Thermoregulation
- Sensory
- Minor role in humans

Three Types of Hair

- **Lanugo** – fine, downy, unpigmented hair of fetus
- **Vellus**
  - Fine, unpigmented
  - 2/3 hair of women
  - 1/10 hair of men
  - All of children’s except eyebrows, eyelashes and scalp
- **Terminal**
  - Course and pigmented
  - Eyebrows, eyelashes and scalp
  - After puberty
    - Axillary
    - Pubic
    - Male facial hair
    - Some hair of trunk and limbs
Hair Structure

- **Shaft**
  - Superficial
  - Dead tissue
- **Root**
  - Remainder of hair within follicle
  - Dead tissue

- **Medulla**
  - Soft core
- **Cortex**
  - Hard core
  - Gives hair stiffness
- **Cuticle**
  - Outermost layer

Hair Develops in Follicles

- Diagonal tube extending deep in dermis
- Two layers
  - Epithelial root sheath
  - Connective tissue root sheath
- **Bulb** contains matrix
- **Hair papilla**
  - Contains blood vessels and nerves
- Associated structures
  - Hair receptors
  - Arrector pili

Arrector Pili

- Smooth muscle attaches to follicle
- Raises hairs
- Emotional response, cold
- Function?

Hair Growth and Loss (Scalp)

Scalp – 4 to 8 years
Eyelashes – 5 months
Eyebrows – 2 months

Glands

- **Sebaceous glands**
  - Usually connected to hair follicles
  - Secrete a waxy, oily substance (sebum)
  - Develop in utero at about 5 months
  - Secretion increases at puberty
Glands

- **Sweat glands**
  - Eccrine glands
  - Found just about everywhere (esp. palms & soles)
  - Produce “perspiration”
    - Water, salt, met. wastes
  - Merocrine secretion

[Image of sweat glands]

http://www.pg.com/science/skincare/Skin_tws_35.htm

Glands

- **Sweat glands (scent glands)**
  - Specific type of sweat gland
  - Found near hair follicles
  - Axillary & genital regions
  - Develop at puberty
  - Called “apocrine” sweat glands
    - Really merocrine secretion

[Image of sweat glands and hair follicles]

http://www.pg.com/science/skincare/Skin_tws_35.htm

The Skin with Sweat Glands

- Ceruminous Glands
  - Found in auditory canal
  - Cerumen
    - Earwax
    - Combination of sebum and dead epidermal cells
  - Keeps eardrum pliable, waterproofs canal, kills bacteria, and coats guard hairs

[Diagram of ear canal and ceruminous glands]

Ceruminous Glands

- Mammary Glands
  - Produce milk during lactation
  - Not synonymous with breasts
  - Small traces in both males and females
  - Modified apocrine gland

[Image of mammary glands]

Mammary Glands

Nails

- Dorsal surfaces of ends of fingers & toes
- Primate feature
- Grasping
- Derivatives of stratum corneum

[Image of nails]
Nail Structure

- **Nail plate**
  - Free edge
  - Nail body
  - Nail root
  - Nail fold
  - Nail groove
- **Nail bed**
  - Hyponychium — epidermis
  - Nail matrix — growth area
  - Lunule
  - Eponychium (cuticle)

Skin Cancer

- Induced by UV rays (both natural and tanning beds)
- Elderly and fair-skinned most common
- 3 types
  - Basal cell carcinoma
  - Squamous cell carcinoma
  - Malignant melanoma

Basal Cell Carcinoma

- Most common
- Least dangerous: hardly metastasizes
- Arises in stratum basale and invades dermis

Squamous Cell Carcinoma

- Arises from keratinocytes of stratum spinosum
- Can metastasize to lymph nodes
- Can be lethal

Malignant Melanoma

- Most deadly, but only 5% of cases
- Arises from melanocyte of existing mole
- Metastasizes quickly and often fatal if not treated quickly