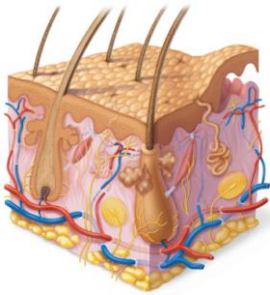


Chapter 5
Integumentary System

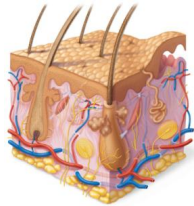


Chapter 5: Integumentary System Marieb & Hoehn - Figure 5.1

Integument Function:

1) Protection:

- a) Physical (e.g., cuts, abrasions, tears)
 - Tough: Keratinized cells
 - Stretchy: Elastic / collagen fibers
 - Bouncy: Adipose tissue (shock absorption)
- b) Chemical
 - Impermeable (non-porous)
- c) Biological (e.g., bacteria)
 - Arid / low nutrient surface
 - Acid / antibody secretions
- d) Environmental (e.g., UV radiation)
 - Melanin (pigment)



3) Sensation:

- Pain (nociceptors)
- Touch (light vs. heavy pressure)

2) Thermoregulation:

- Adipose tissue (insulation)
- Vascular perfusion
- Sweat glands

4) Excretion & Secretion

- Salts, water, waste (sweat glands)
- Milk (mammary glands)

Chapter 5: Integumentary System Marieb & Hoehn - Figure 5.1

Anatomy of Integument:

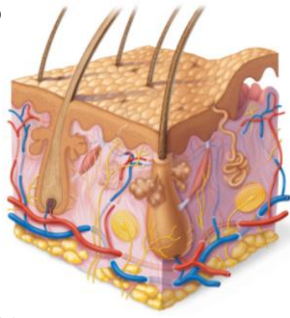
1) Cutaneous Membrane (Skin)

Epidermis

Dermis

Hypodermis
Subcutaneous layer

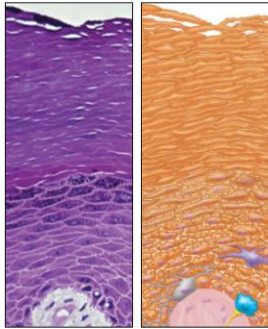
Attach skin to muscle / bone



Callus:

Epidermis thickening due to repeated friction

Anatomy of Epidermis:



- Epithelial tissue (*stratified squamous*)
- Avascular (i.e., no blood vessels)
- Function = Protection
 - Thin vs. thick skin

Cell Types Present:

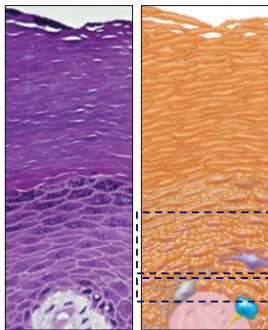
- 1) **Keratinocytes** (most common)



keratin

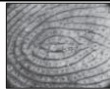
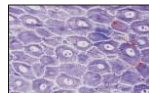
- 2) **Melanocytes**
 - Melanin (skin pigment)
- 3) **Langerhans cells**
 - Macrophages (defense)
- 4) **Merkel cells** (touch receptors)

Anatomy of Epidermis:

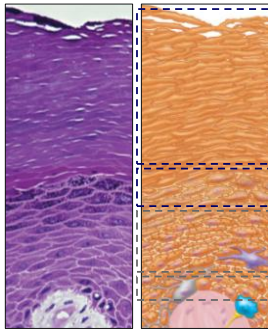


Layers (Strata):

- 1) **Stratum Basale (Germinativum):**
 - Innermost layer
 - Form **epidermal ridges**
 - Fingerprints (unique)
 - Actively dividing cells (*basal cells*)
 - Melanocytes
 - Merkel cells
- 2) **Stratum Spinosum:**
 - Cells connect (desmosomes)
 - Langerhan's cells



Anatomy of Epidermis:

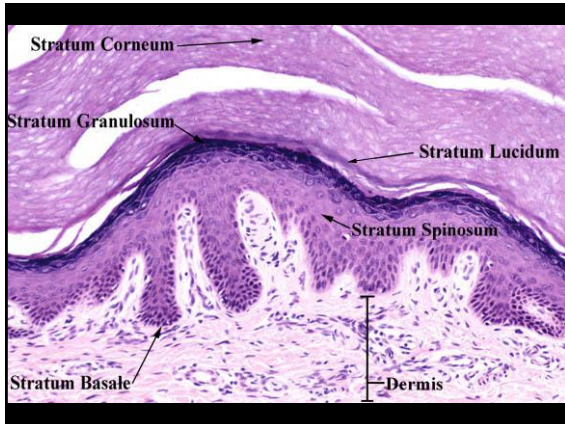


Layers (Strata):

- 3) **Stratum Granulosum:**
 - Organelles disintegrate
 - ↑ protein / enzyme content
 - Keratin production
 - **Glycolipids** (water resistant)
 - **Insensible perspiration**
- 4) **Stratum Lucidum:**
 - Only present in thick skin
- 5) **Stratum Corneum:**
 - Outermost layer
 - Dead, keratinized cells
 - Constantly shed (40 lbs. / lifetime)

Keratinocyte Life Span:
~ 6 weeks





Chapter 5: Integumentary System

Epidermal Characteristics :


- 1) Relatively impermeable (keratin & glycolipids)
 - Oils / lipids can penetrate epidermis (slowly)
- 2) Colored:
 - a) Pigments
 - **Carotene** (orange-yellow) : Accumulates inside cells
 - **Melanin** (brown; yellow-brown; black): Produced by melanocytes



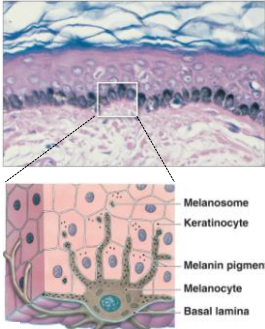
Chapter 5: Integumentary System

Melanocytes:

- All individuals have similar # of melanocytes
 - Variation = quality / quantity of melanin
- **Albinism** = lack of melanin
 - Faulty enzyme (Tyrosinase)



Freckle:
Local accumulation of melanin



Melanosome

Keratinocyte

Melanin pigment

Melanocyte

Basal lamina

(enters neighboring cells)

- Protects against UV radiation
- **Tan** = Melanin production enhanced by UV light

- ↓ levels UV light beneficial:



- ↑ levels UV light detrimental:

Skin Cancers (DNA damage)

Most common

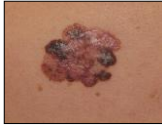
Most dangerous



Basal Cell Carcinoma
(stratum basale)



Squamous Cell Carcinoma
(stratum spinosum)



Melanoma
(Melanocytes)

Epidermal Characteristics :

- 1) Relatively impermeable (keratin & glycolipids)

- Oils / lipids can penetrate epidermis (slowly)



Poison Oak



Nicotine Patch

- 2) Colored:

- a) Pigments

- Carotene (orange-yellow) : Accumulates inside cells
- Melanin (brown; yellow-brown; black) : Produced by melanocytes

- b) Dermal circulation:

- Blood vessels under skin = Pinkish tint (hemoglobin)
- **Cyanosis** = Low blood oxygen level (dark red blood)



Perioral cyanosis



Peripheral cyanosis

Diseases Associated with Skin Pigmentation :

- 1) **Jaundice:**

- Accumulation of yellowish pigment (bilirubin)
- Liver malfunction (does not secrete bile)



- 2) **Pituitary Tumor:**

- Overproduction of melanocyte-stimulating hormone



- 3) **Addison's Disease:**

- Overproduction of adrenocorticotropic hormone
- Mimics melanocyte-stimulating hormone

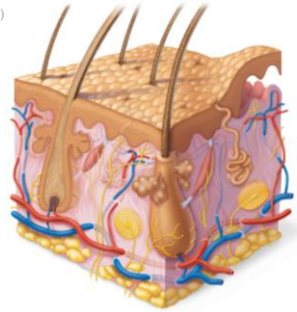
- 4) **Vitiligo:**

- Loss of melanocytes (autoimmune disease)



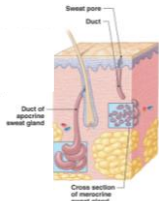
Anatomy of Integument:

- 1) Cutaneous Membrane (Skin)
- 2) Skin Appendages:



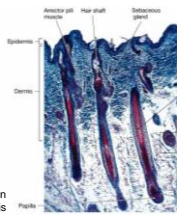
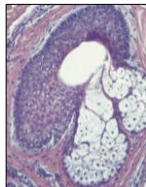
Skin Appendages:

- 1) **Sweat Glands** (merocrine - 3 million / person):
 - A) Produce **sweat** (water, salts, waste - acidic)
 - a) **Eccrine** sweat glands:
 - Widely distributed (palms / soles / forehead)
 - Cool body (perspiration - 1 gal / hour)
 - b) **Apocrine** sweat glands:
 - Axillary & genital regions (hair follicle)
 - Odor = bacterial breakdown
 - B) Produce **cerumen** (i.e., earwax)
 - **Ceruminous** glands:
 - Ear canal; produce sticky, bitter substance
 - Protection against insects / foreign matter
 - C) Produce **milk** (nutrition for offspring)
 - **Mammary** glands:
 - Breast (females / males)
 - Nutrition for developing offspring



Skin Appendages:

- 2) **Sebaceous Glands** (holocrine):
 - Secrete oily substance (**sebum**)
 - Hair follicles (structure = simple branched alveolar)
 - Lubricates hair shaft; antibacterial (acidic)
 - **Pimple** = Blocked, infected gland
- 3) **Hairs** (pili - ~ 2.5 million / body):
 - Fused, keratinized cells
 - Composed of **shaft & root**
 - Hair appearance = shaft shape
 - Color = variation in melanin
 - Produced by hair follicles



Growth:
2 - 5 years
(0.3 mm / day)

Vellus Hairs:
"Peach fuzz"

Terminal Hairs:
Course hair

Roots set deep in
dermis / hypodermis

Skin Appendages:

3) Hairs (pili - ~ 2.5 million / body):

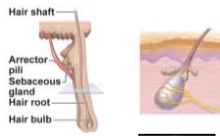
• Function:

- 1) Scalp: protection & insulation
- 2) Body: hair plexi
 - Sensation (e.g., insect detection)
 - Insulation (arrector pili = muscles)
- 3) Ears / Nose / Eye:
 - Protection (trap particles)

• Hair growth affected by age, stress and diet (e.g., alopecia)

4) Nails:

- Keratinized, dead cells (body of nail)
- Nail root = site of growth



Marieb & Hoehn - Figure 5.7
