## Anatomy of Skin

Structure of the Skin

- Two main parts:
  - Epidermis
    - superficial
    - thinner
    - epithelial tissue
  - o <u>Dermis</u>
    - deeper
    - thicker
    - connective tissue

\*The two layers are attached by the basement membrane.

#### The Skin's Layers



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- <u>Subcutaneous layer</u> (subQ)
  - Also called the <u>hypodermis</u>.
  - Deep to the <u>dermis</u>, but not part of the skin.
  - o consists of areolar and adipose ct
  - Attaches skin to underlying <u>tissues</u> and <u>organs</u>.



#### Epidermis

- It is keratinized stratified squamous epithelium
- 4 key cells:



- 1. Keratinocytes
  - They make the protein keratin (a tough, protective protein).
  - The most numerous cell type: about 90% of the epidermal cells.



### 2. Melanocytes

- About <u>8%</u> of the epidermal cells.
- Make the protein pigment melanin.
  - contributes to skin color
  - absorbs damaging ultraviolet light.



3. Langerhans cells Immune cells located in the epidermis



### 3. Merkel cells

• associated with touch





Merkel Cell (Tactile Disc)

### Layers of the Epidermis

- Most areas of the body have <u>four strata</u> or layers. This is referred to as <u>thin</u> <u>skin</u>.
- In areas of the body exposed to greater friction, like the <u>fingertips</u>, <u>palms and</u> <u>soles of the feet</u> the epidermis has <u>five strata</u> or layers. This is referred to as <u>thick skin</u>.
- The epidermis is <u>avascular</u> (no blood vessels) and cells get their nutrients by way of <u>diffusion</u> from the deeper dermis (connective tissue).
- As cells move away from the dermis they start to <u>dehydrate</u> and <u>die</u>. This leads to the distinctive <u>strata</u> in the epidermis.



Stratum Corneum

Granular layer (contains purple keratinohyaline granules)

Stratum spinosum (spiny processes separate keratinocytes)

Basal layer

- 1. stratum basale or germinativum
  - The deepest layer
  - rests on the basement membrane
  - is a single layer of <u>cuboidal or columnar keratinocytes</u>
  - This is the <u>mitotically active</u> layer.

### 2. stratum spinosum

- Just above the S. basale
- Several layers(8-10) of spiny shaped cells



## 3. stratum granulosum

- just above S. Spinosum
- 3-5 layers of flattened keratinocyte
- Nuclei are fragmented (cells are dying).



### 4. stratum lucidum

- Only present in thick skin
- 3-5 layers of clear dead keratinocytes
- contain large amounts of keratin



### 5. stratum corneum

- 25-30 layers of flattened dead keratino
- outermost layer of the epidermis
- continually being shed and replaced by cells from the deeper strata.



### Callus

• An abnormal thickening of the <u>stratum corneum</u> resulting from constant exposure to <u>friction</u>.



### Dermis

- <u>Deeper</u> part of the skin.
- Made primarily of connective tissue containing <u>collagen</u> and <u>elastic</u> fibers.
- Has two layers:
  - superficial (papillary layer)
  - deeper (reticular layer)
- \*Both are highly vascular

### Papillary layer of the demis

- $\frac{1}{5}$  of the thickness of the dermis.
- It is Areolar connective tissue with fine elastic fibers.
- Forms fingerlike projections called <u>dermal</u> <u>papillae</u> to increase the surface area and contact with the <u>epidermis</u>.







### Reticular layer of the dermis

- attaches to the <u>subcutaneous layer</u> (hypodermis)
- It is <u>Dense irregular connective</u> <u>tissue</u> with bundles of collagen and some coarse elastic fibers.



### Skin Colour 1.Melanin

- Located primarily in the <u>epidermis</u>.
- Protects the body from <u>UV</u> radiation.
- When a person tans the body is increasing the amount of melanin in the skin.



- <u>Freckles</u> are patches of melanin
- Liver spots are caused by an accumulation of melanin





## 2. Carotene

- A yellow orange pigment.
- Found in the <u>S. corneum</u> and fatty areas of the dermis and hypodermis.



#### 3.Hemoglobin

- <u>Pink to red</u> coloration.
- It is the oxygen-carrying protein found in blood

#### Abnormal skin colorations

#### Albinism

- A genetic disorder where an individual can't produce <u>melanin</u>.
- This will affect <u>skin, hair</u> and <u>eye</u> <u>color</u>.



#### Cyanosis/Cyanotic

• <u>Bluish</u> coloration of the skin as a result of low <u>oxygen</u> content.





#### Jaundice

- <u>Yellow</u> coloration of the skin and eyes.
- Typically the result of <u>liver</u> problems.
- It is the buildup of bilirubin in the blood.



### Erythema

- Enlargement of the capillaries in the dermis.
- Causes a <u>red</u> discoloration of the skin.
- From infection, injury or allergies.



# 1. Hair

- Covers the body; except for the <u>palms of the hands</u>, <u>soles of</u> <u>the feet</u> and a few other areas.
- Modified epidermis
- They are organs of sensation and protection.

#### Shaft

• The visible portion of the hair extending above the skin surface.



#### Root

### Portion of the hair deep to the shaft penetrating the dermis within a hair follicle.



#### Hair follicle

• A hair follicle is a mass of epidermis that wraps around each hair extending down into the dermis and forms a small tube.



### Hair papilla

- The base of the hair follicle.
- Contains blood vessels that nourish the growing hair.

Arrector pili muscle



- Runs from the dermis to the side of the hair follicle.
- Smooth muscle (involuntary) that can make hair stand up straight. ("goose bumps")

#### Hair root plexus

- Nerves associated with hair follicles that aid in touch sensation.
- Think of an ant crawling over your skin.



#### Hair color

- Melanocytes in the base of the hair produce melanin which passes into the hair.
- Dark hair contains true melanin.
- Blonde and red hair have a variant of melanin with <u>iron</u> or <u>sulfur</u>.
- Gray hair has reduced <u>melanin</u>.
- White hair is an accumulation of <u>air bubbles</u> in the hair shaft.

#### Function of hair

- Protects scalp from sun and injury.
- Eyelashes and eyebrows protect eyes.
- Nostril hair help filter air
- Helps with sensing light touch (hair root plexuses)

### **Hair Disorders**

• Hirsutism

Excessive hair growth in <u>women</u> in a male growth pattern.

Typically the result of excessive male hormone levels in the woman androgens. Alopecia Loss of hair







### Sebaceous gland

- <u>Oil glands</u>
- Connected to <u>hair follicles</u>
- Secretes an oily substance called <u>sebum</u>
  - Prevents excessive water loss
  - Keeps skin soft
  - Coats hair
  - Inhibits some bacterial growth



#### Sudoriferous gland

- Sweat glands
- 3-4 million
- 2 types
  - -Eccrine sweat glands
  - Apocrine sweat glands

Eccrine sweat gland

- Secretes <u>cooling sweat</u>
- Secreted directly onto the skin
- Helps regulates <u>body temperature</u> and aids in <u>waste removal</u>.
- Contains <u>water</u>, <u>ions (Na<sup>+</sup></u>),<u>urea</u> and <u>uric acid</u>



### Ejaithetial cells of a sweat gland





#### **Apocrine sweat gland**

- Secretion stimulated by <u>stress</u>
- Secreted into the hair follicle of the <u>axilla</u> and <u>groin</u> regions.
- Begin to function at <u>puberty</u>
- Slightly more <u>viscous</u> than eccrine sweat.
- Made of the same components as eccrine sweat plus <u>lipids</u> and <u>proteins</u>

#### **Ceruminous gland**

- Modified sweat gland of the <u>external ear.</u>
- Secretes <u>cerumen</u> (earwax)
- Along with ear hair provides a sticky barrier to

foreign items.



#### Vocab Sheet

- Sebaceous gland
- Eccrine gland
- Apocrine gland
- Ceruminous gland

### The Nails

- Like our hairs, nails are modified epidermis. So, what are nails primarily made of?
- How are they different than hair?

• Made of <u>plates</u> of tightly packed, hard, keratinized epidermal cells.

#### Nail structure

- Nail body: visible part of the nail
- Free edge: part that extends past the distal end of the digit.
- Nail root: part of the nail that is not visible.New nail cells are created here.



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- Lunula: crescent shaped area at the base of the nail.
- Cuticle: a narrow band of epidermis that grows over the proximal nail.
   Nail Growth
- Nail cells under the skin multiply.
- The new cells push the old cells out above the skin.
- Once the cells reach the surface they die.
- Grows about 1mm/week

### Functions of the Integumentary System

### 1. Body temperature regulation

Two ways:

- a. releases sweat onto the surface of the skin.
- b. altering the flow of blood through the blood vessels in the dermis.



### 2. Protection

- a. Keratin protects the underlying tissues abrasion, heat and microbes.
- b. Fats in the skin resist the loss of water.
- c. Melanin protects against UV light.
- d. acidic pH of sweat slows the growth of some bacteria



### **3.**Sensation

- <u>Touch</u>, <u>pressure</u>, <u>vibration</u>, <u>ticklin</u>~
  <u>warmth and coolness</u>, and <u>pain</u>
  can result from nerve endings in the skin.
- Referred to as <u>cutaneous</u> <u>sensation</u>.



### 4. Excretion

• Glands in the skin excrete water, fatty substances and ions like sodium.



### 5. absorption

The skin does have the ability to absorb some <u>fat-soluble vitamins</u> (A, E and K) and <u>hormones</u>.



### 6. Synthesis of vitamin D

 Vitamin D is formed in the <u>epidermis</u> when exposed to <u>UV</u> radiation. It is then modified and transported to the digestive tract where it aids in the absorption of <u>calcium</u>.