Anatomy of Skin
Kyle EB

1. What is wrong with Kyle?
2. How does this condition affect Kyle’s health/life?
3. What is the new treatment?
4. What would you do if you were Kyle? (receive the treatment or not?)
The Story of Kyle Hicks

Skin

- The external surface of the body.
- Also referred to as the **cutaneous membrane**.
- About **16%** of an adult’s total body weight. (So if you weigh 100 lbs that means your skin weighs **16 lbs**).
Structure of the Skin

- Two main parts:
  - **Epidermis**
    - superficial
    - thinner
    - epithelial tissue
  - **Dermis**
    - deeper
    - thicker
    - connective tissue

*The two layers are attached by the basement membrane.*
- **Subcutaneous layer** (subQ)
  - Also called the *hypodermis*.
  - Deep to the *dermis*, but not part of the skin.
  - Consists of *areolar* and *adipose* ct
  - Attaches skin to underlying *tissues* and *organs*. 
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 8% 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.
4. Merkel cells

○ associated with touch
Layers of the Epidermis

- Most areas of the body have **four strata** or layers. This is referred to as **thin skin**.
- In areas of the body exposed to **greater friction**, like the **fingertips, palms and soles of the feet** the epidermis has **five strata** or layers. This is referred to as **thick skin**.
The epidermis is **avascular** (no blood vessels) and cells get their nutrients by way of **diffusion** from the deeper dermis (**connective tissue**).

As cells move away from the dermis they start to **dehydrate** and **die**. This leads to the distinctive **strata** 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 **cuboidal or columnar keratinocytes**
- This is the **mitotically active** 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 keratinocytes.
- 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 keratinocytes
- outermost layer of the epidermis
- continually being shed and replaced by cells from the deeper strata.
Callus

- An abnormal thickening of the **stratum corneum** resulting from constant exposure to **friction**.
**Stratum Corneum**

**Granular layer**
(contains purple keratinozyaline granules)

**Stratum spinosum**
(spiny processes separate keratinocytes)

**Basal layer**
Mnemonic & Poster

- Cora Lucille’s Granny Spins Baseballs
- Look at the diagrams on pg 103 in the red textbook to help create your posters.
On a loose-leaf sheet of paper with your name on it, answer the following:

1. What is the meaning of **keratinized stratified squamous epithelium**? (describe all four terms)
2. Why does the epidermis stratify?
The Dermis
Dermis

- **Deeper** part of the skin.
- Made primarily of connective tissue containing **collagen** and **elastic** fibers.
- Has two layers:
  - superficial (papillary layer)
  - deeper (reticular layer)

*Both are highly vascular*
Papillary layer of the dermis

- \( \frac{1}{5} \) of the thickness of the dermis.
- It is **Areolar connective tissue** with fine elastic fibers.
- Forms fingerlike projections called **dermal papillae** to increase the surface area and contact with the **epidermis**.
Reticular layer of the dermis

- attaches to the **subcutaneous layer** (hypodermis)
- It is **Dense irregular connective tissue** with bundles of collagen and some coarse elastic fibers.
Compare and Contrast

Create a Venn Diagram comparing and contrasting the **epidermis** and the **dermis**.
Find a **new** seat. Only **4** people in the lab benches.
Why do we find different skin color in people from different parts of the globe?
Skin Color
1. Melanin

- Located primarily in the **epidermis**.
- Protects the body from **UV radiation**.
- When a person tans the body is increasing the amount of melanin in the skin.
• **Freckles** are patches of melanin

• **Liver spots** are caused by an accumulation of melanin
2. Carotene

• A yellow-orange pigment.

• Found in the *S. corneum* and fatty areas of the dermis and hypodermis.
3. Hemoglobin

- Pink to red coloration.
- It is the oxygen-carrying protein found in blood.
Abnormal skin colorations
Albinism

• A genetic disorder where an individual can’t produce melanin.
• This will affect skin, hair and eye color.
Cyanosis/Cyanotic

• Bluish coloration of the skin as a result of low oxygen content.
Jaundice

- **Yellow** coloration of the skin and eyes.
- Typically the result of liver problems.
- It is the buildup of bilirubin in the blood.
Erythema

- Enlargement of the capillaries in the dermis.
- Causes a red discoloration of the skin.
- From infection, injury or allergies.
Accessory Structures of the Skin
1. Hair

• Covers the body; except for the **palms of the hands, soles of the feet** 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 **iron** or **sulfur**.
• Gray hair has reduced **melanin**.
• White hair is an accumulation of **air bubbles** 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 women in a male growth pattern.
  – Typically the result of excessive male hormone levels in the woman (androgens).
alopecia

• loss of hair
2. Skin glands
What do the glands in your skin do?
Sebaceous gland

• **Oil glands**
• Connected to **hair follicles**
• Secretes an oily substance called **sebum**
  – 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 **cooling sweat**
- Secreted **directly onto the skin**
- Helps regulates **body temperature** and aids in **waste removal**.
- Contains **water**, **ions (Na⁺)**, **urea** and **uric acid**
Apocrine sweat gland

• Secretion stimulated by stress
• Secreted into the hair follicle of the axilla and groin regions.
• Begin to function at puberty
• Slightly more **viscous** than eccrine sweat.

• Made of the same components as eccrine sweat plus **lipids** and **proteins**.
C. Ceruminous gland

- Modified sweat gland of the **external ear**.
- Secretes **cerumen** (earwax)
- Along with ear hair provides a sticky barrier to foreign items.
Got it. Need it.
Vocab Sheet

- Sebaceous gland
- Eccrine gland
- Apocrine gland
- Ceruminous gland
What did you learn? What questions do you have?

• What was 1 thing you learned today?
• Or what is one question you have about what was discussed today?
The Nails

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

• Made of **plates** 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.
• **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 from 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

- **Touch, pressure, vibration, tickling, warmth and coolness**, and **pain** can result from nerve endings in the skin.
- Referred to as **cutaneous sensation**.
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 fat-soluble vitamins (A, E and K) and hormones.
6. Synthesis of vitamin D

- Vitamin D is formed in the **epidermis** when exposed to **UV** radiation. It is then modified and transported to the digestive tract where it aids in the absorption of **calcium**.
What do you think?