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

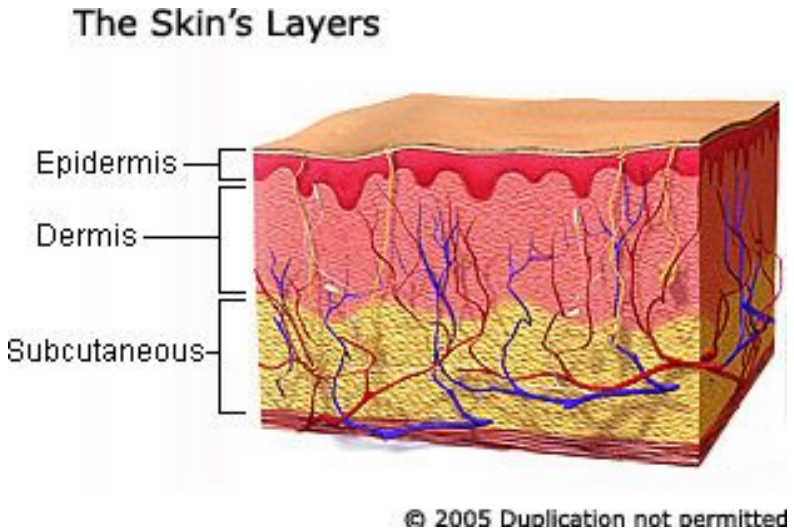
http://www.kansas.com/news/local/education/article21264273.html

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)

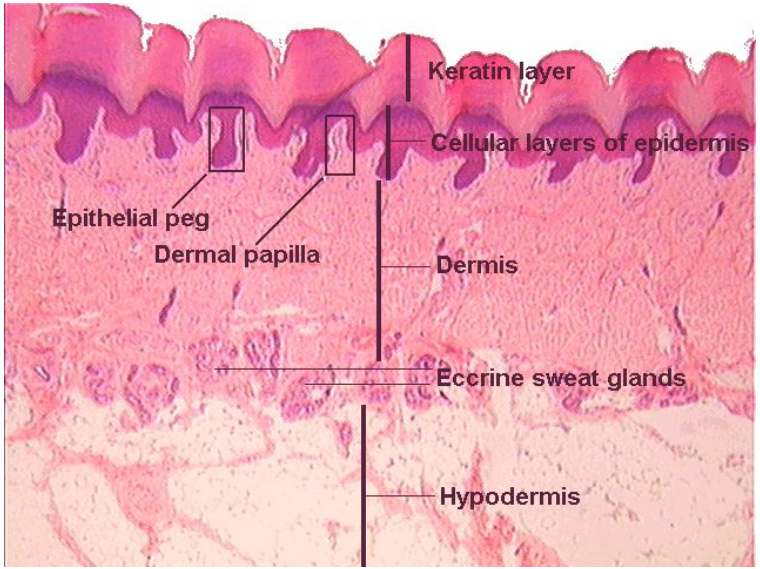
Structure of the Skin

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



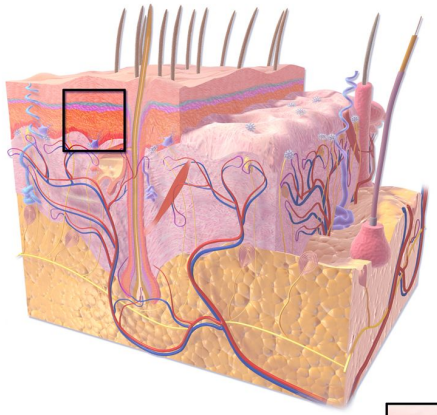
*The two layers are attached by the basement membrane.

- **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**.

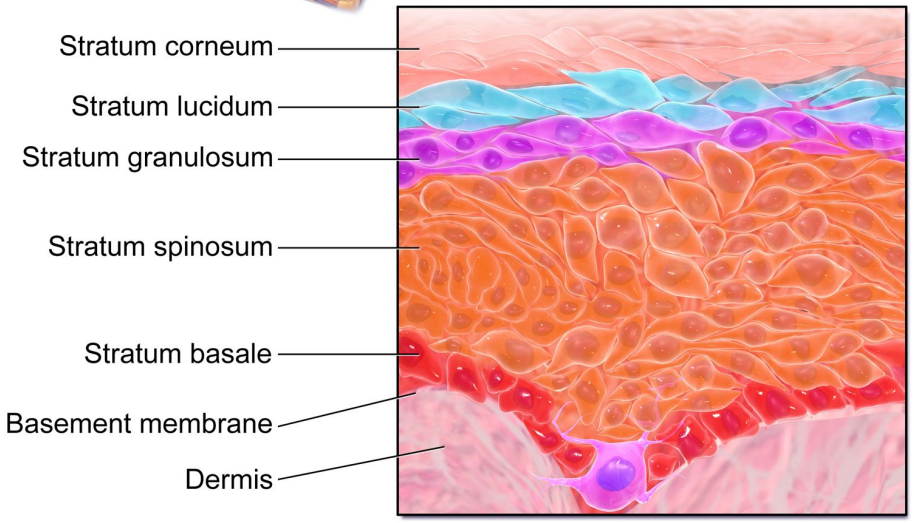


Epidermis

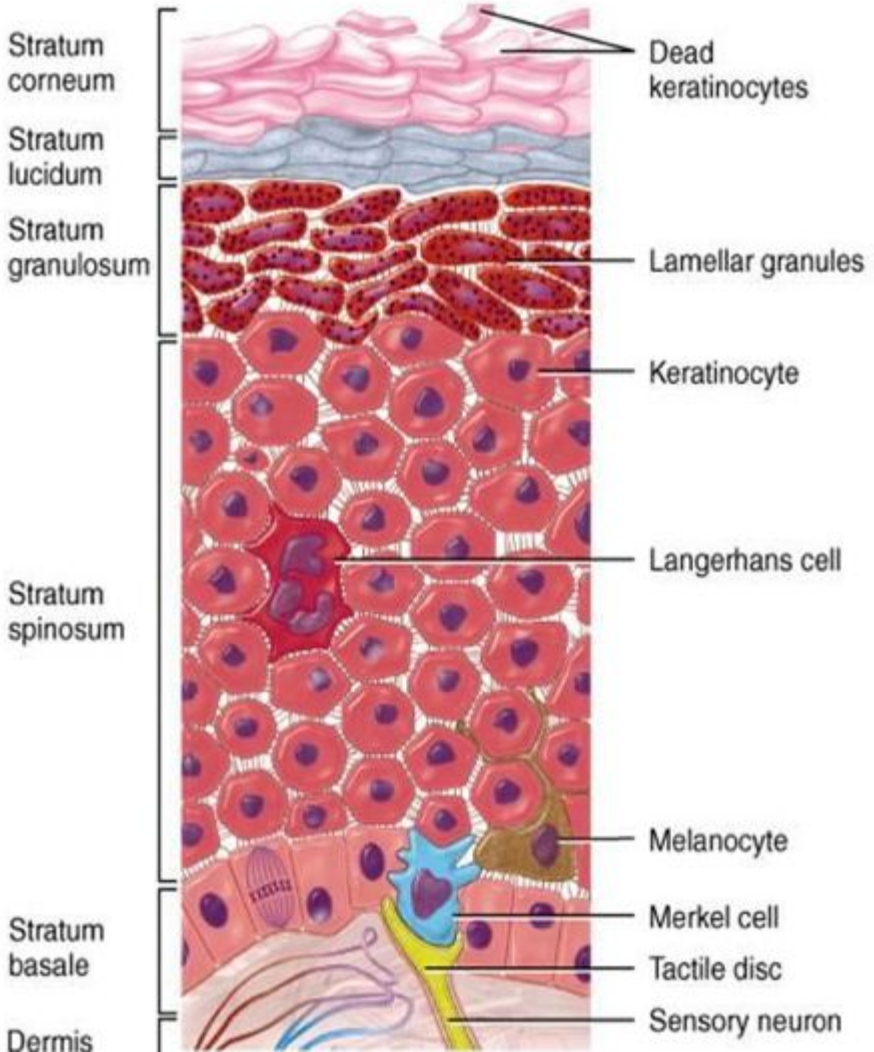
- It is keratinized stratified squamous epithelium
- 4 key cells:



The Structure of the Epidermis

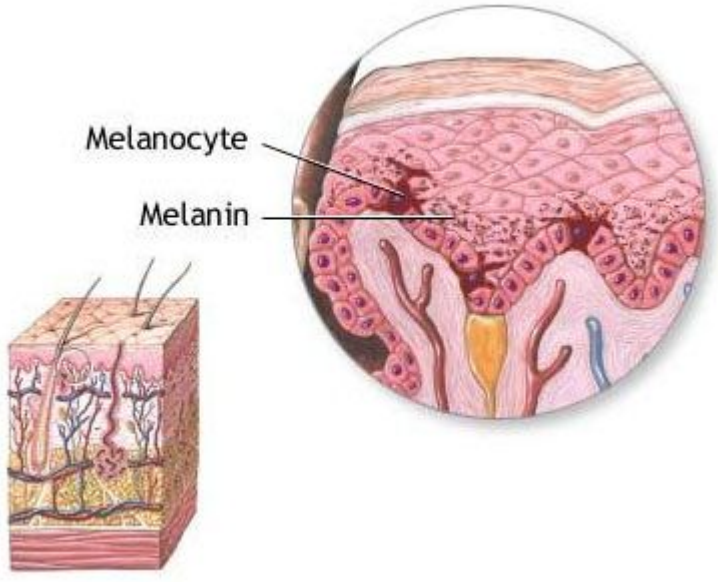


1. Keratinocytes
    - They make the protein **keratin** (a tough, protective protein).
    - The most numerous cell type: about 90% of the epidermal cells.



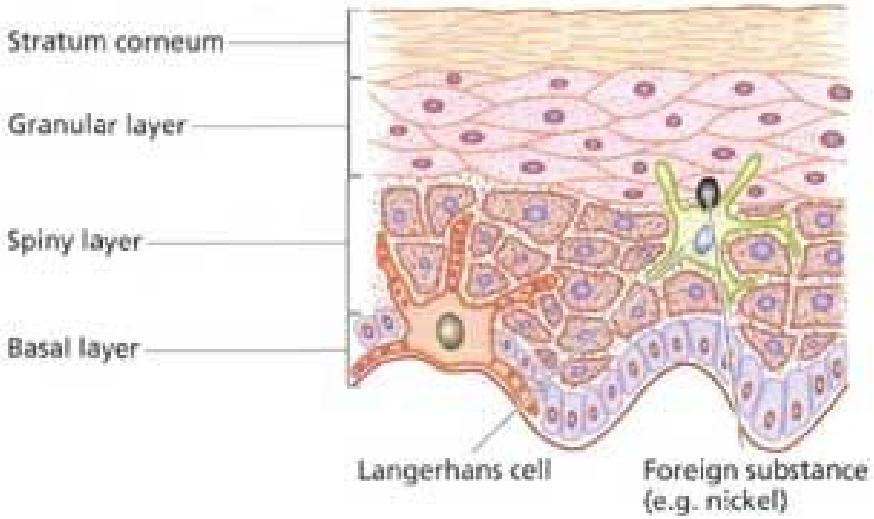
2. Melanocytes

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



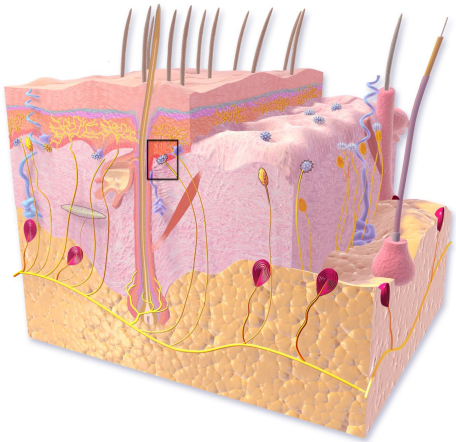
3. Langerhans cells

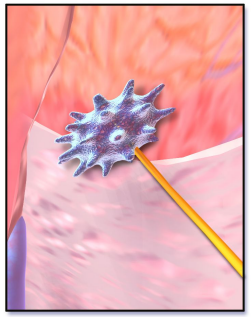
- Immune cells located in the epidermis.



4. Merkel cells

- associated with touch



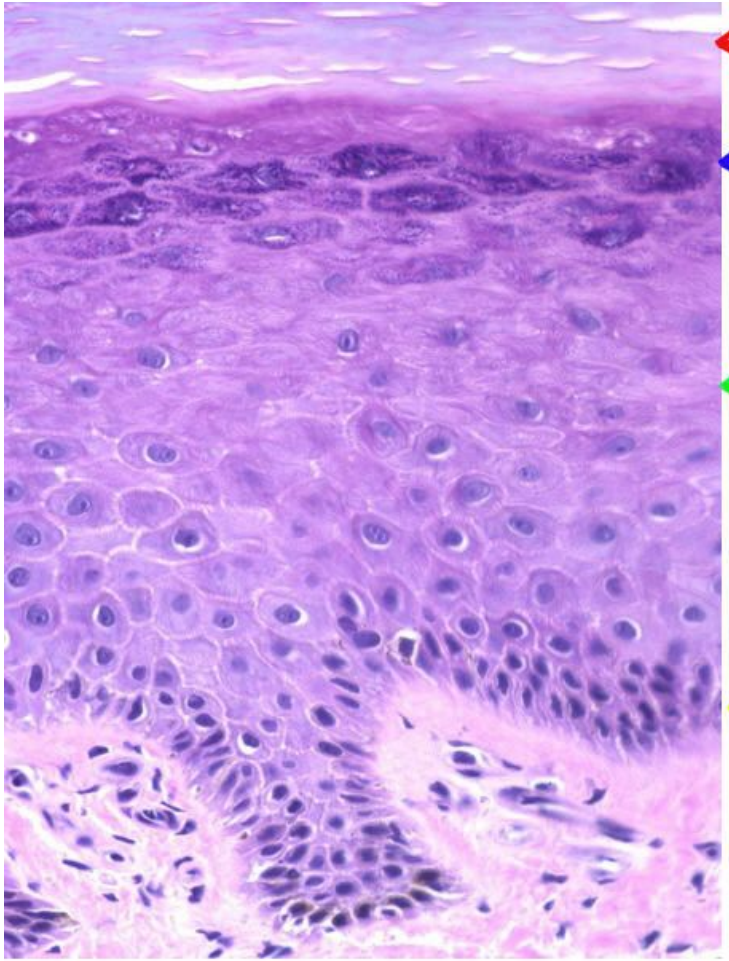


Merkel Cell
(Tactile Disc)

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

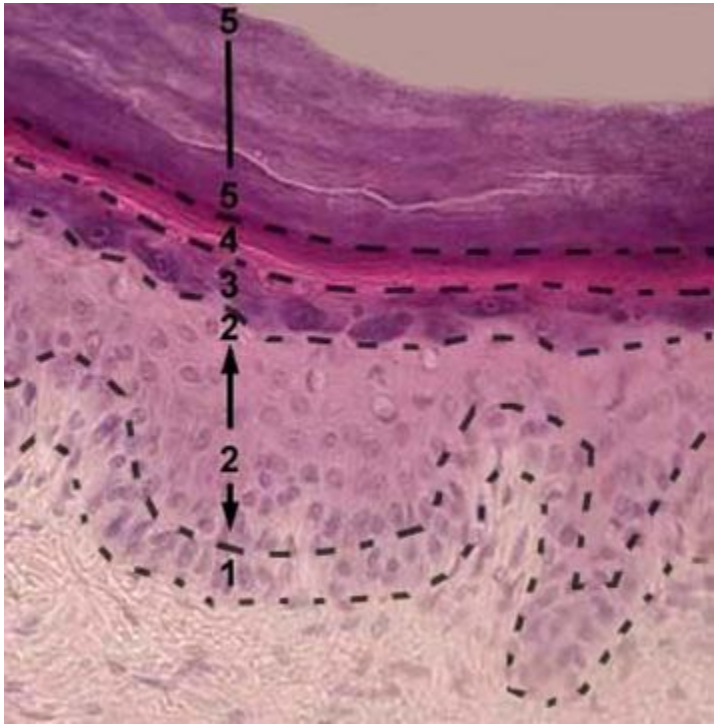
- just above S. Spinosum
- 3-5 layers of flattened keratinocytes.
- Nuclei are fragmented (cells are dying).

4. stratum lucidum

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

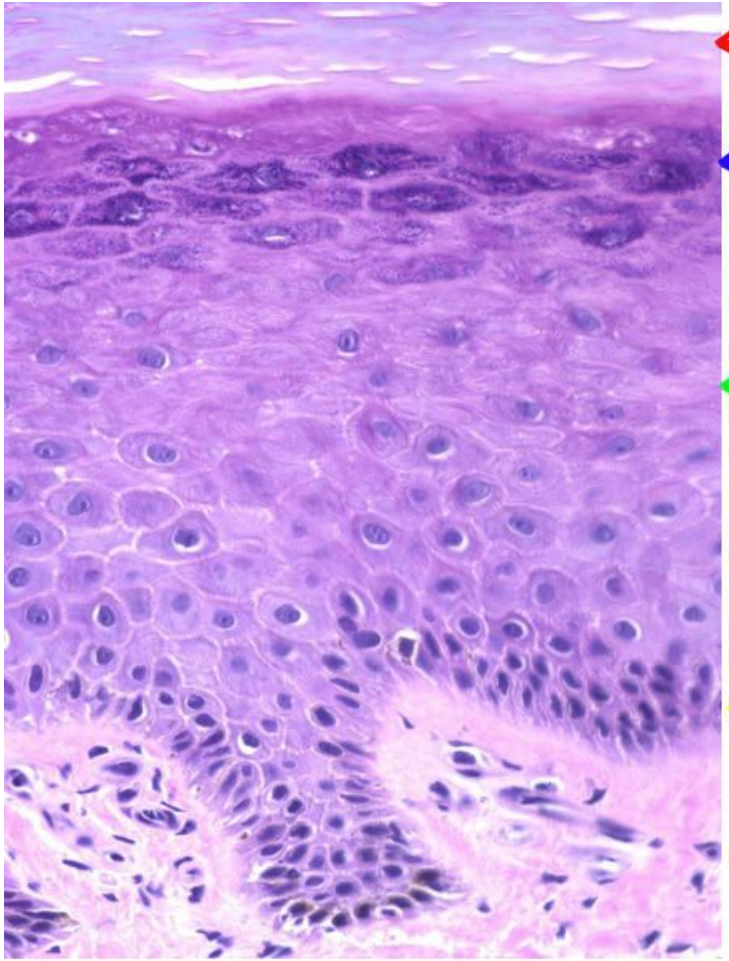
5. stratum corneum

- 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 keratinohyaline 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.

Summary

On a loose-leaf sheet of paper with you 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

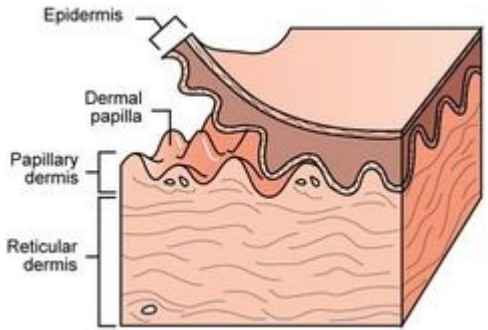
Dermis

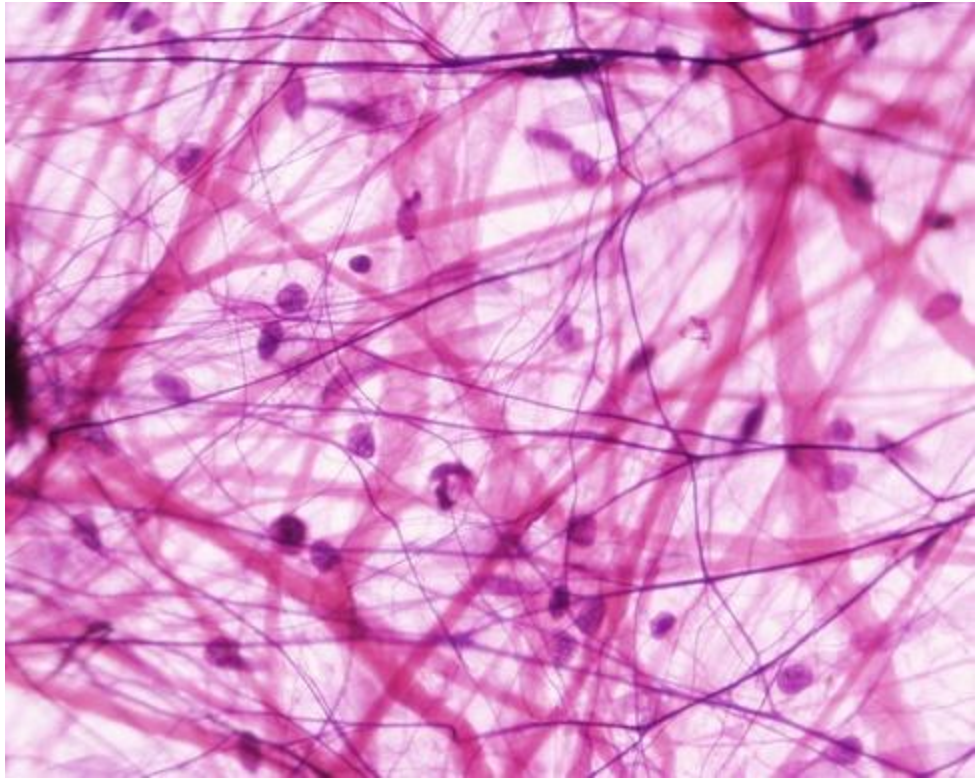
- **Deeper** part of the skin.
- Made primarily of connective tissue containing **collagen** and **elastic** fibers.
- Has two layers:
  - superficial (papillary layer)
  - deeper (reticular layer)

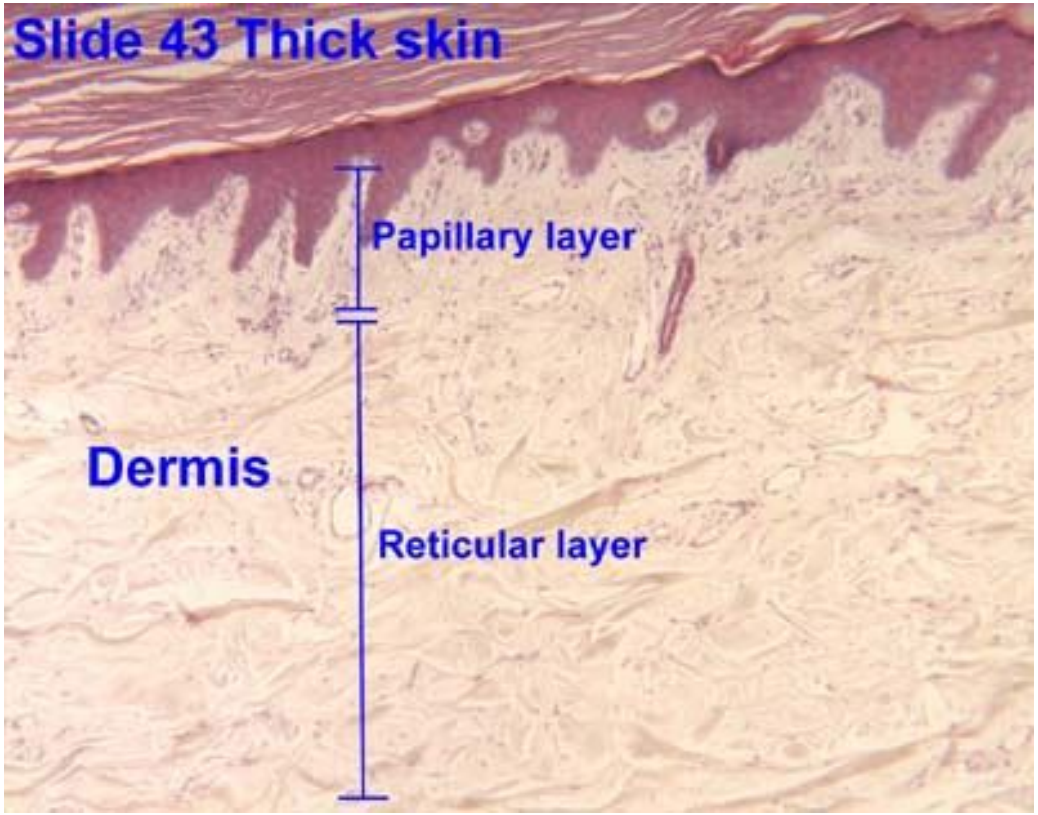
*Both are highly vascular

Papillary layer of the demis

- **⅕** 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**.

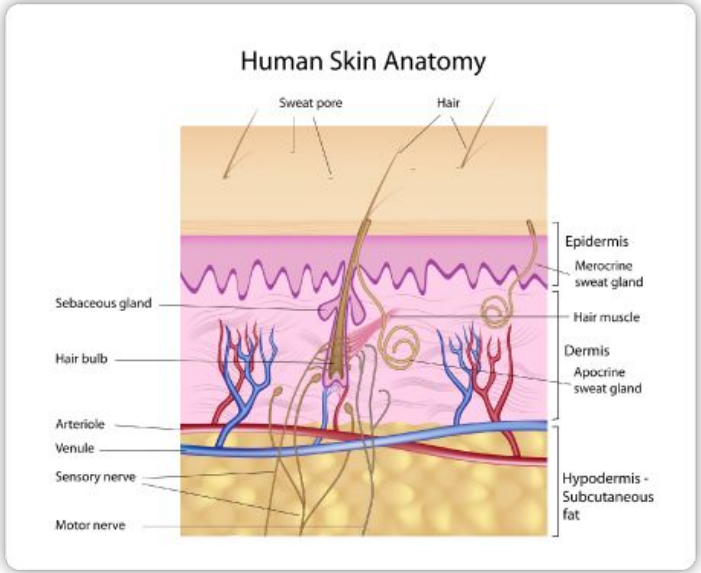


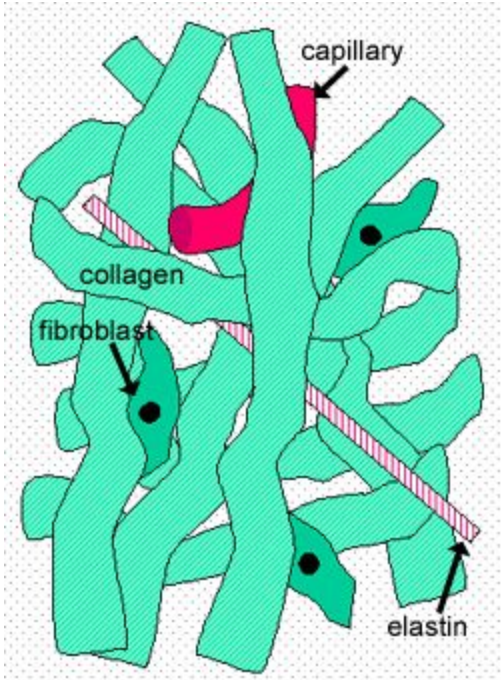



Slide 43 Thick skin
Papillary layer
Dermis
Reticular layer

Reticular layer of the dermis

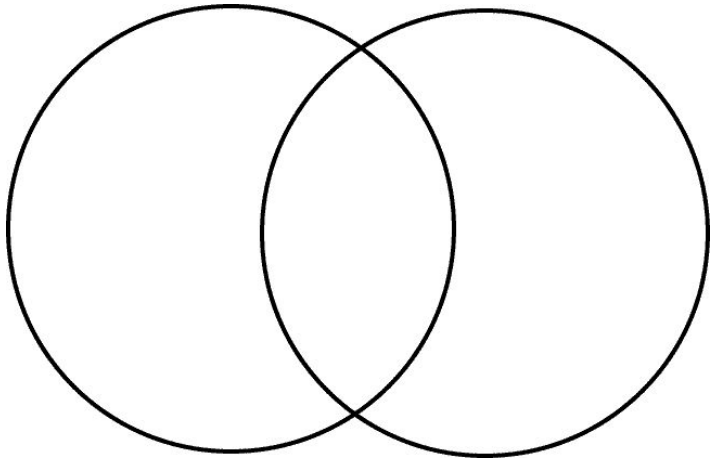
- attaches to the **subcutaneous layer** (hypodermis)
- It is **Dense irregular connective tissue** with bundles of collagen and some coarse elastic fibers.




capillary
collagen
fibroblast
elastin

Compare and Contrast

Create a Venn Diagram comparing and contrasting the **epidermis** and the **dermis**.



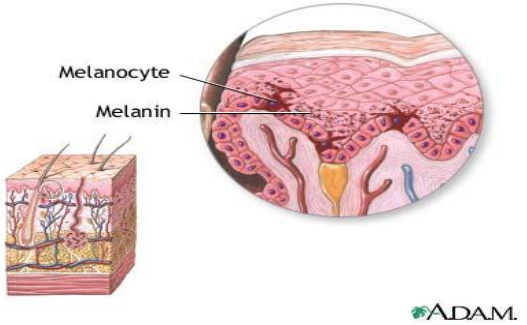
Find a **new** seat. Only **4** people in the lab benches.

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.



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

2. Carotene

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

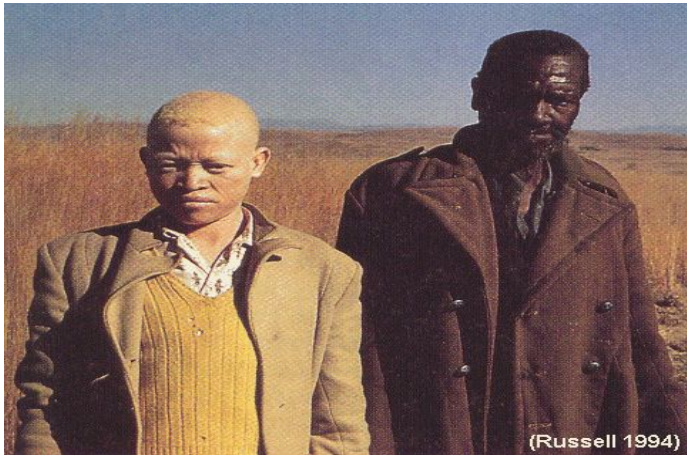
3.Hemoglobin

- **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

- **<u>Bluish</u>** coloration of the skin as a result of low **<u>oxygen</u>** 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.

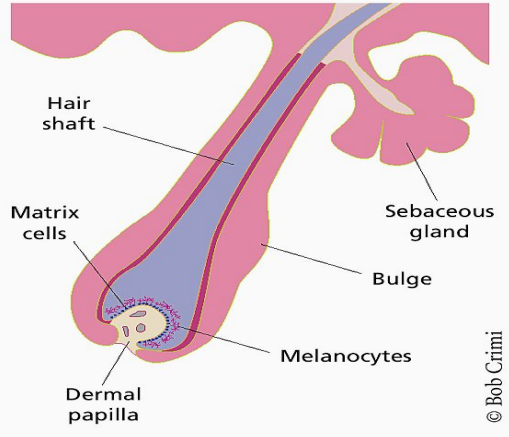
Accessory Structures of the Skin

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.

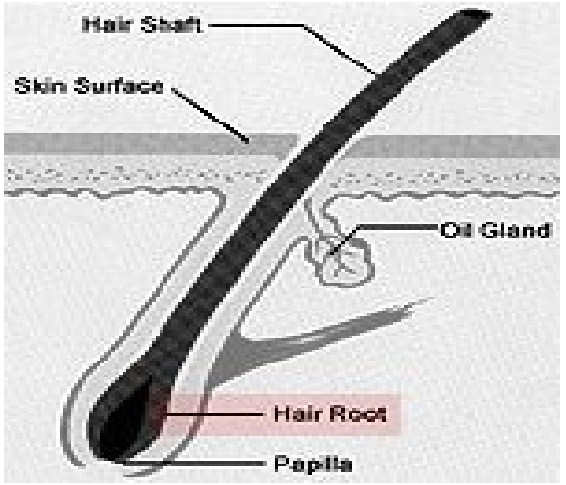
Shaft

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



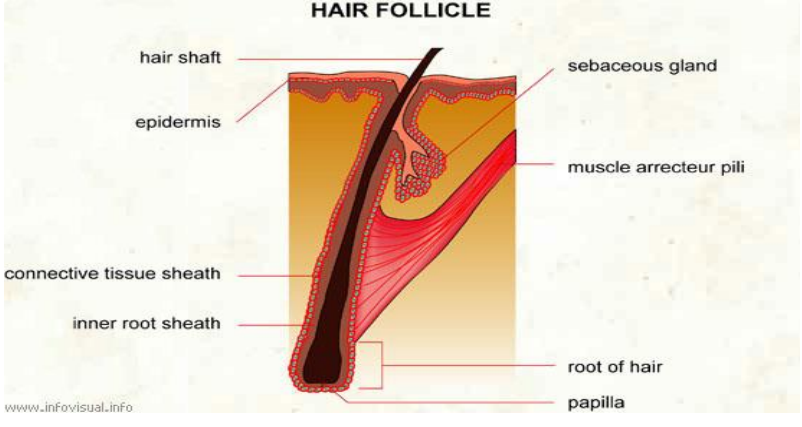
Root

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



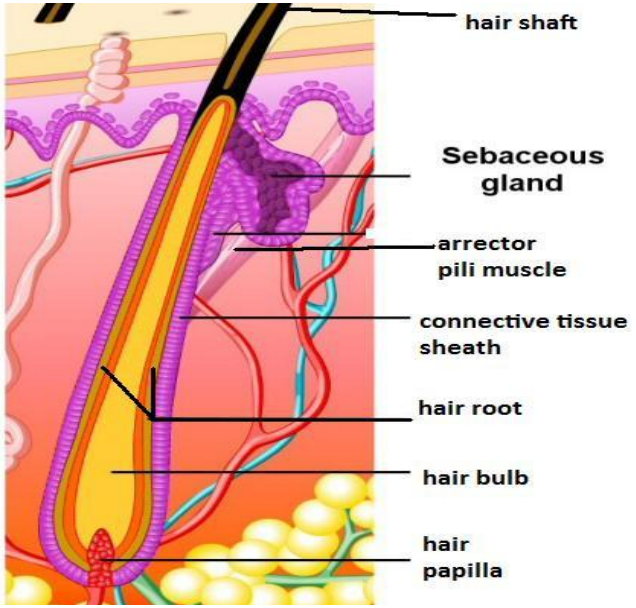
Hair follicle

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



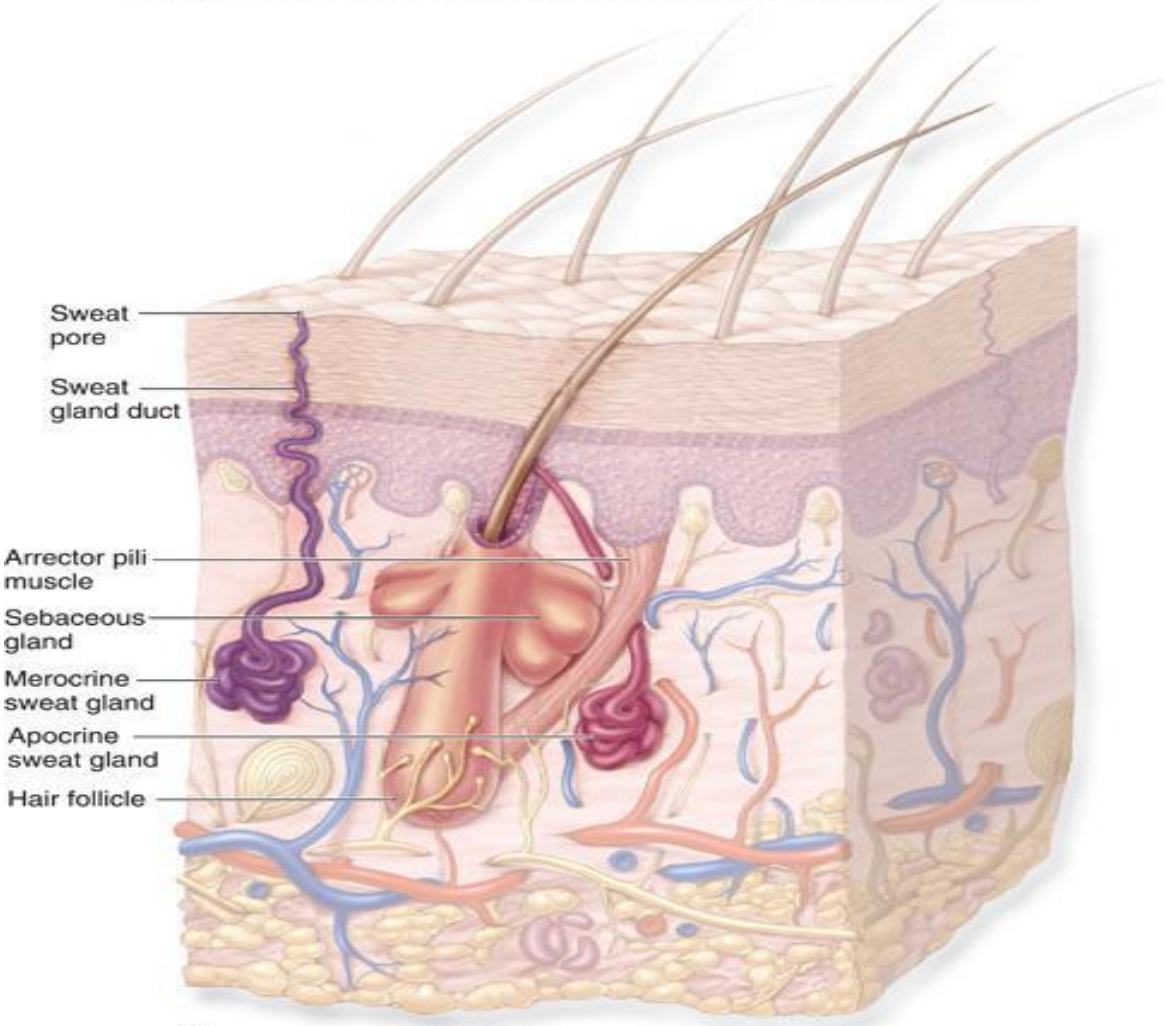
Hair papilla

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



Arrector pili muscle

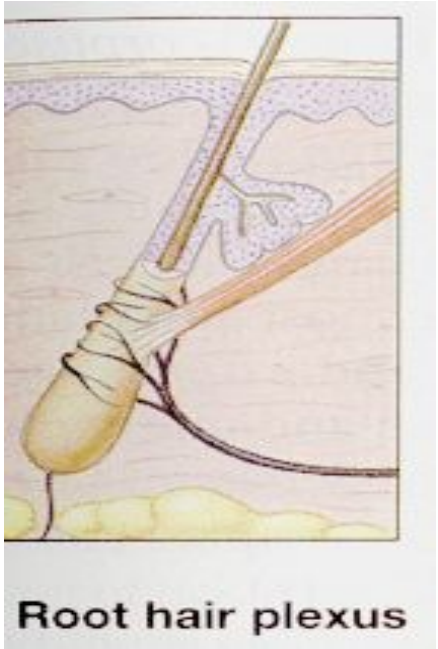
- Runs from the dermis to the side of the hair follicle.
- Smooth muscle (involuntary) that can make hair stand up straight. (“goose bumps”)



(a)

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).


Chas. Eisenmann, Photo., 229 Bowery, N. Y.

alopecia

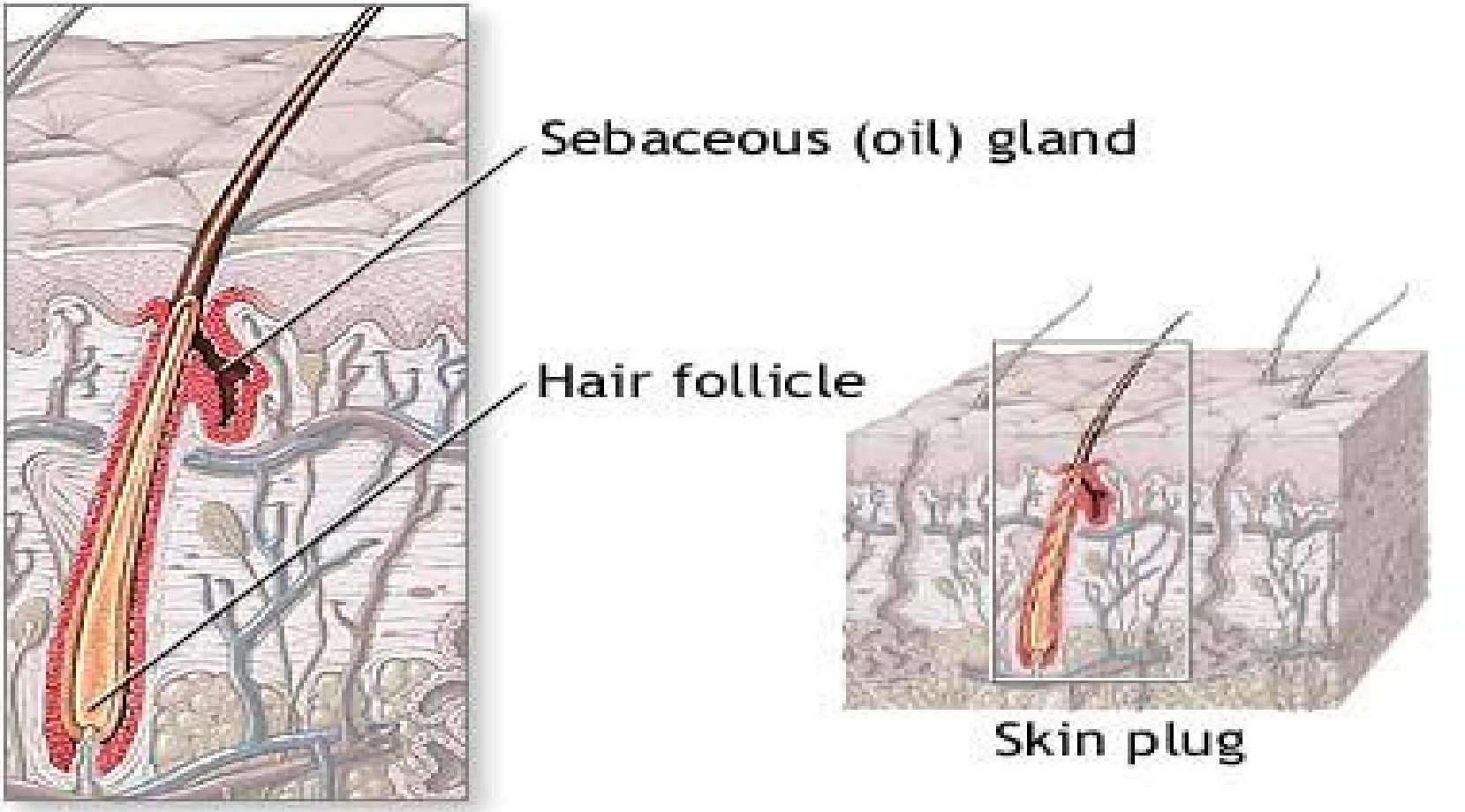
- loss of hair

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

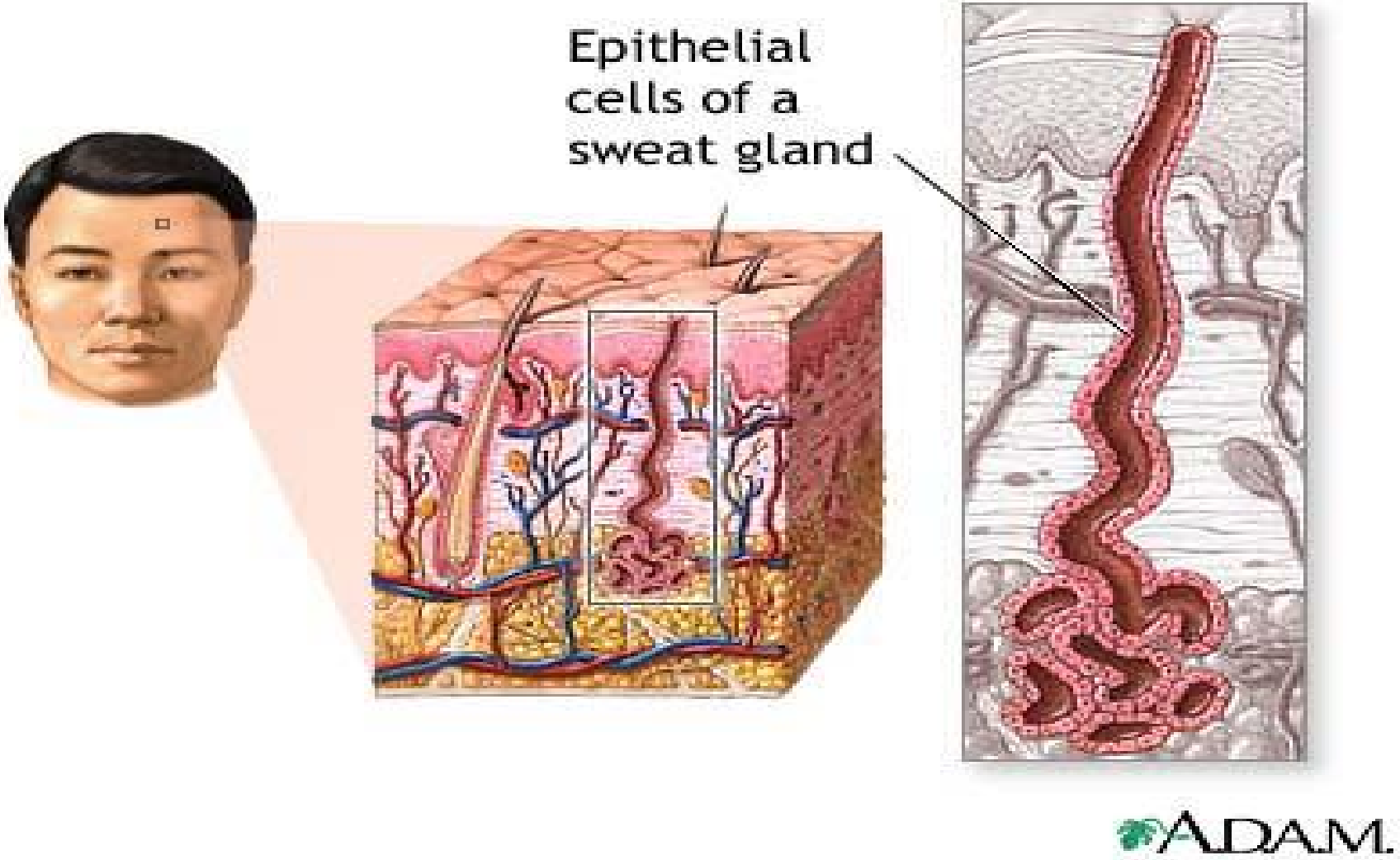


Sudoriferous gland

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

Eccrine sweat gland

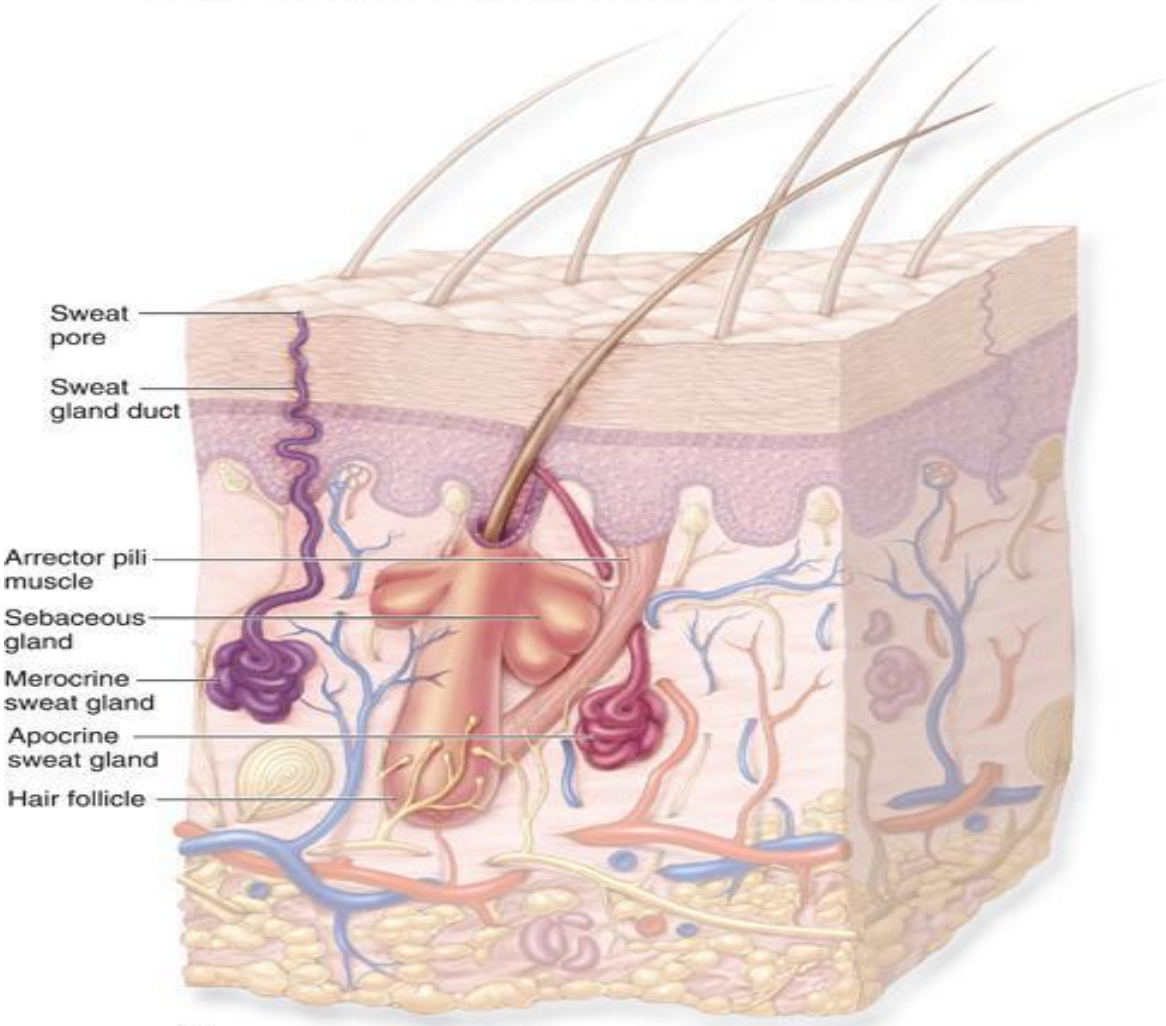
- Secretes **cooling sweat**
- Secreted **directly onto the skin**
- Helps regulates **body temperature** and aids in **waste removal**.
- Contains **water**, **ions (Na^{+})**,**urea** and **uric acid**


Epithelial cells of a sweat gland
A.D.A.M.

Apocrine sweat gland

- Secretion stimulated by **stress**
- Secreted into the hair follicle of the **axilla** and **groin** regions.
- Begin to function at **puberty**

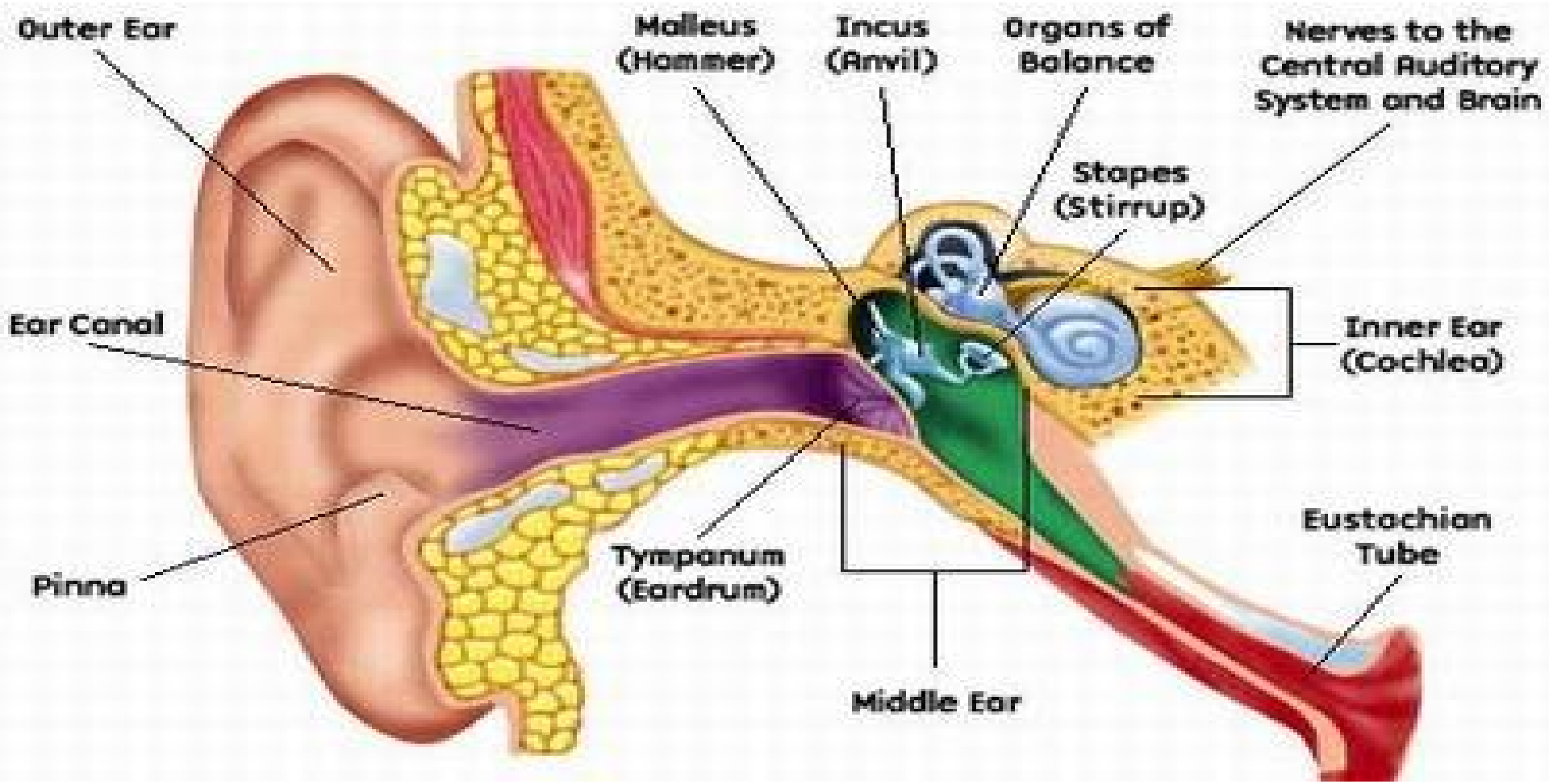
- Slightly more **viscous** than eccrine sweat.
- Made of the same components as eccrine sweat plus **lipids** and **proteins**.



(a)

C. Ceruminous gland

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


Outer Ear
Malleus (Hammer)
Incus (Anvil)
Organs of Balance
Nerves to the Central Auditory System and Brain
Stapes (Stirrup)
Ear Canal
Inner Ear (Cochlea)
Eustachian Tube
Tympanum (Eardrum)
Pinna
Middle Ear

Got it. Need it.

Vocab Sheet

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

The Nails

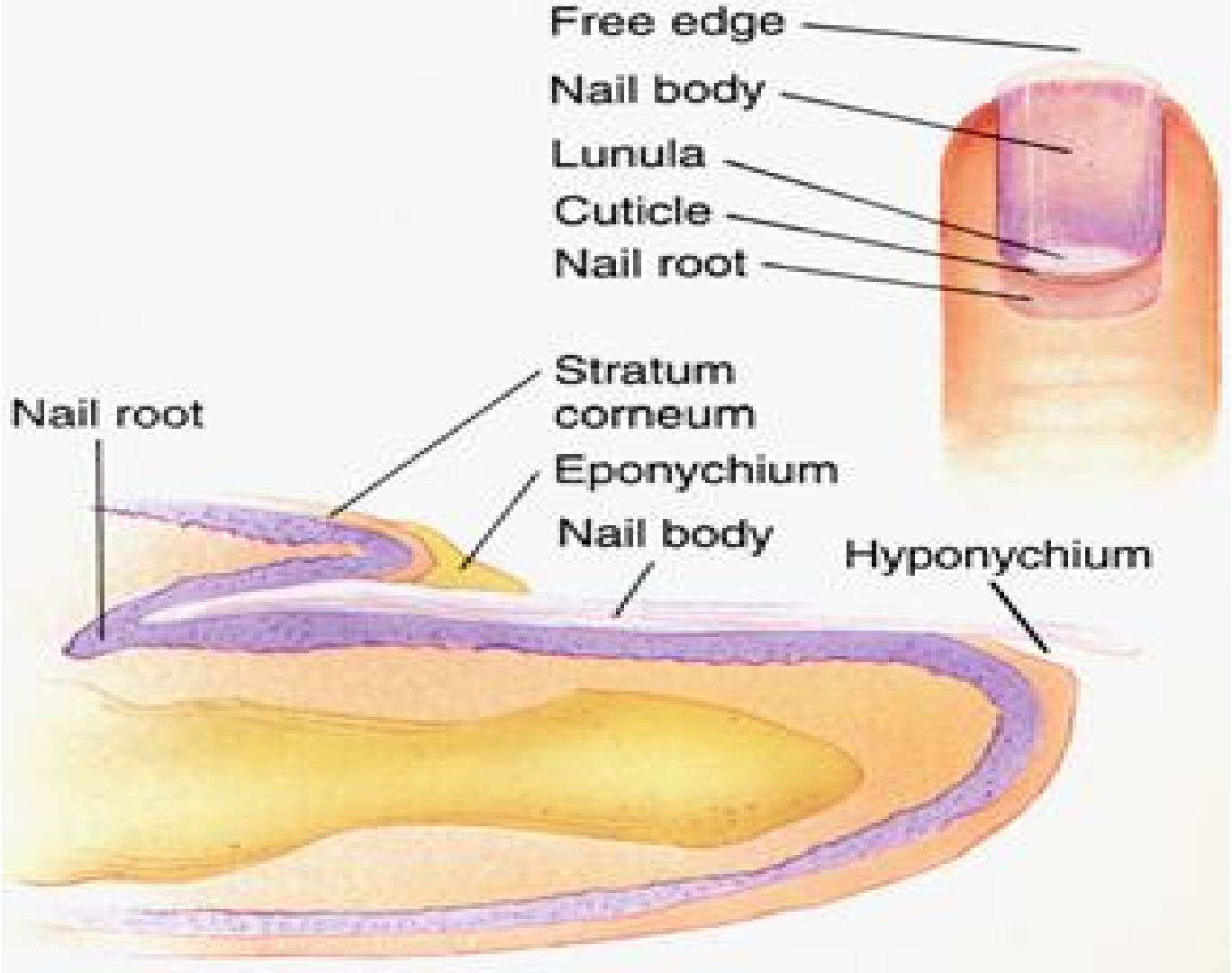
- Like our hairs, nails are modified epidermis. So, what are nails primarily made of?
- How are they different than hair?

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.


Free edge
Nail body
Lunula
Cuticle
Nail root
Nail root
Stratum corneum
Eponychium
Nail body
Hyponychium

- **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

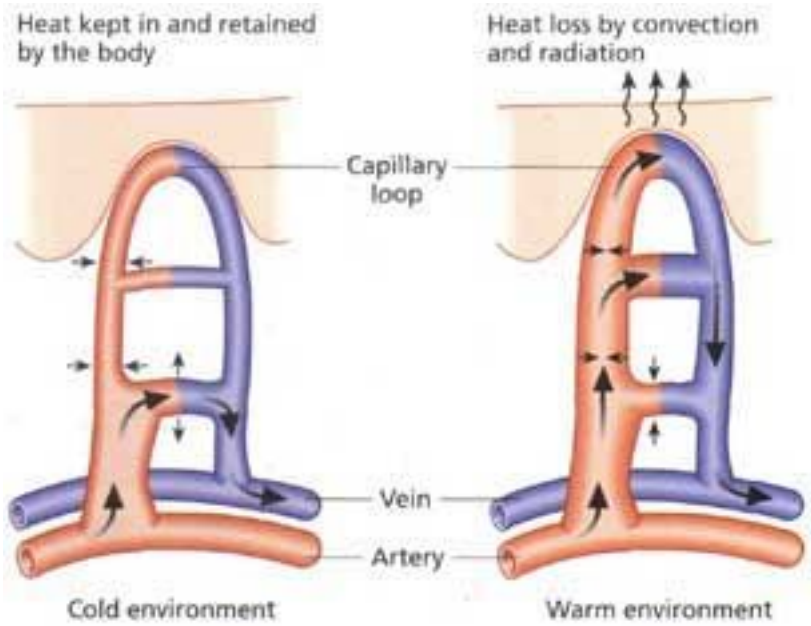
https://eyongetarock.wordpress.com/2013/06/16/worlds-longest-nails-4/

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.

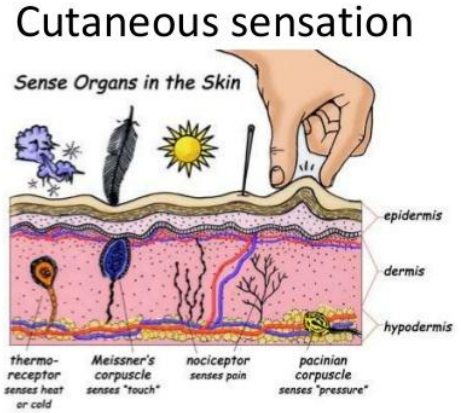


2. Protection

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

- **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?