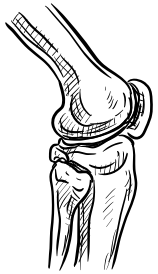
بسم الله الرحمن الرحيم



HISTOLOGY

MID | Lecture #2

Skin Histology pt.2

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Deema Nasrallah

وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوا أَمْثَالَكُم

اللهم استعملنا ولا تستبدلنا

رَمَضَانُ مُبَارَكٌ

بسم الله الرحمن الرحيم

QUIZ

بسم الله الرحمن الرحيم
اللهم لا سهل إلا ما جعلته سهلاً، وأنت تجعل الحزن إذا شئت سهلاً
اللهم سهّل علي دراستي، وبارك لي في وقتي، ووفقني لما تحب وترضى

Let’s get to the sensory receptors!

Sensory receptors

They are divided into two types depending on the presence of a connective tissue capsule

Unencapsulated receptors

Not surrounded by a connective tissue capsule (Naked)

Therefore:

Encapsulated receptors

Surrounded by a connective tissue capsule

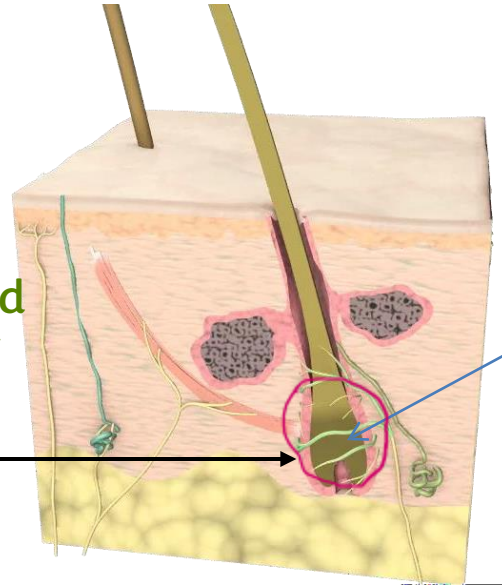
Unencapsulated nerve receptors

1 Merkel disc
- for light touch and sensing an object texture
- expanded nerve endings associated with merkel cell

2- Free nerve endings
- In papillary dermis
- Temperature, pain, itching, tactile sensation

Tactile sensation: sensation produced by pressure receptors in the skin. E.g: sensation of silk on skin.

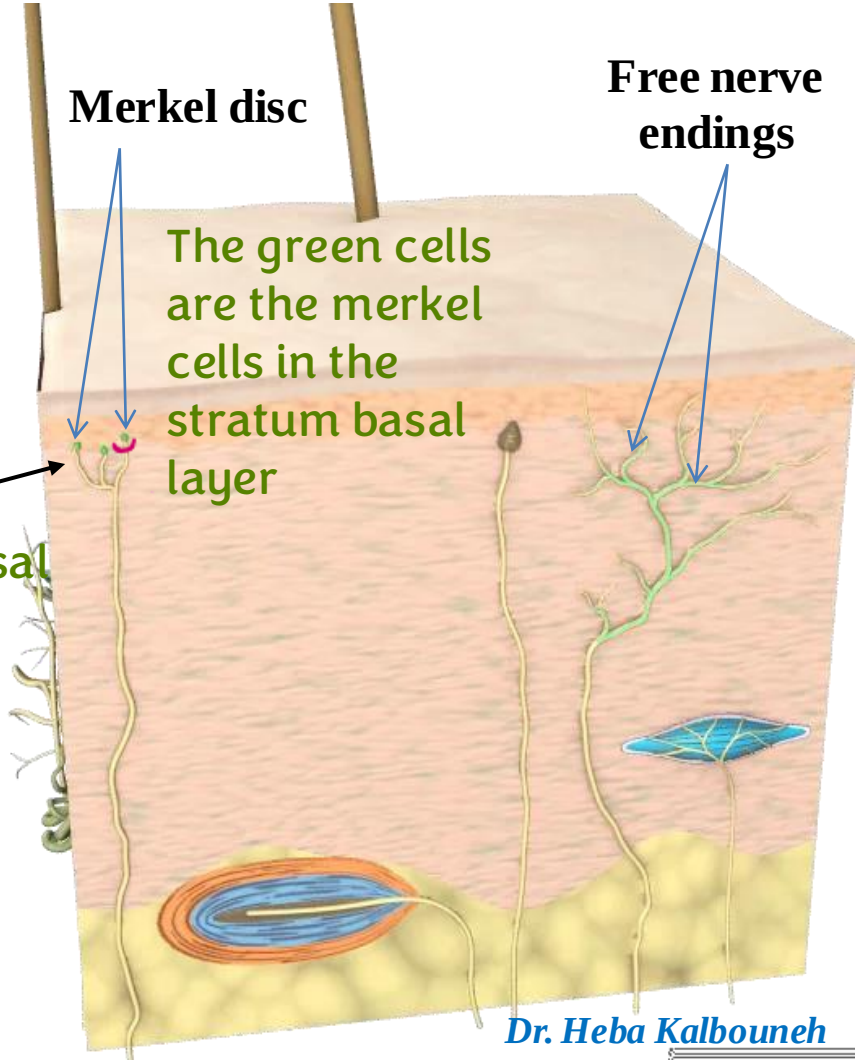
3- Root hair plexuses Associated with hair follicles.
- Surround the bases of hair follicles in reticular dermis
- Detect movements of hair



We have a sensory neuron wrapping around the basal part of the hair follicle, detecting the hair movement.

The sensory neuron is disc-like structure associated with the basal surface of these cells producing the merkel disc.

Root hair plexuses



The capsulated types of receptors:

The location of the corpuscle is important.

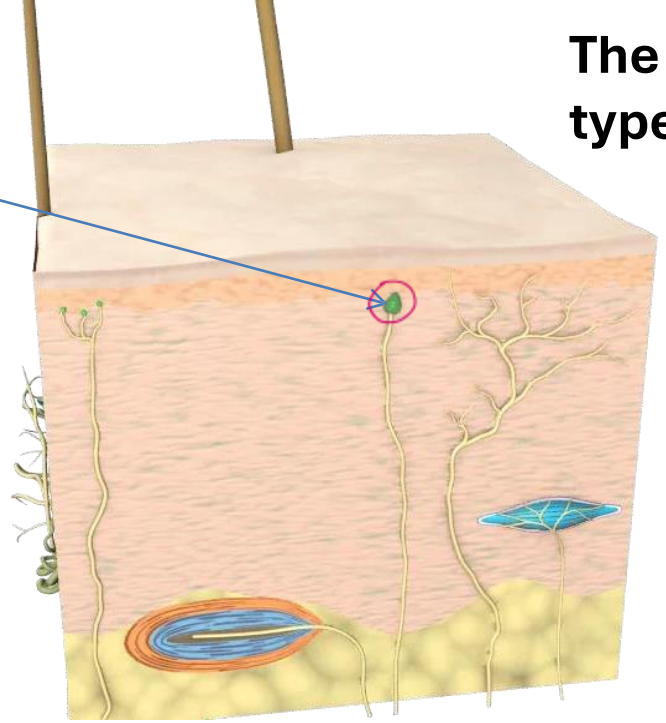
Meissner corpuscles:

- Encapsulated
- In the dermal papilla
- Light touch

Because they're superficial in location.

- Are numerous in fingertips, palms and soles
- Decline in number with aging

Corpuscle means a small rounded organism



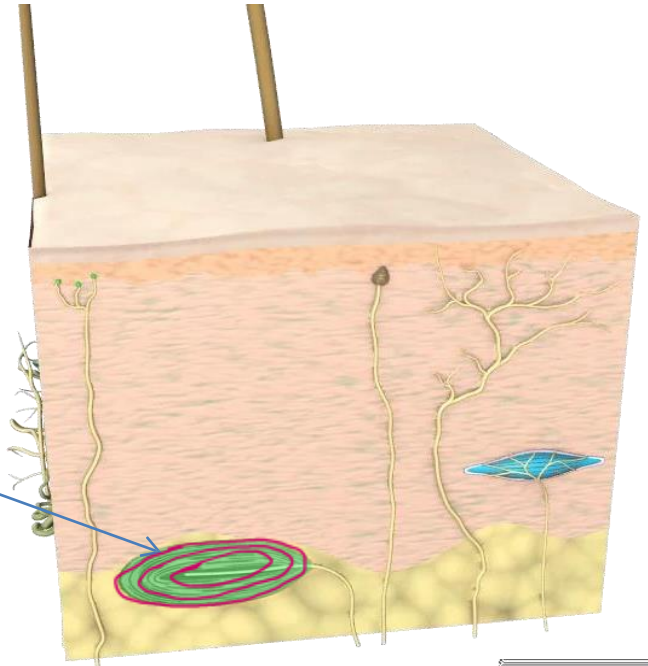
Pacinian corpuscles

Onion-shaped

- Encapsulated
- Found deep in reticular dermis and hypodermis

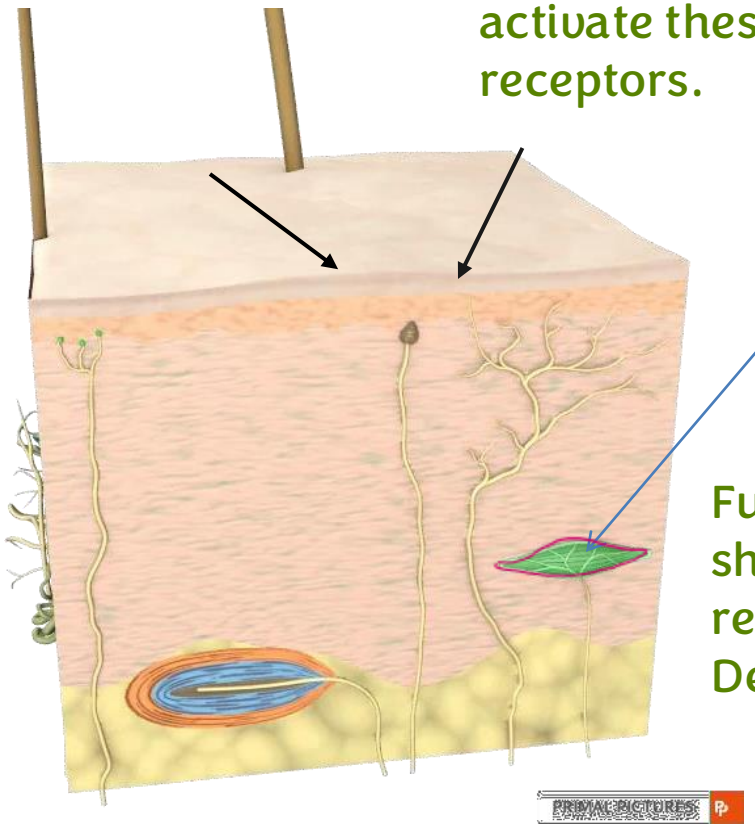
or at the junction between them.

- Coarse touch, pressure (sustained touch) and vibrations



Since it's located deeply in the dermis,It requires a deep pressure to activate it (it's important for the detection of deep pressure or vibrational forces).

Twisting of the skin in more than one direction will activate these receptors.



Ruffini corpuscles:

- Encapsulated
- Stretch (tension) and twisting (torque)

Important for detection of stretch

Fusiform in shape, located in reticular layer of Dermis.

Go to slide 31

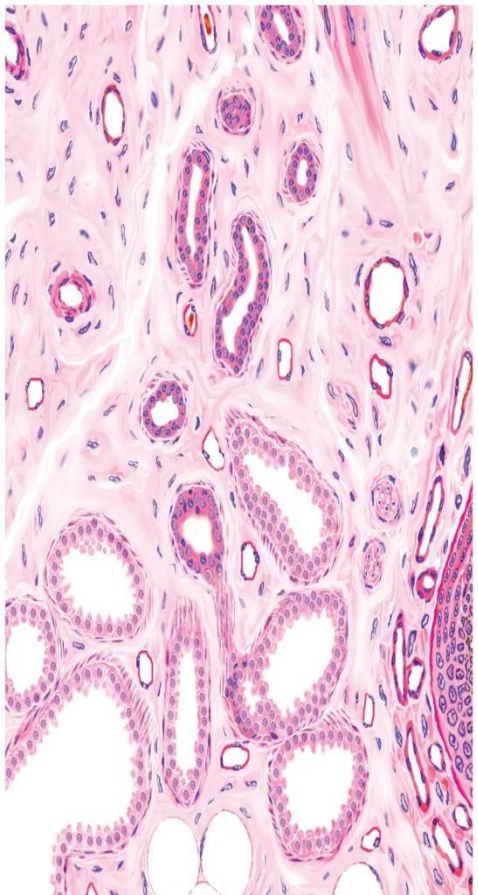
Skin Appendages

The “accessory” structure that comes with the skin. It forms an integumentary system when associated with dermis and epidermis

Hair Follicles and hair

The hair shaft (in the yellow color)

Sweat glands



Sebaceous glands

They open into the hair follicle/canal

Nails

Kerainized plates of dead cells and extensions from the epidermis of skin

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Hairs are elongated keratinized structures that form within epidermal invaginations (hair follicles)

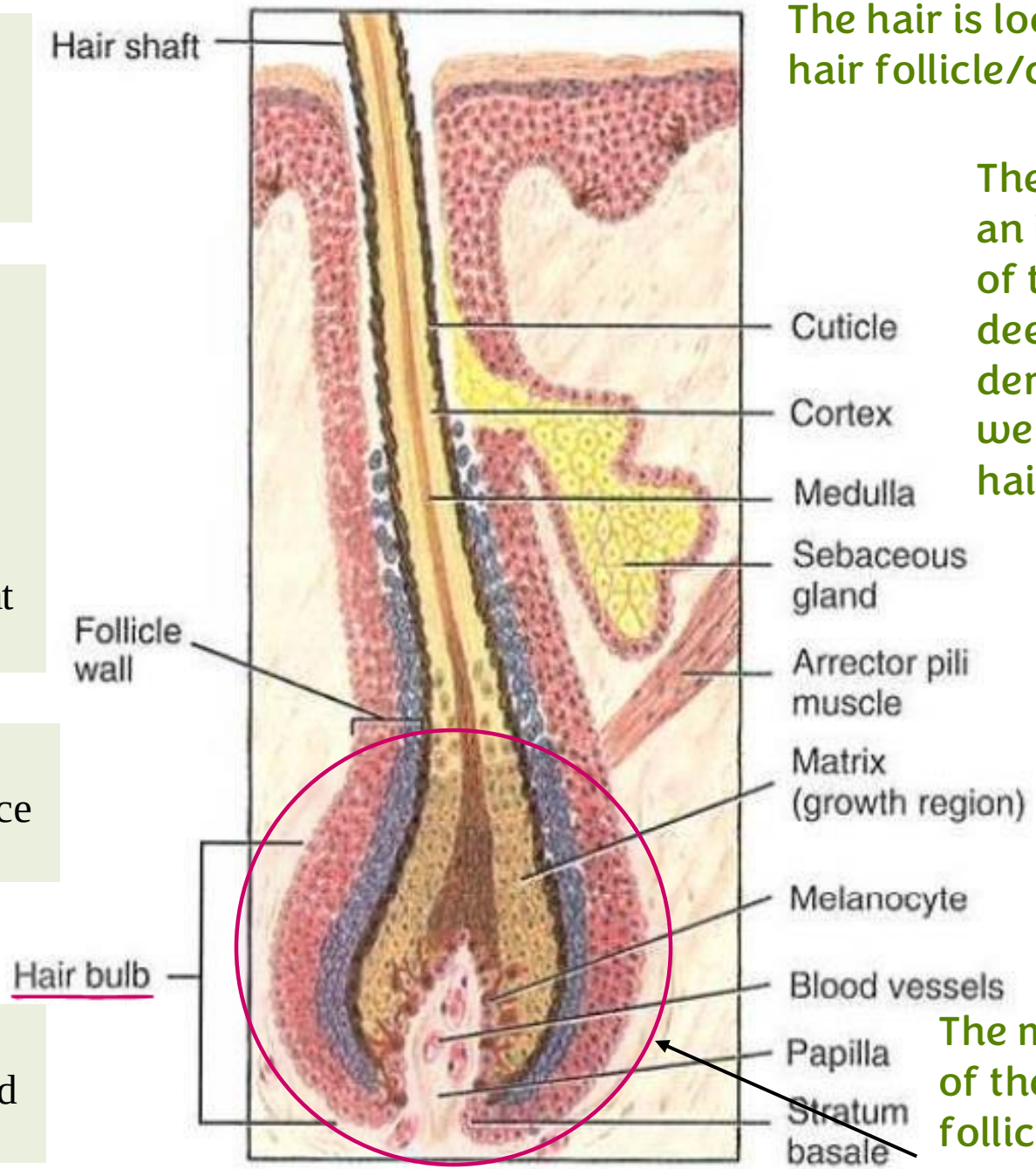
During fetal life a fine hair grows all over the surface of the fetal body (but mainly over the head) and it pulls out few days after birth

Types of hair:
1 Lanugo: fetal hair
2 Down hair: light colored hair of child Hair during childhood; very thin and light
3 Terminal (adult) hair: thicker, darker hair that begins to grow at puberty that never grew before

Hair shaft: The part of a hair extending beyond the skin surface (visible part)

Hair fiber

Hair root: The part of a hair below the skin surface (embedded part)



The hair is located inside the hair follicle/canal/pocket.

The hair follicle is an invagination of the epidermis deep inside dermis (where we can find the hair shaft inside)

The most basal part of the hair follicle(Swollen and rounded structure)

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Hair follicle is a tube of stratified squamous epithelium, invaginated into the dermis

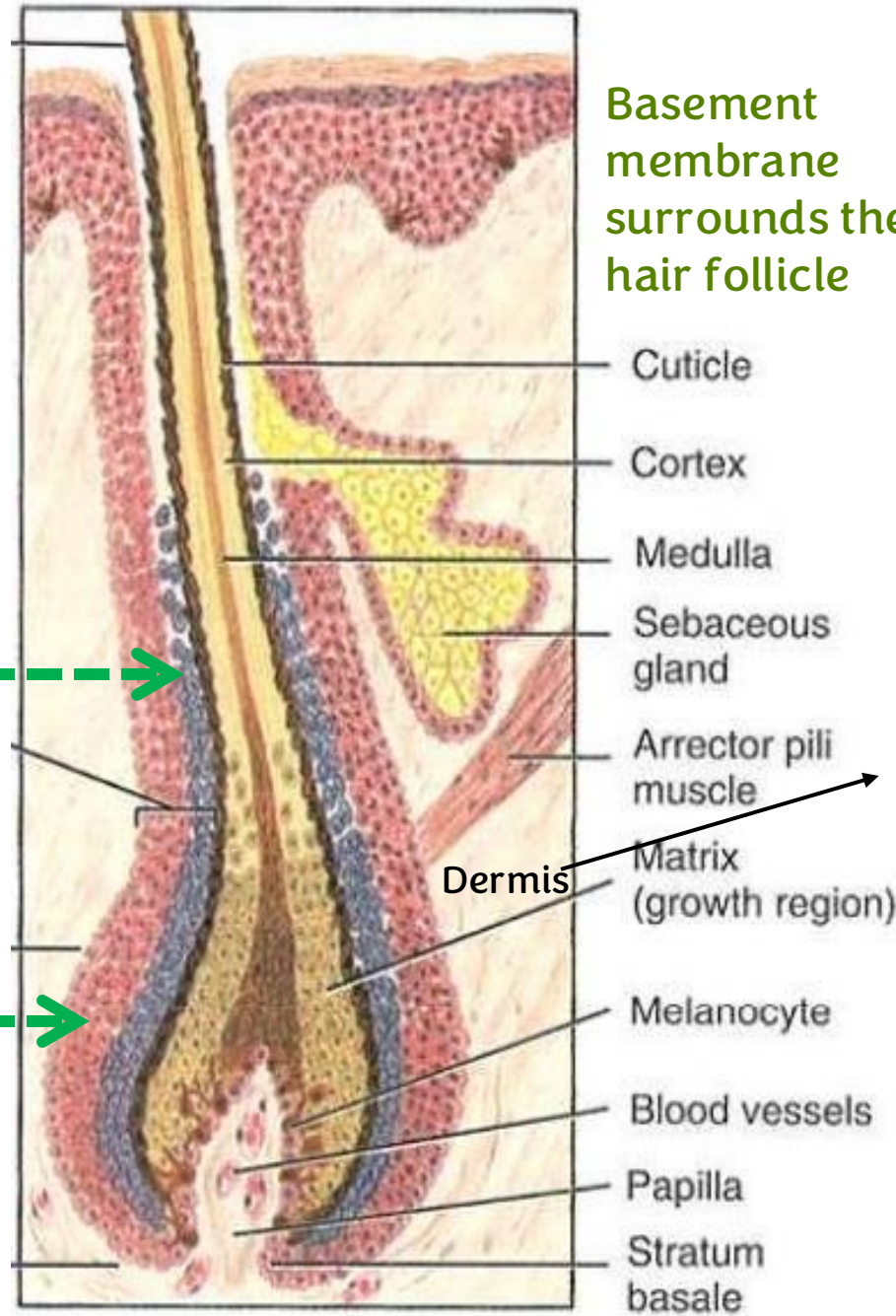
INNER ROOT SHEATH
Disintegrates at the level of the sebaceous gland

Surrounded by

OUTER ROOT SHEATH

- Is continuous with the epidermis
- It does not take part in hair formation
- Surrounded by a glassy basement membrane
- Basement membrane is surrounded by a connective tissue sheath.

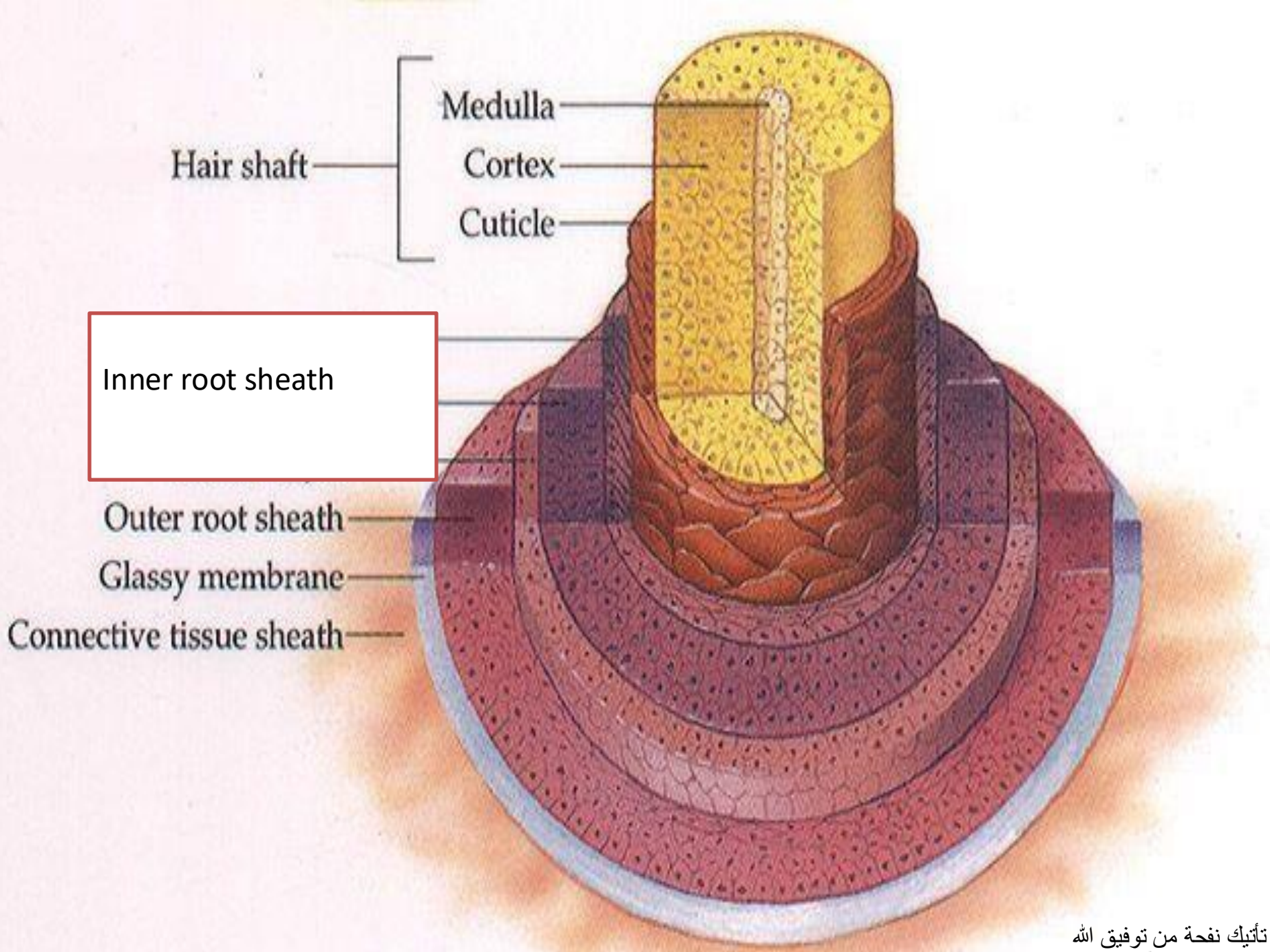
Very thick and appears glassy under the microscope



Basement membrane surrounds the hair follicle

The dermis around the hair follicle is called dermal sheath

Only the first two layers are invaginated not all layers (stratum basale and stratum spinosum) to form the outer root sheath



"ليس عليك إلا السعي، وقد تأتيك نفحة من توفيق الله تدفعك للأمام بعشرات أضعاف سعيك."

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Hair matrix

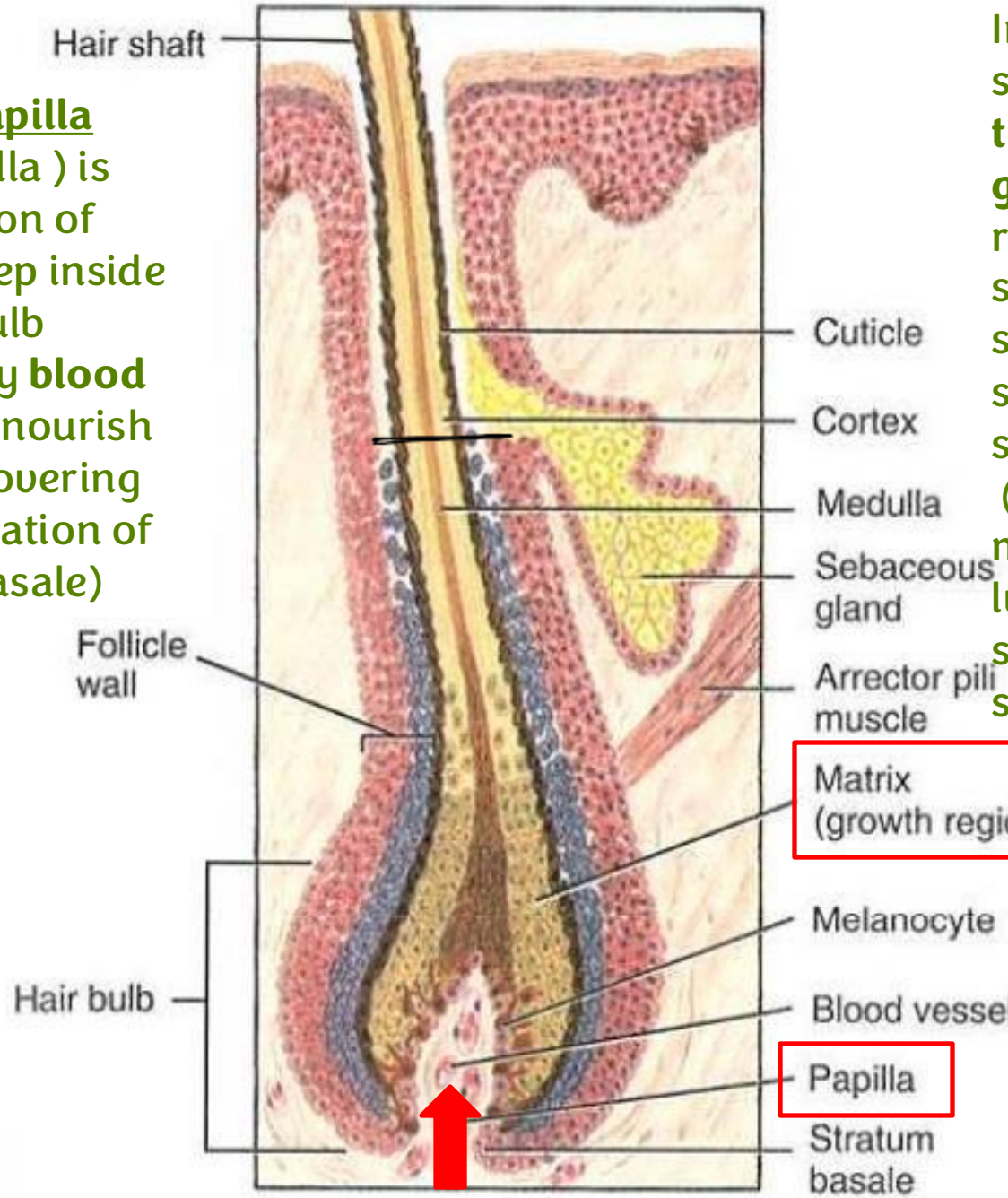
- Contains the proliferating cells that generate the hair and the internal root sheath
- Located just above the dermal papilla
- Melanocytes located in the matrix (between matrix cells) produce hair color.

The keratin of the hair shaft is hard and highly compact

Matrix cells

The cells in the hair matrix proliferate and move upwards, gradually becoming keratinized to produce the hair.

Dermal papilla (hair papilla) is invagination of dermis deep inside the hair bulb having tiny **blood vessels** to nourish the cells covering it (continuation of stratum basale)

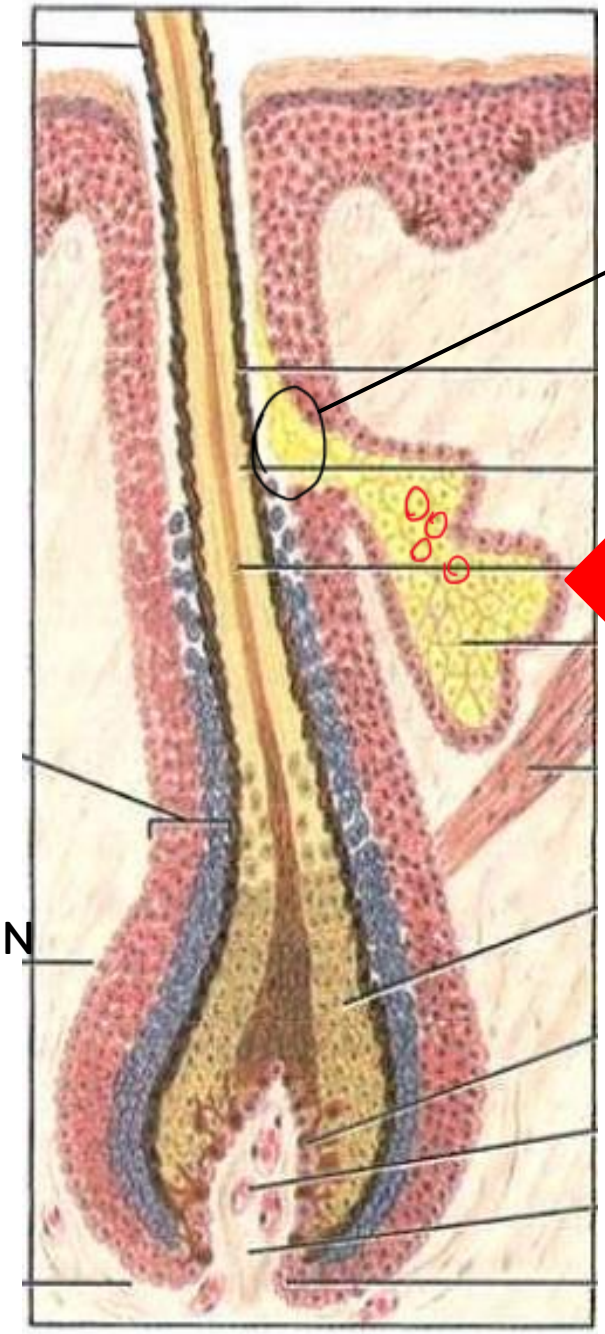


Inner root sheath stops at **the duct of the sebaceous gland** and does not reach the skin surface to make space for the secretion of the sebaceous gland (to secrete its oily material and to lubricate the hair shaft itself also the surface of the skin)

Sebaceous glands

- secrete an oily or waxy matter, called **sebum**, to lubricate and waterproof the skin and hair

- Secrete by holocrine mode of Secretion (The whole cell explodes to secrete)



This duct would be blocked by the sebum secreted by these cells especially during puberty because we have excessive secretions; so the sebum would accumulate below the level of epidermis producing BLACKHEADS

The secretion of the sebaceous gland here is stimulated by Estrogen and Testosterone, this takes place around puberty time; we start producing these hormones and skin starts to be oily.

💡WHY DON'T WE HAVE SEBACEOUS GLANDS AND HAIR IN THE SOLES AND PALMS?

Because if we had, it would be an oily surface and this would be very difficult to grasp things and to run or walk barefoot

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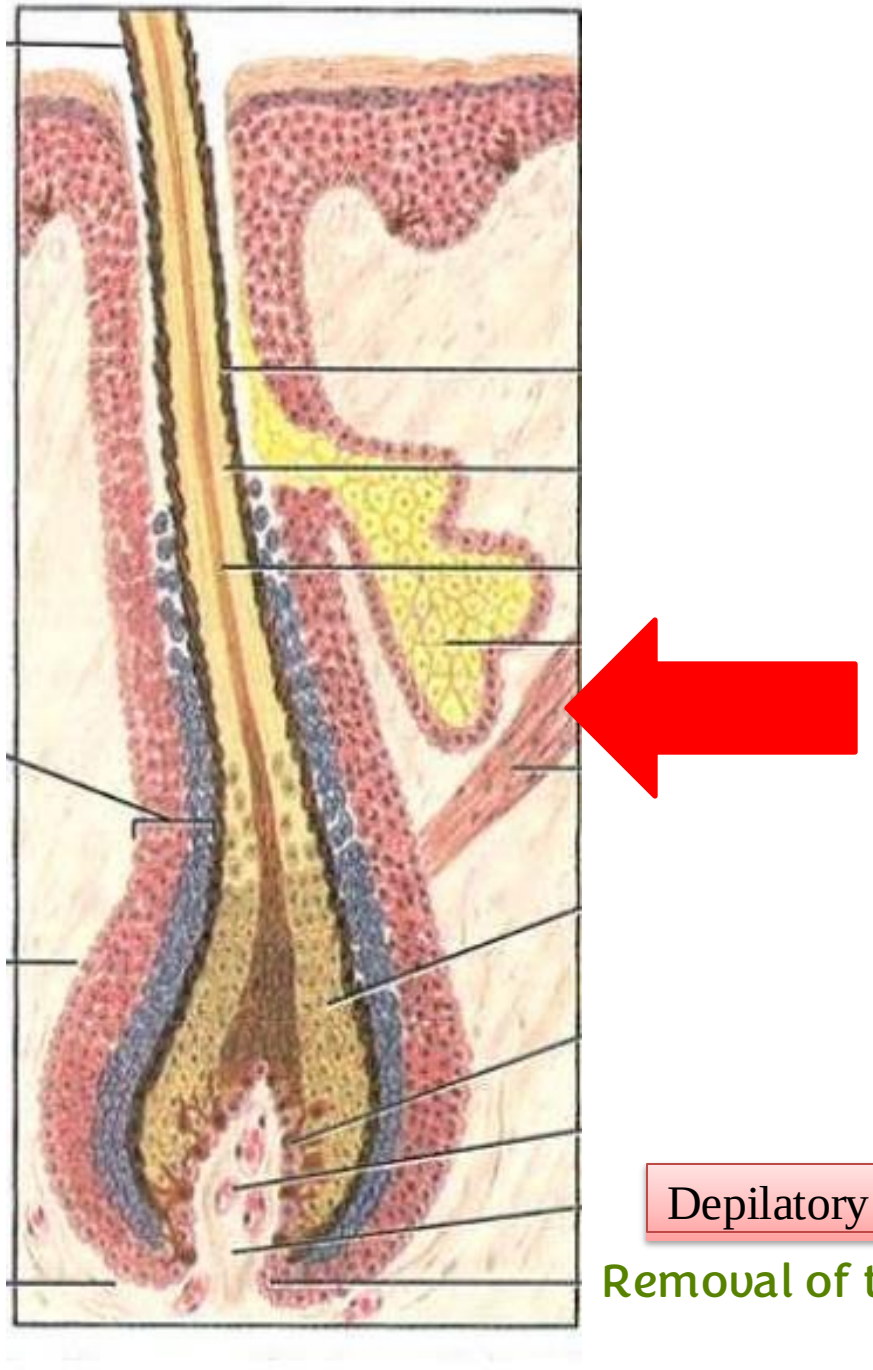
A **comedo** is a clogged hair follicle (pore) in the skin. Keratin combines with oil to block the follicle

Pili: hair

Arrector pili muscles are small smooth muscles extend from hair follicles to the dermal papilla (erection of the hair)

➢ Contraction of these muscles causes the hairs to stand on end (goose bumps) closing the pore and reducing heat loss from our skin

➢ Innervated by the autonomic nervous system (sympathetic) " not under our control "

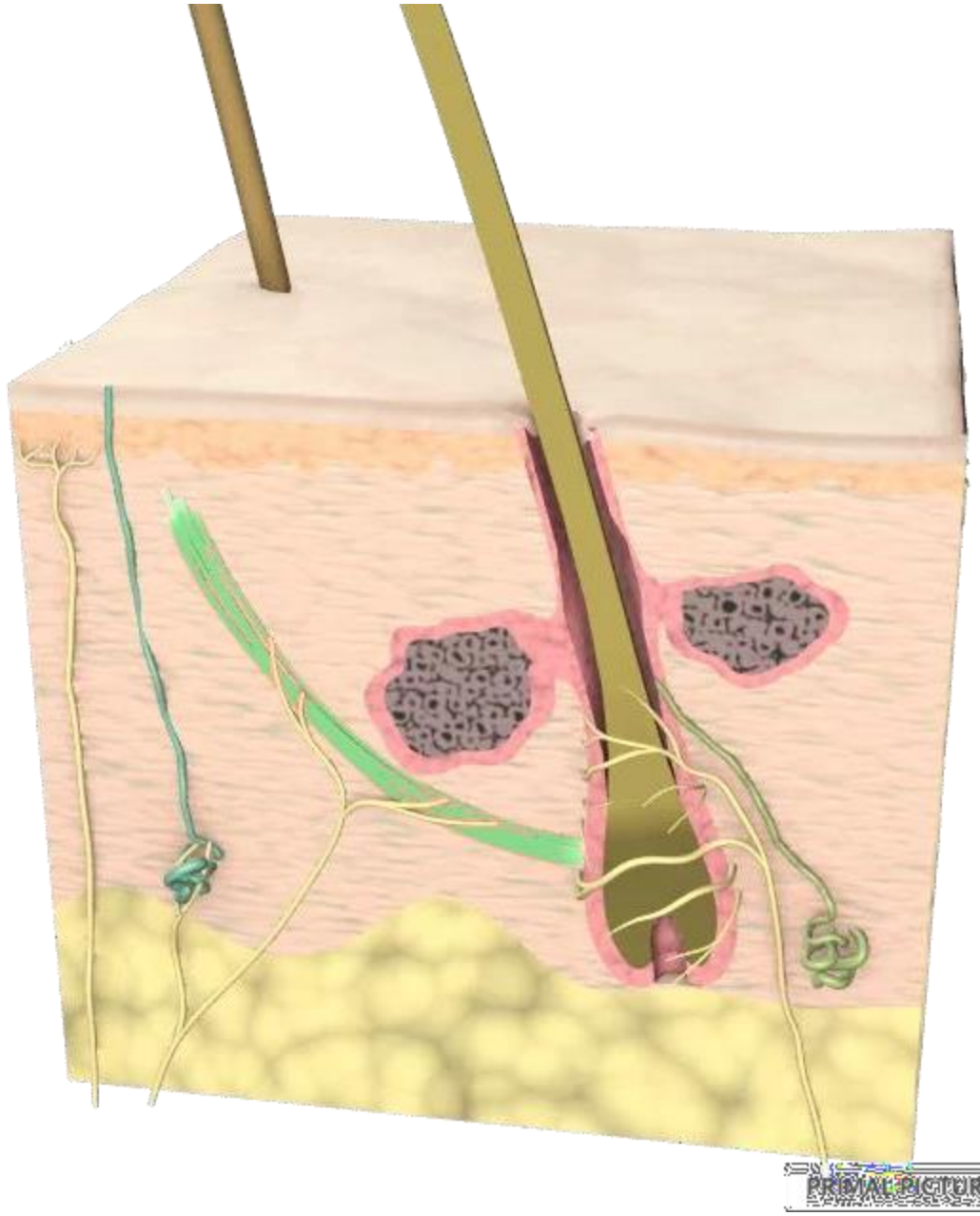


Depilatory

Removal of the hair

- The role of this muscle is more prominent in animals because it reduces heat loss. The erected hairs create a layer of insulation in animals with hair/fur.

- The attachments of these muscles to dermal papillae cause dimples seen in goosebumps.



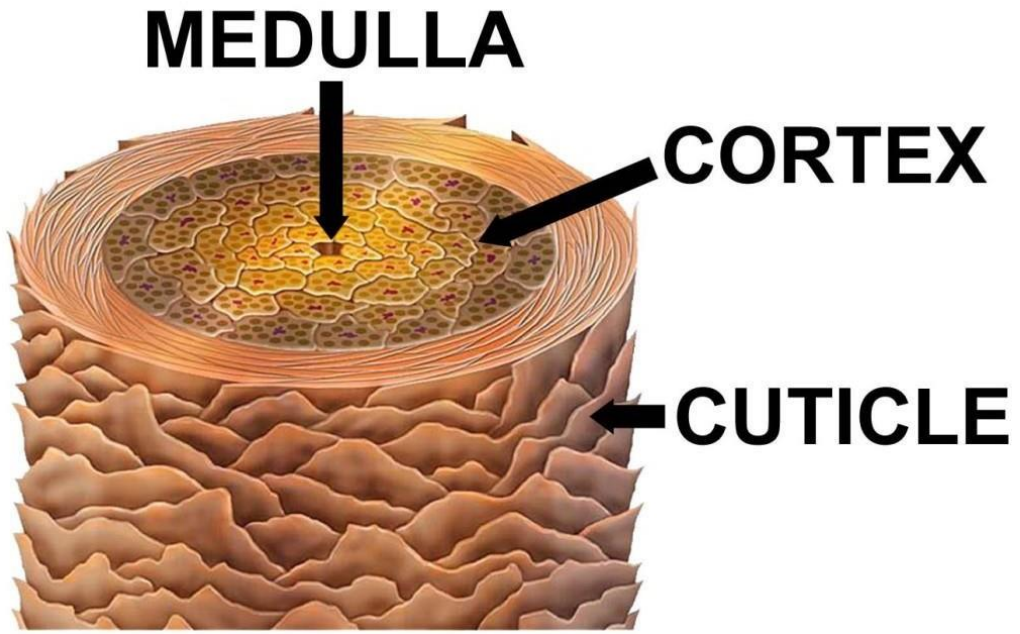
Pulls hairs upright when cold or frightened

Structure of the hair shaft

Medulla: large vacuolated and moderately keratinized cells

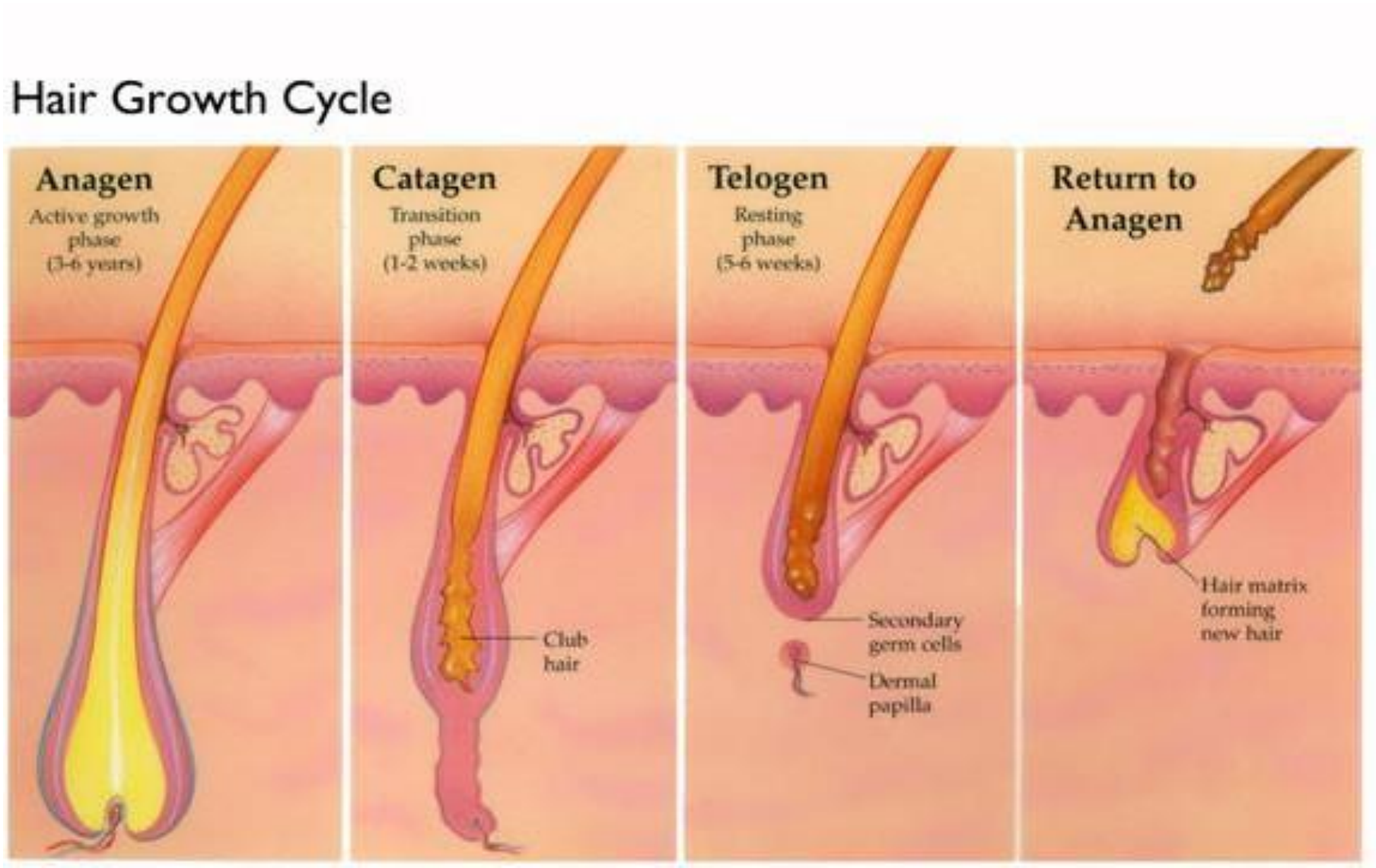
Cortex: heavily keratinized and densely packed cells + contains the pigment melanin.

Cuticle: thin layer heavily keratinized flat squamous cells covering the cortex and the keratin involved is of a very hard type.



In hair with split ends, the cells in the cuticle are desquamated from their place producing those split ends.

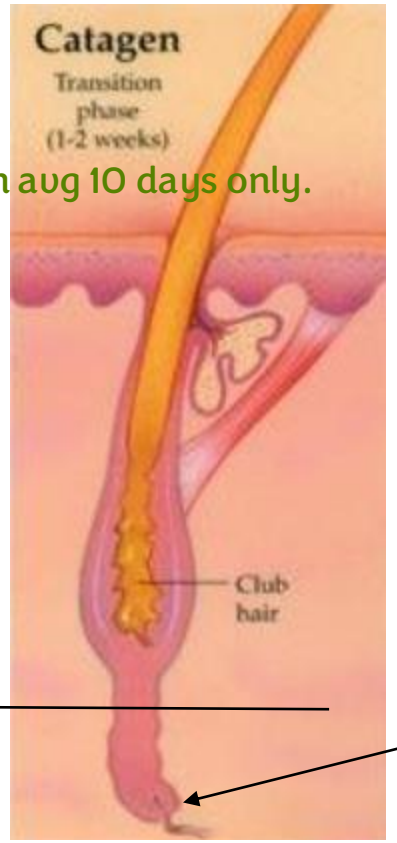
Hairs grow discontinuously, with periods of growth followed by periods of rest and this growth does not occur synchronously in all regions of the body or even in the same area



- The duration is variable among people (the 3-6 years). People with a short anagen phase have difficulty growing their hair beyond a certain length, while the ones with a longer anagen phase can grow their hair longer.
- The type of hair also plays a role in the duration of the anagen phase:

- The hair on the arms, legs, eyelashes, and eyebrows all have very short active growth phase.
- Meanwhile the scalp hair has a long active growth phase.

The matrix cells undergo mitosis to produce new cells. The new cells become keratinized, eventually forming the hair fiber.



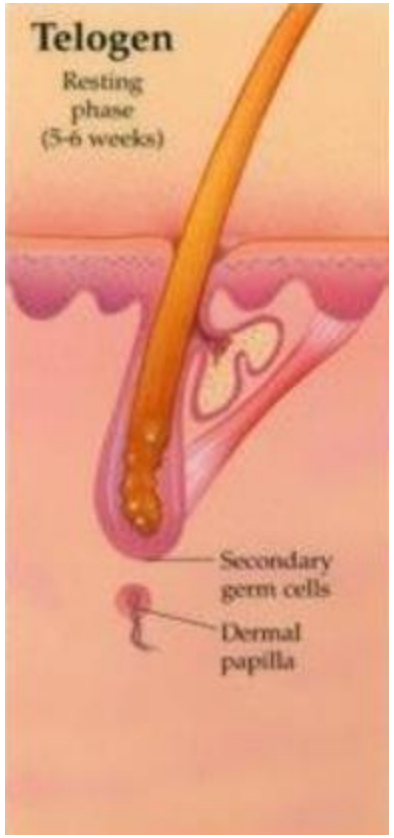
On avg 10 days only.

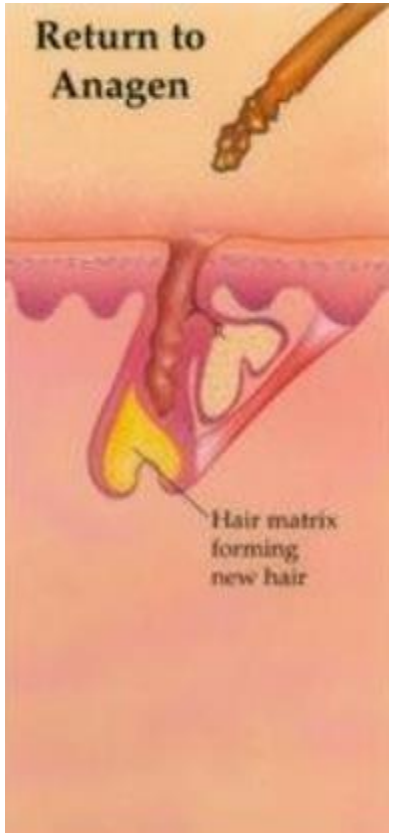
- The separation here causes the hair follicle to shrink, because the matrix cells got separated from their source of nutrients which is the dermal papilla.

- Remember: the dermal papilla has tiny blood vessels that keep the matrix cells nourished.

Dermal papilla starts to disintegrate. Separation of the hair bulb and dermal papilla starts to occur.

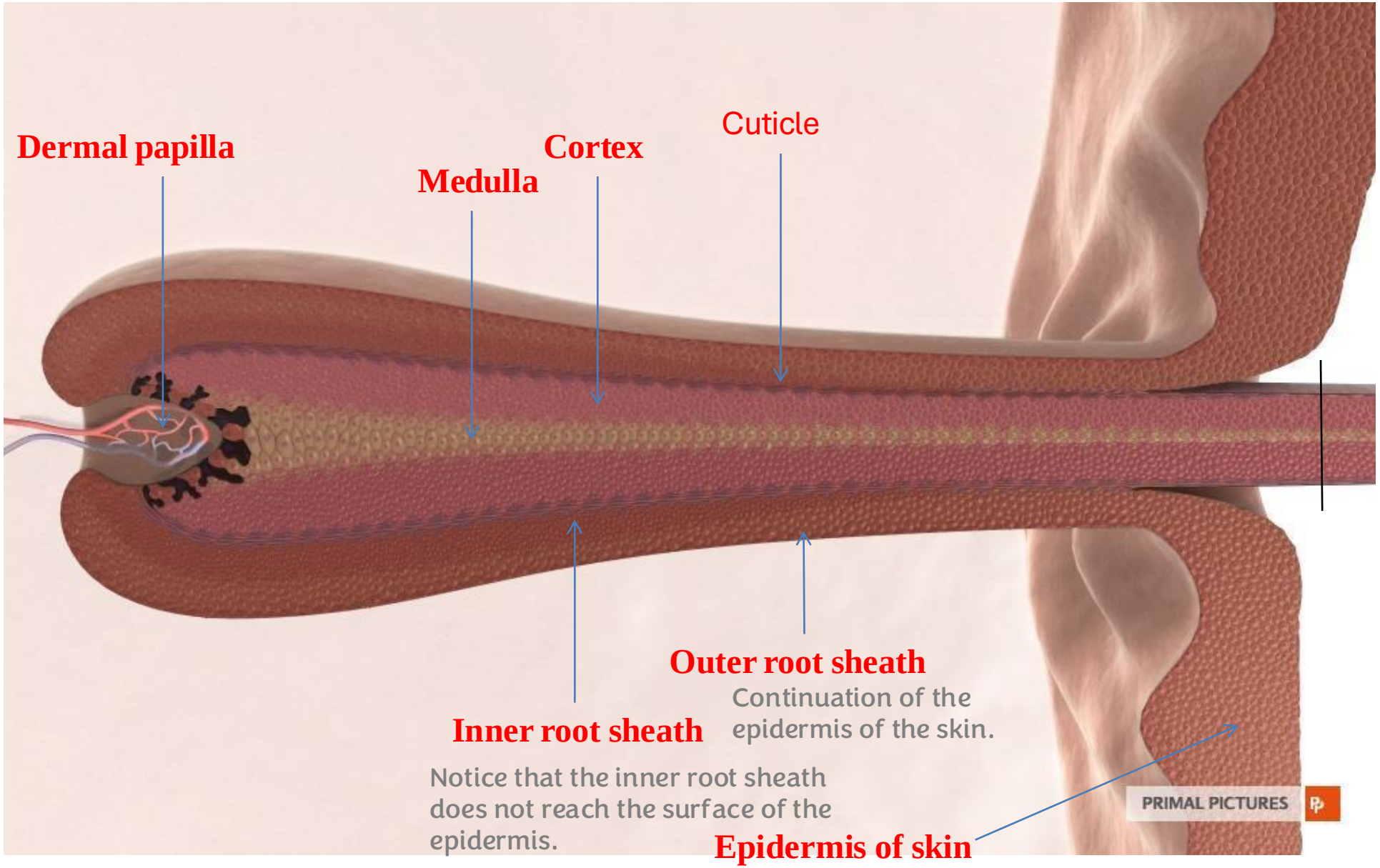
- It's called the resting phase because the dermal papilla is completely detached from the hair follicle and hair bulb. This causes the shedding of hair to take place.





- After 6 weeks, we return to anagen phase. During the anagen phase, formation of new dermal papilla and hair takes place.

85% of the hair follicles are in the anagen phase, and 15% are in the telogen phase. For example, if the scalp contains 150,000 hair follicles, then the normal amount (15%) to shed is 100 hair/day. This amount might change due to factors such as stress and medical conditions.



- In movies, cutting peripheral hair to extract DNA for criminal identification is scientifically inaccurate. This is because the hair shaft is made up of dead cells that lack nuclei and do not contain DNA.
- To correctly extract DNA take out the hair bulb + part of the hair root. This way you can have nucleated cells to extract the DNA.

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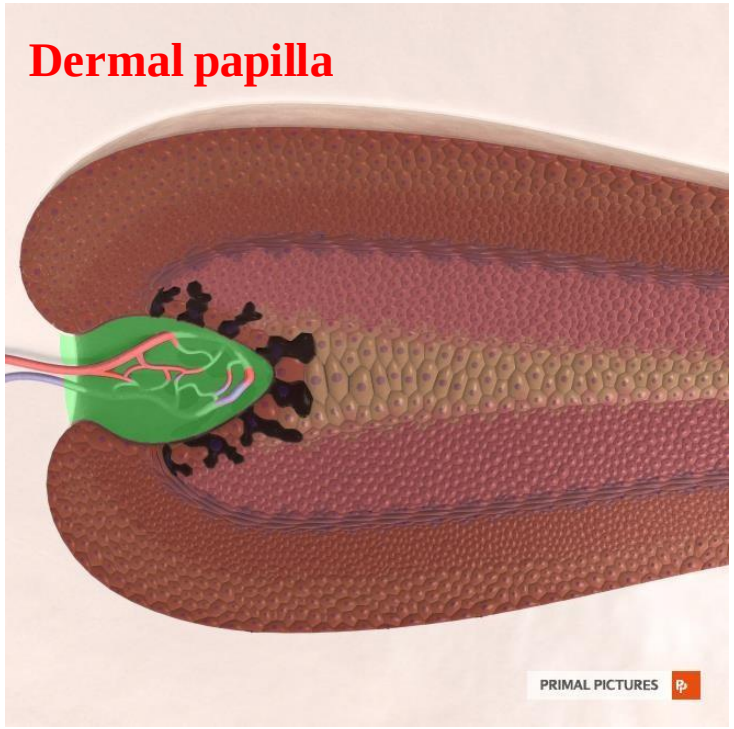
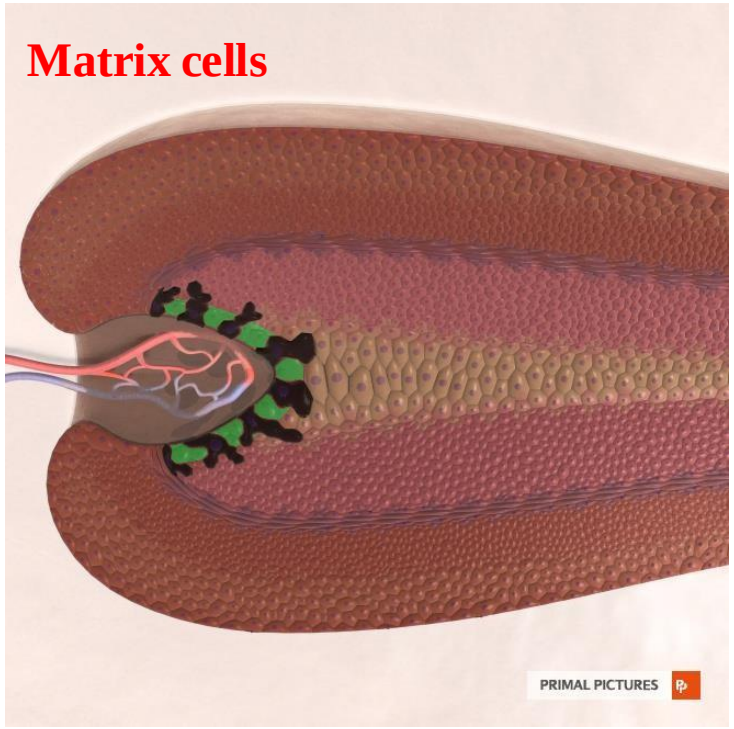
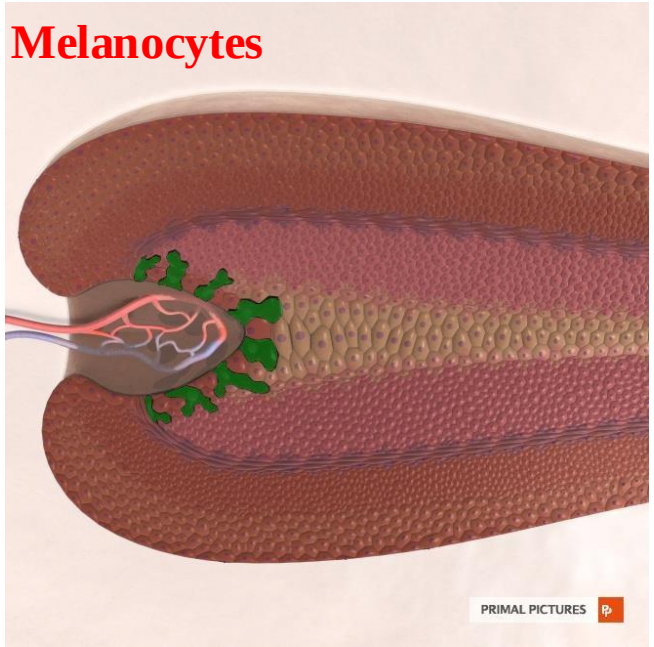
Dermal papilla is an invagination of the dermis deep inside the basal part of the hair bulb.
You find here the tiny blood vessels for nourishing these dividing matrix cells.





Matrix cells divide producing new hair cells and the inner root sheath.



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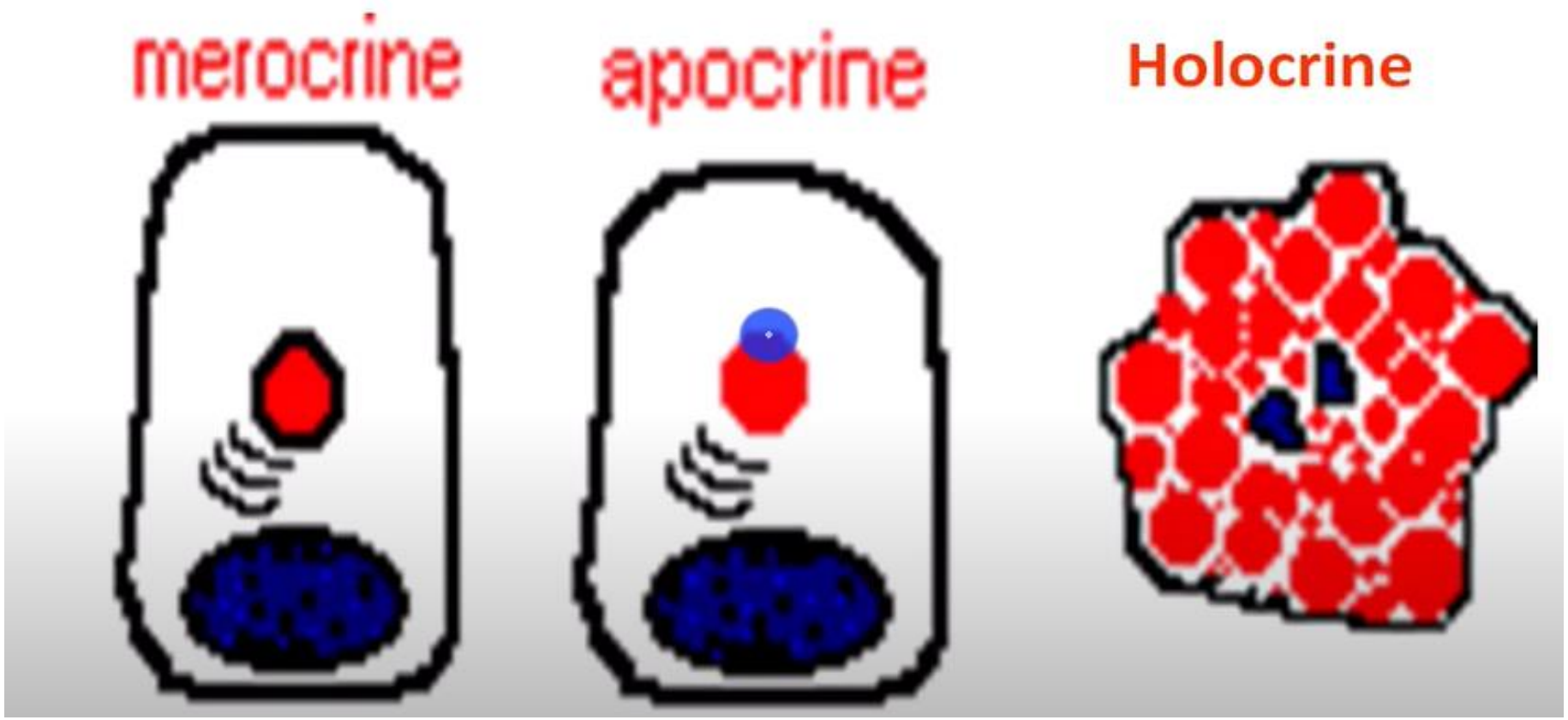
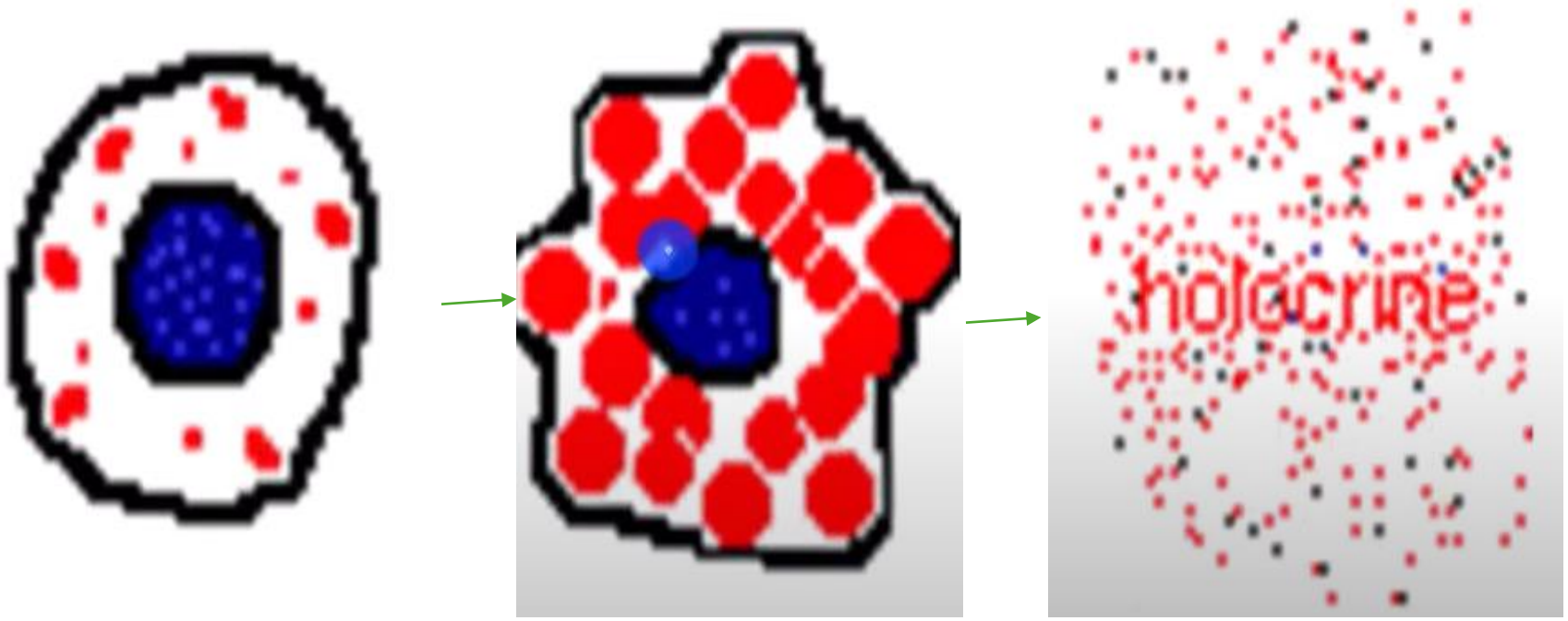
Modes of Secretion



Merocrine: it is the typical form of secretion, typical exocytosis from the cell.

Apocrine: the secretory vesicle along with part of the apical cytoplasm and plasma membrane are being lost during secretion.

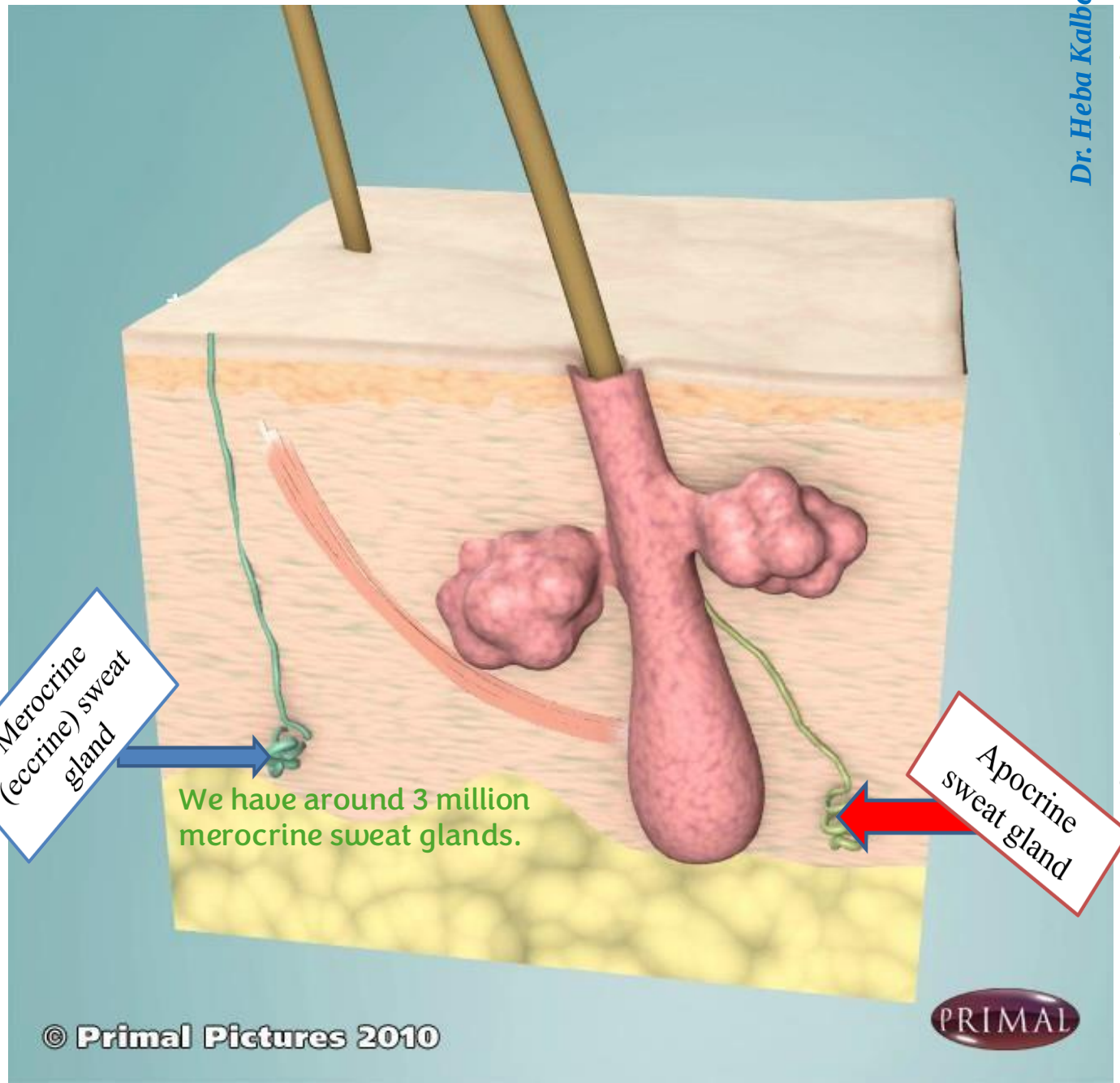
Modes Of Secretion



In holocrine secretion, the sebaceous glands secrete secretory products that accumulate in the cell until it ruptures.

Sweat glands

- Eccrine sweat glands are more in forehead and armpits.
- SWEATY HANDS, FEET, FACE AND ARMPITS.
- Smelly feet happen when the feet sweat all day in the shoes resulting in a **wet** shoe with bacterial growth. Bacteria continues to grow even if the shoe got taken off, and especially if the shoe was put in a **dark place** like a shoe cabinet. Even if you wear the same wet shoes on clean feet, this wet environment creates the perfect condition for the bacteria to grow. The solution is to dry the shoe and expose them to sunlight.
- **Warm+dark+moist=perfect conditions for bacterial growth.**



Apocrine Sweat Gland:

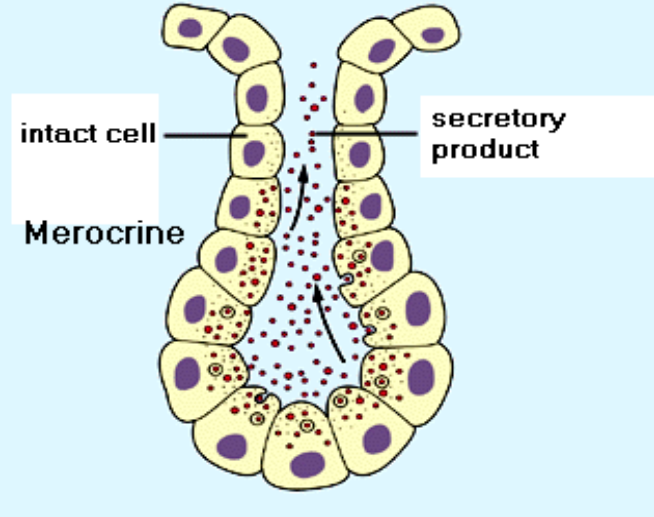
- They're modified sweat glands, because they do not secrete true sweat but secrete pheromones through apocrine secretion.
- Role of apocrine sweat glands in humans is not completely understood. Main role in animals is for sexual attraction.
- Remember: they cannot be found on the palms and soles, because there is no hair follicles there.

Sweat Glands

Eccrine sweat gland

(True sweat gland)

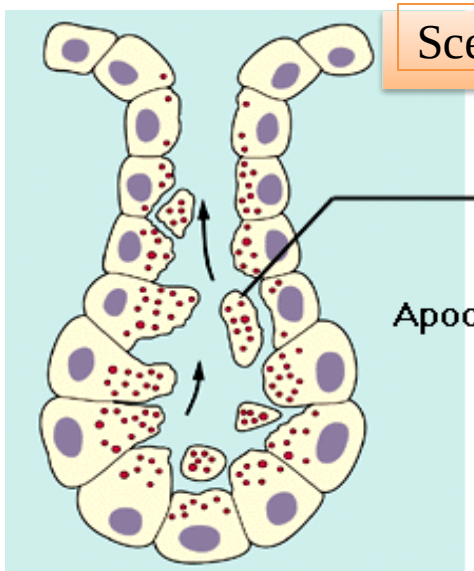
- Merocrine secretion
- Empty directly onto skin surface
- Location: most all over body (esp. abundant on palms & soles: ~ 500/cm^2)
- Clear, watery secretion (99% H_2O; rest NaCl + some waste products



Apocrine sweat gland

- Empty into hair follicle
- Location: armpits (axilla), groin, nipples
- Viscous, cloudy secretion → good nutrient source for bacteria "rich in proteins & lipids" (odor !!)
- Secretion may contain Pheromones
- Secretion begins at puberty and is stimulated during emotional distress

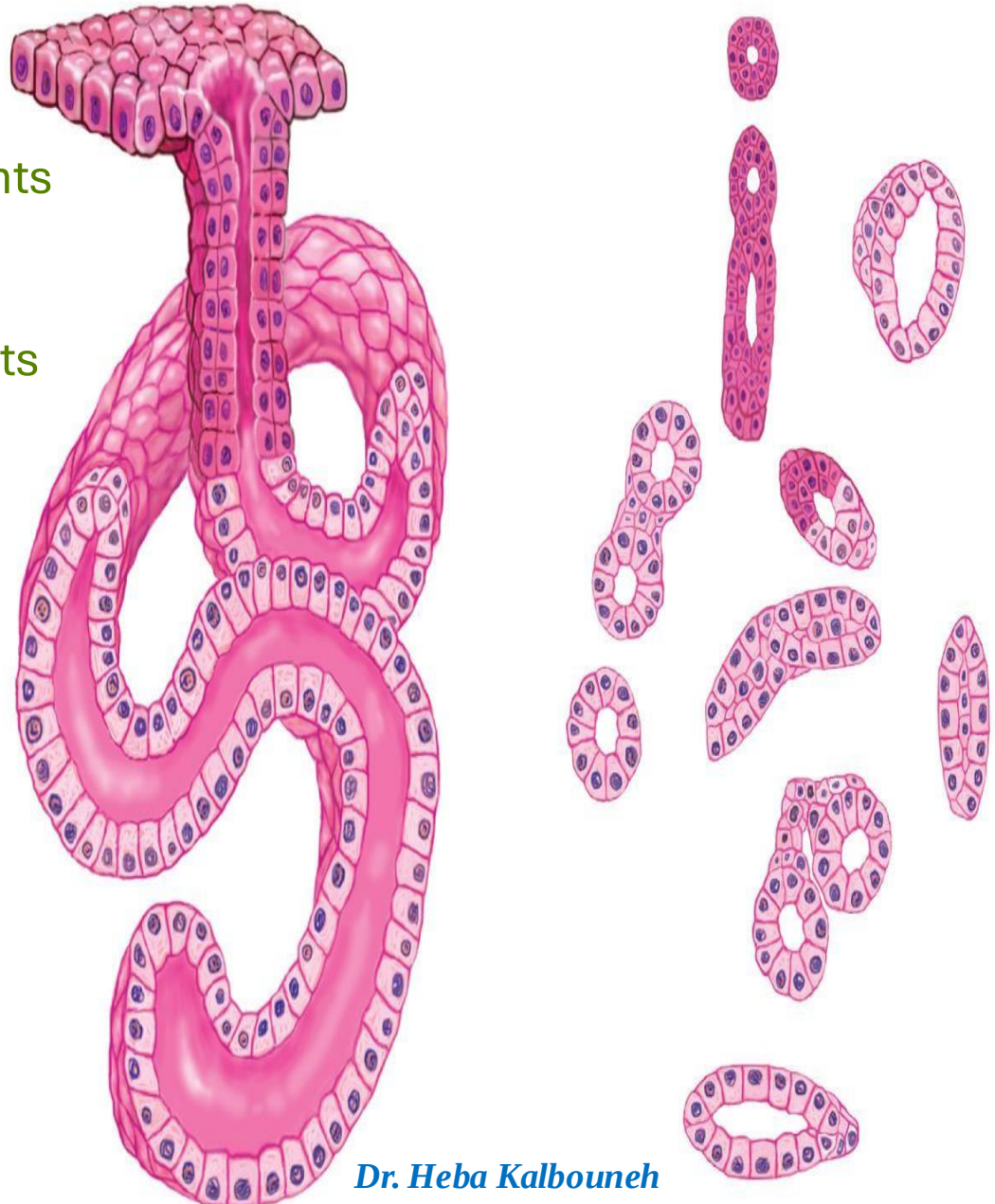
Both types have the same histological structure **simple coiled tubular gland**.

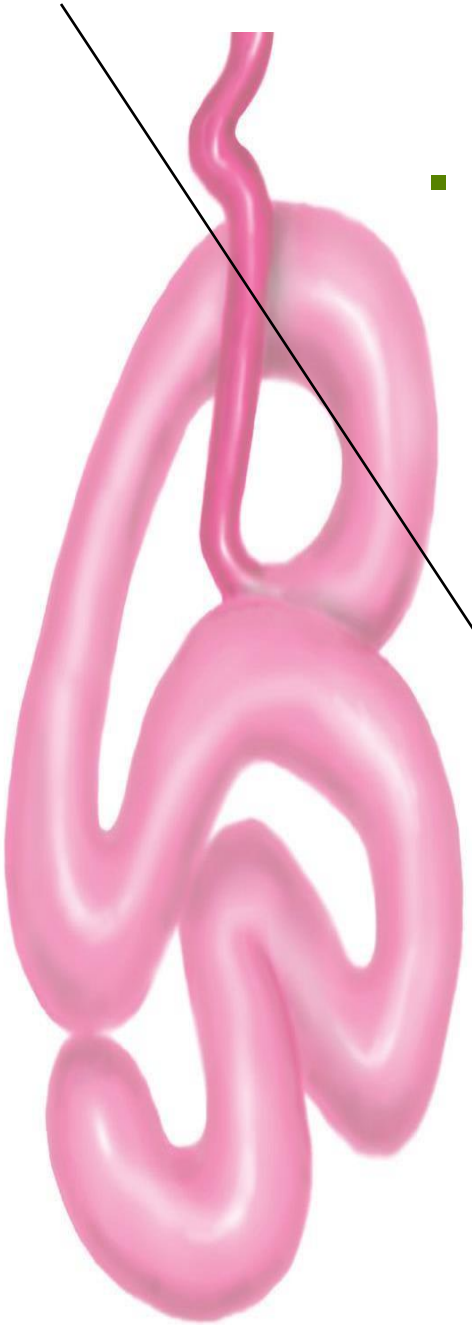


Because they produce smell. The sweat itself is odorless, but because of bacterial decomposition it becomes smelly.

Part of the apical plasma membrane and cytoplasm is being lost during the secretory process.

Light -> represents the secretory portion.
Dark-> represents the ducts of the glands.





- Only rounded profiles and tubules are present in a histological section due its simple coiled tubular gland morphology.

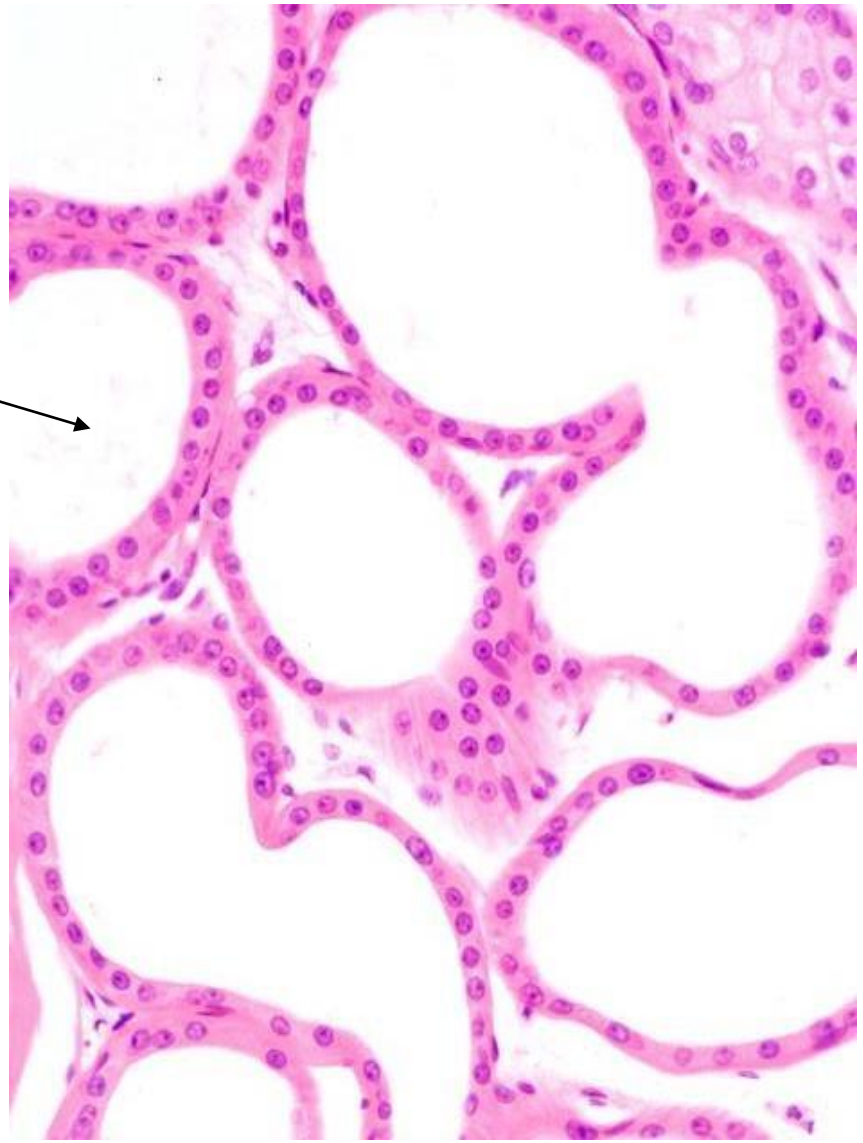
Larger in size.

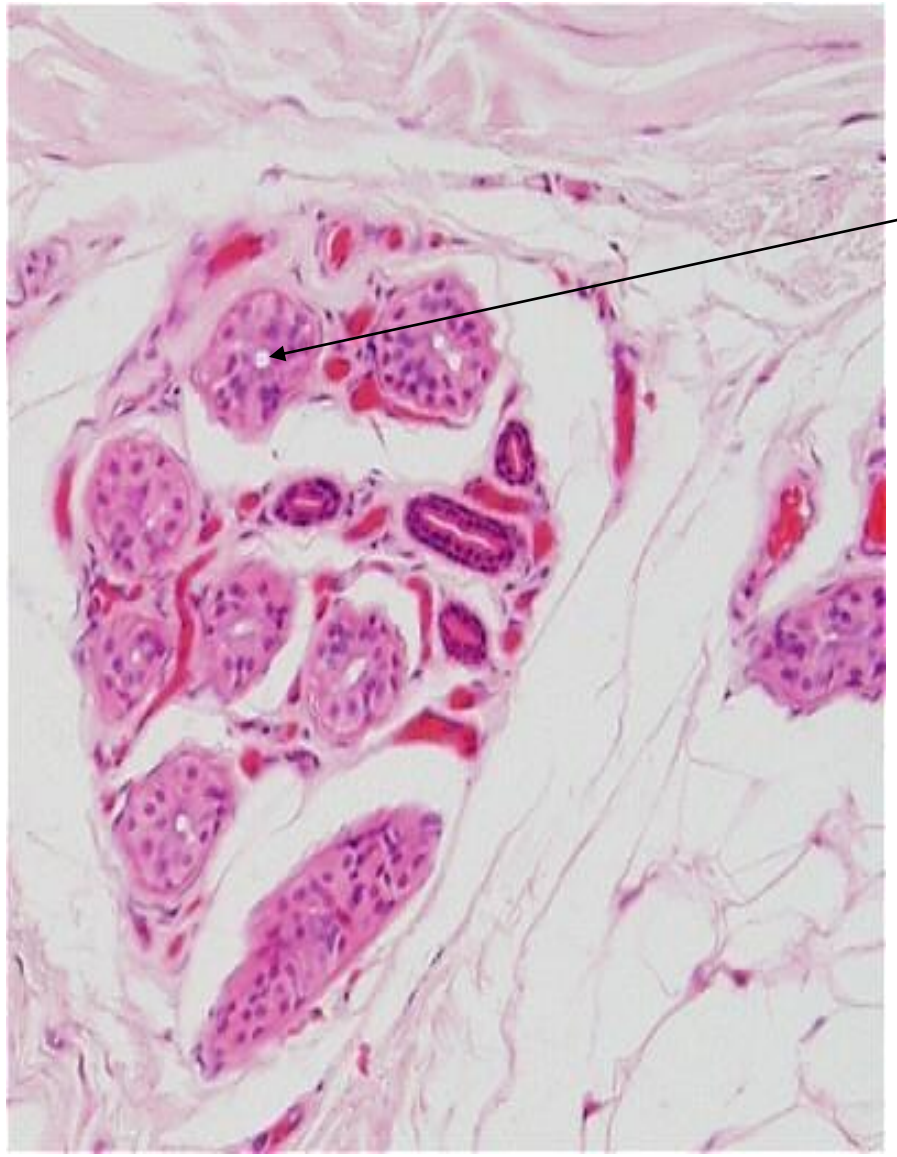
Apocrine sweat glands

Eccrine (merocrine) sweat glands

Smaller in size.

Wider lumen





Narrower lumen

Light microscope

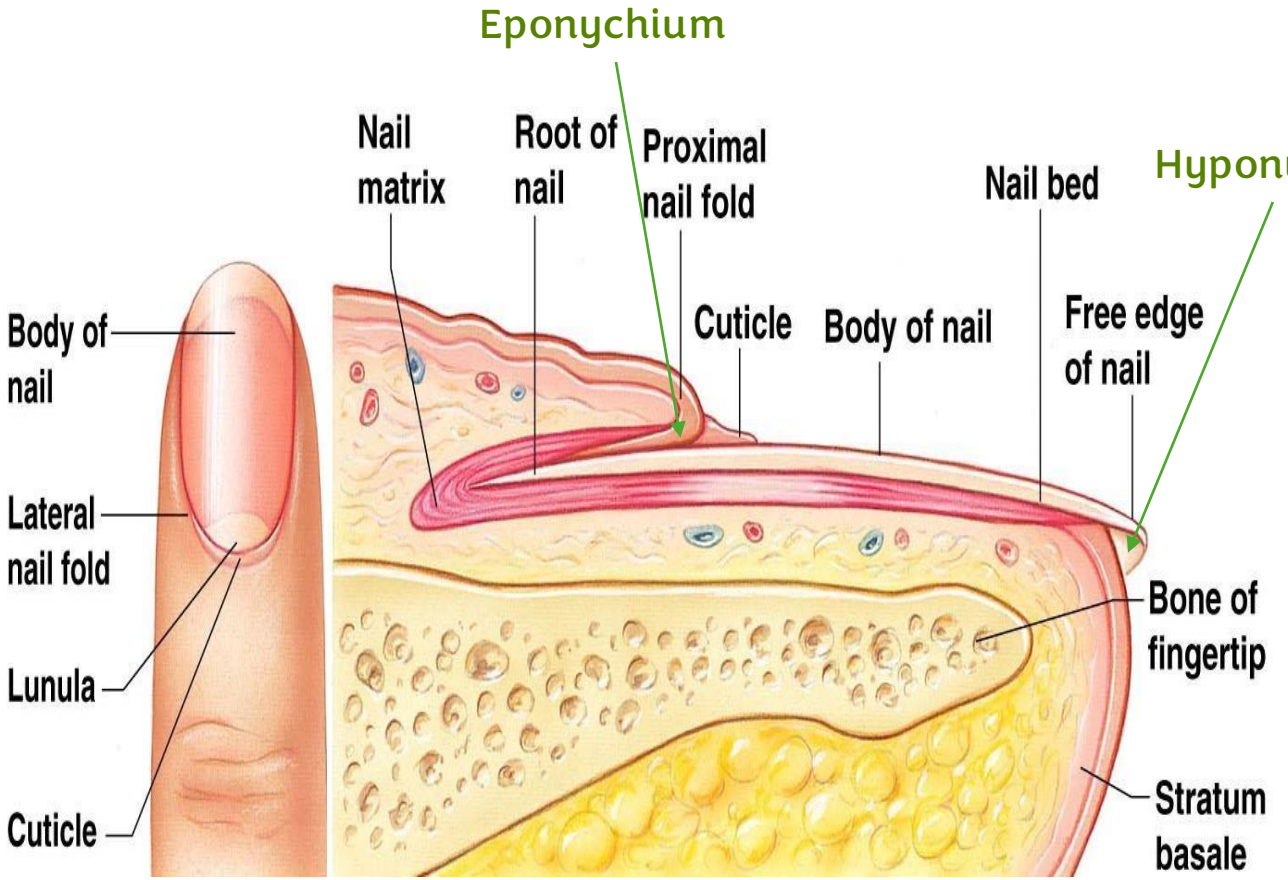
Nails

Hard plates of keratin on the dorsal surface of each distal phalanx
Lack of pigment makes them colorless referring to keratinized (dead) cells, because it lacks activity of melanocytes.
Translucent.

Root of the nail -> embedded deep inside the skin.
Eponychium -> covers the root of nail.

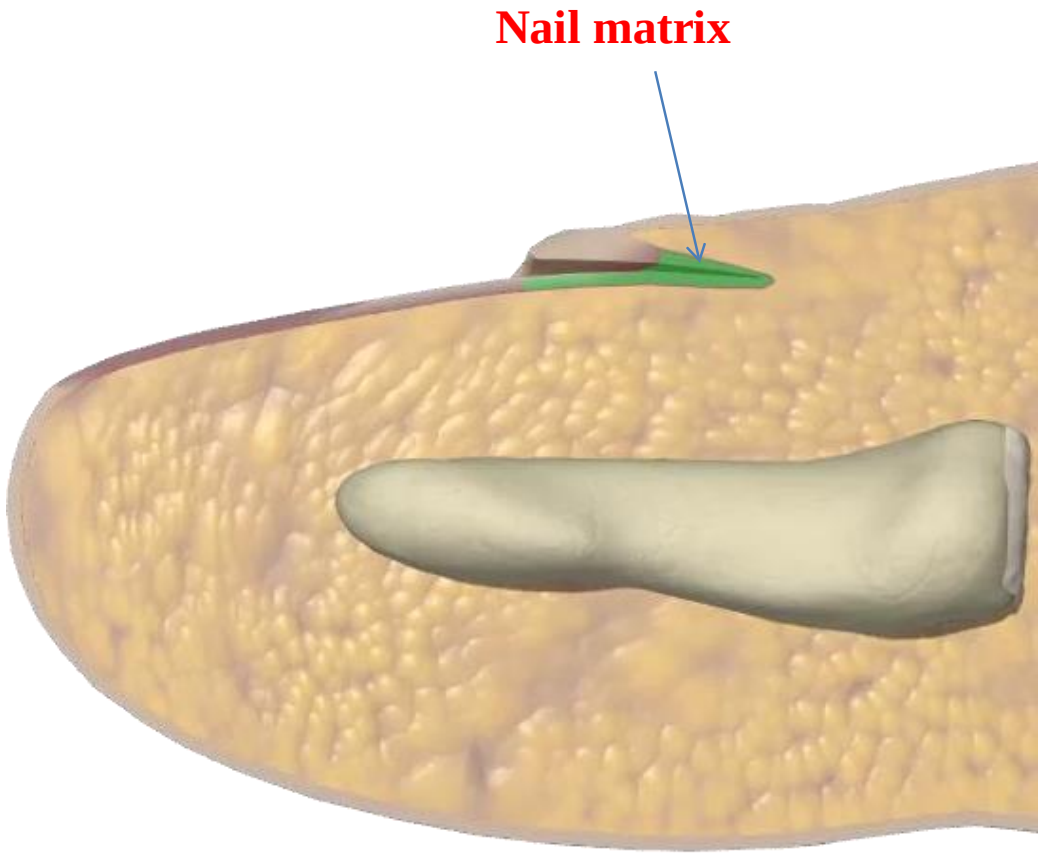
Nail parts

1. Free edge: the part you cut
2. Body: pink part
3. Lunula: white semicircle area
4. Eponychium: proximal nail fold (cuticle)
5. Hyponychium: under the free edge where dirt accumulates
6. Nail bed: directly under the pink part
7. Nail matrix: growth



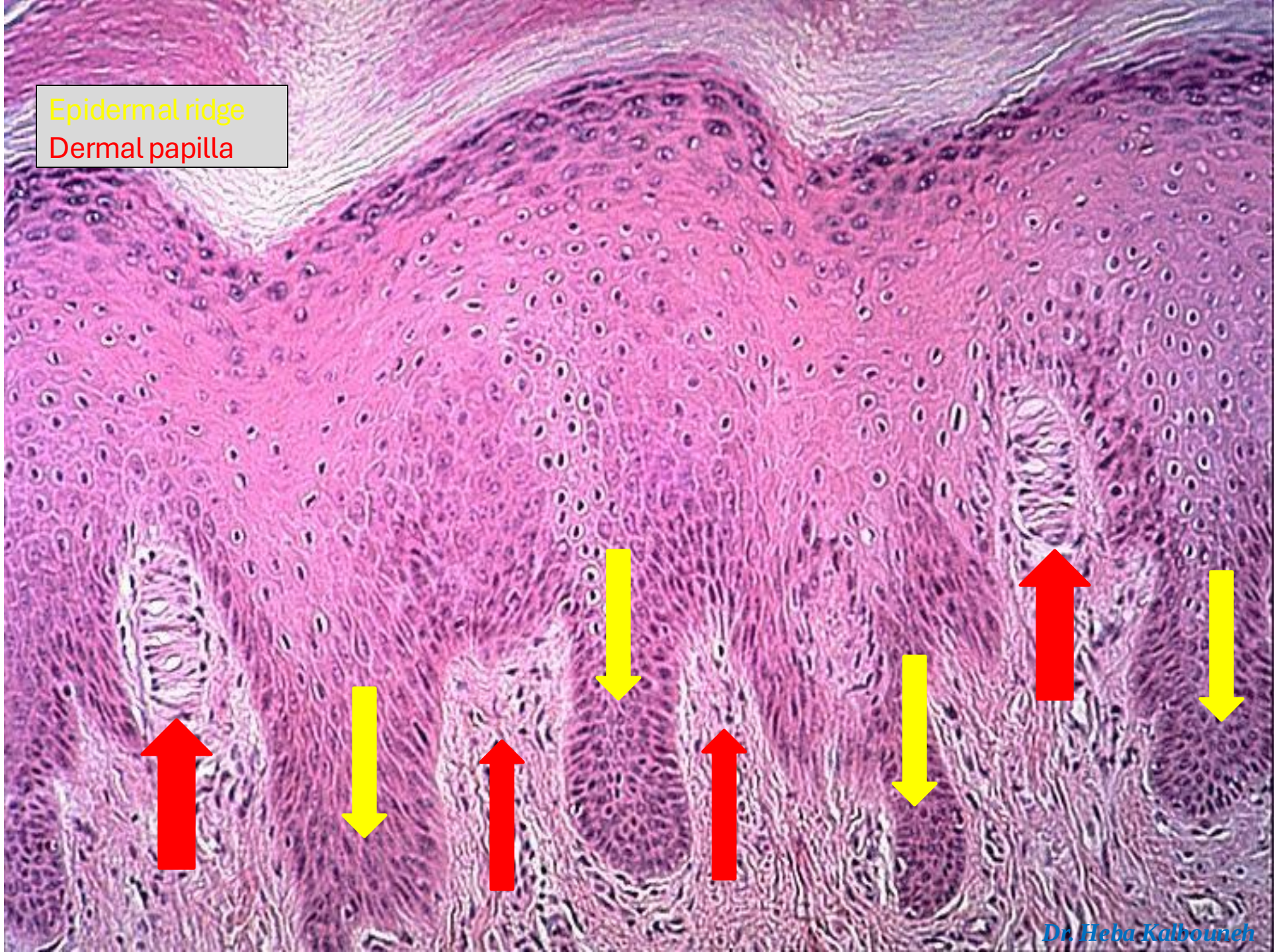
Nail bed is made from skin, so like normal skin it has dermis and an epidermis, but this epidermis consists of the layers: **stratum basale** and **stratum spinosum**. This thin layer of epidermis allows the blood vessels in the dermis to be seen which causes the body of nail to appear pink .

- The nail matrix consists of a layer of cells at the base of the nail that divide rapidly then get filled up with keratin.
- The nail plate gets created in the nail matrix, where the rapid division and keratinization takes place. After mitosis these cells filled with keratin push the nail plate (nail body) over the nail bed causing the nail to grow.



✓ The nail is clinically important as it is an indicator of **distal tissue vascularization** of the patient. If you press on your nail, you can see the vascularization through the nail.

Practical sections for the exam


Epidermal ridge
Dermal papilla
Dr. Heba Kalbouneh

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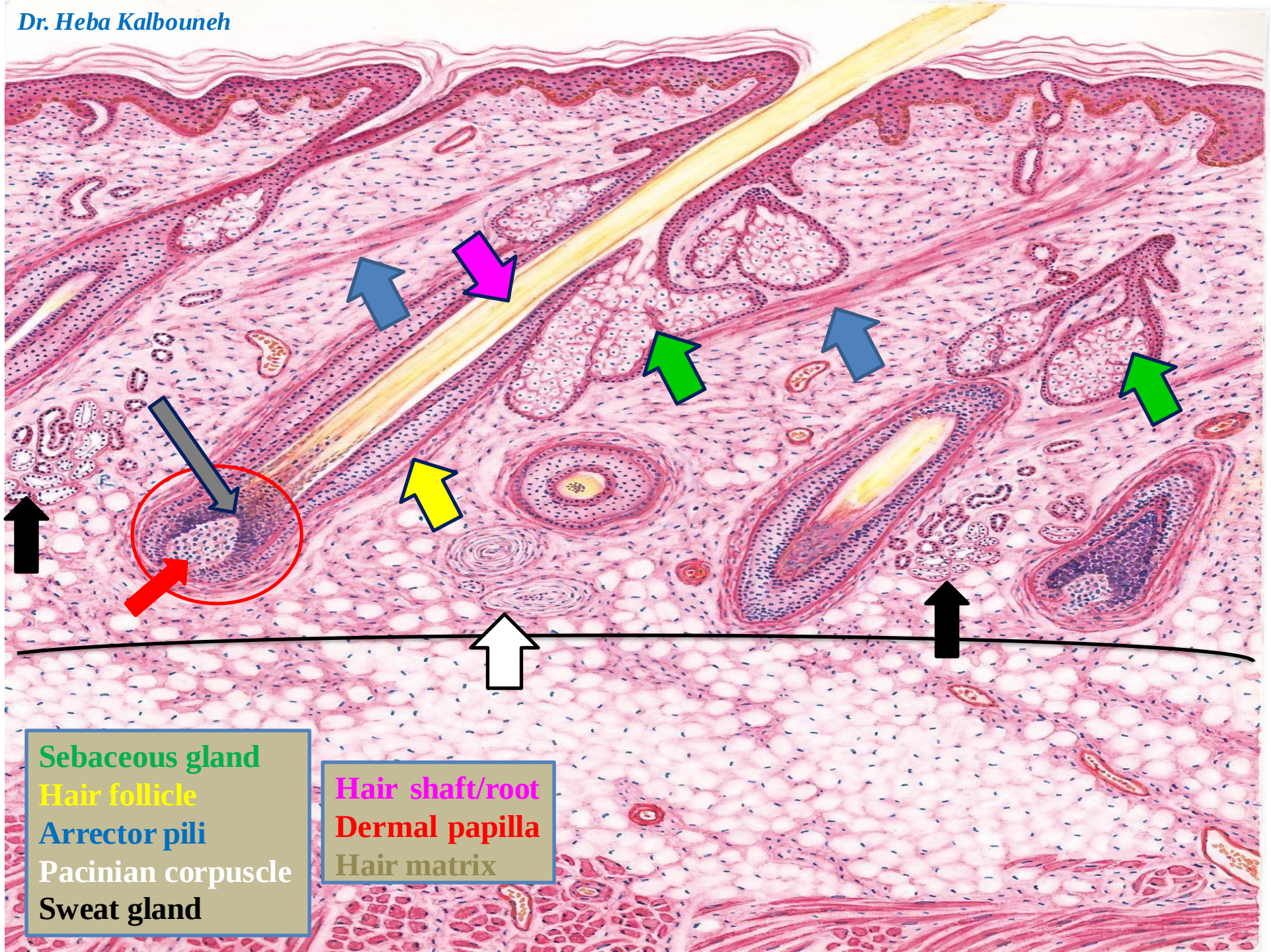
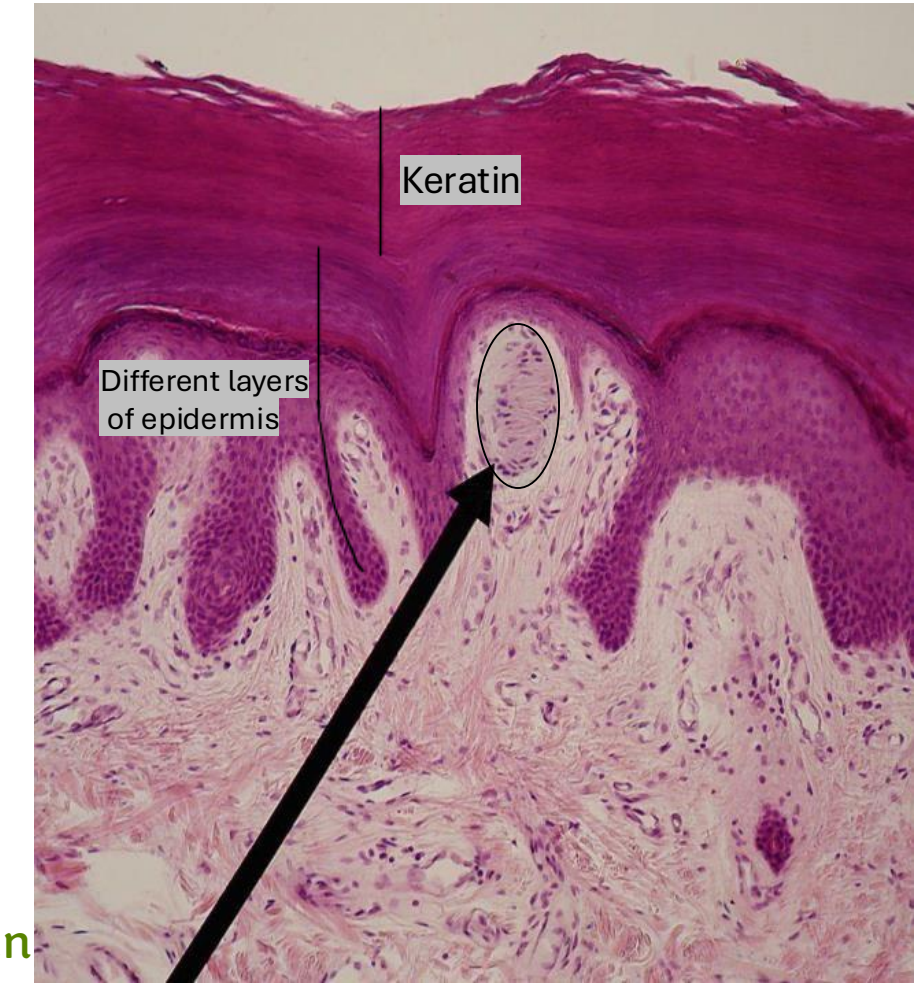


Meissner corpuscle

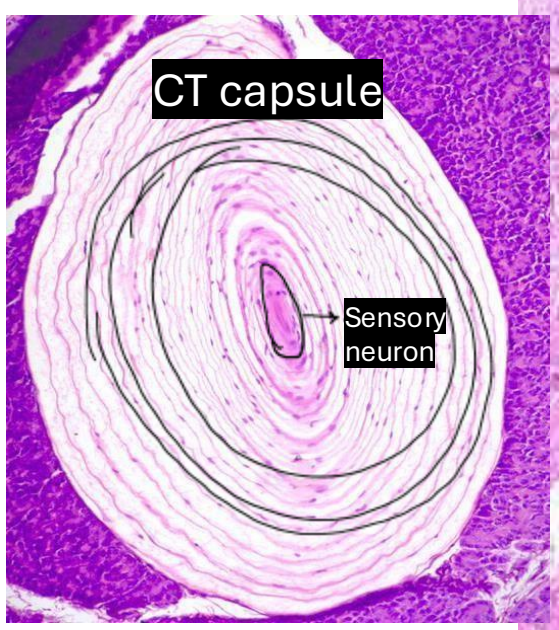


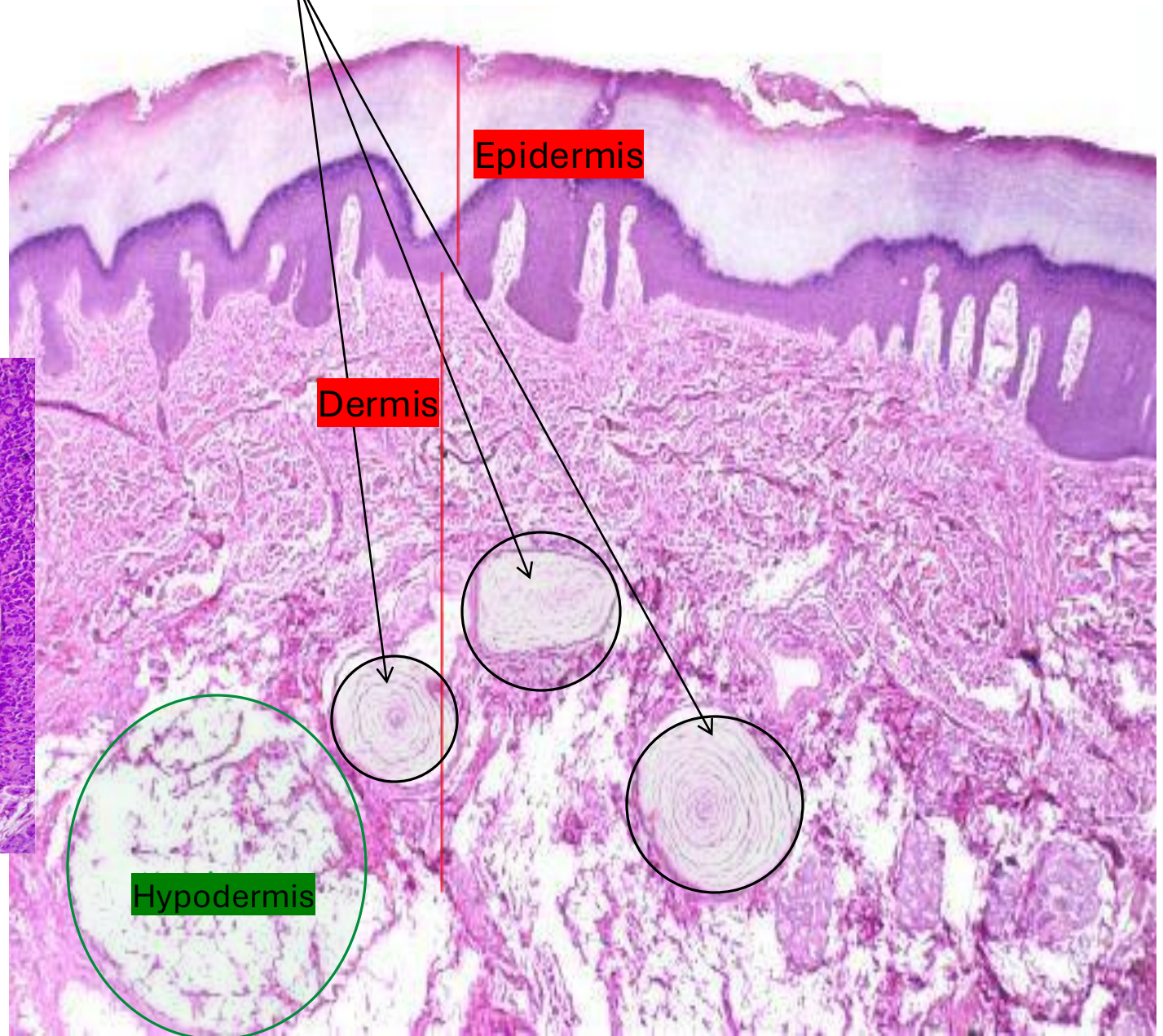
This corpuscle is located in the dermal papillae

So it's Meissner corpuscle

المُمكن الذي بين يديك، والأُمّة التي تراهن عليك، أحقّ أن تعطيه كُلّك. 3<

Pacinian corpuscles





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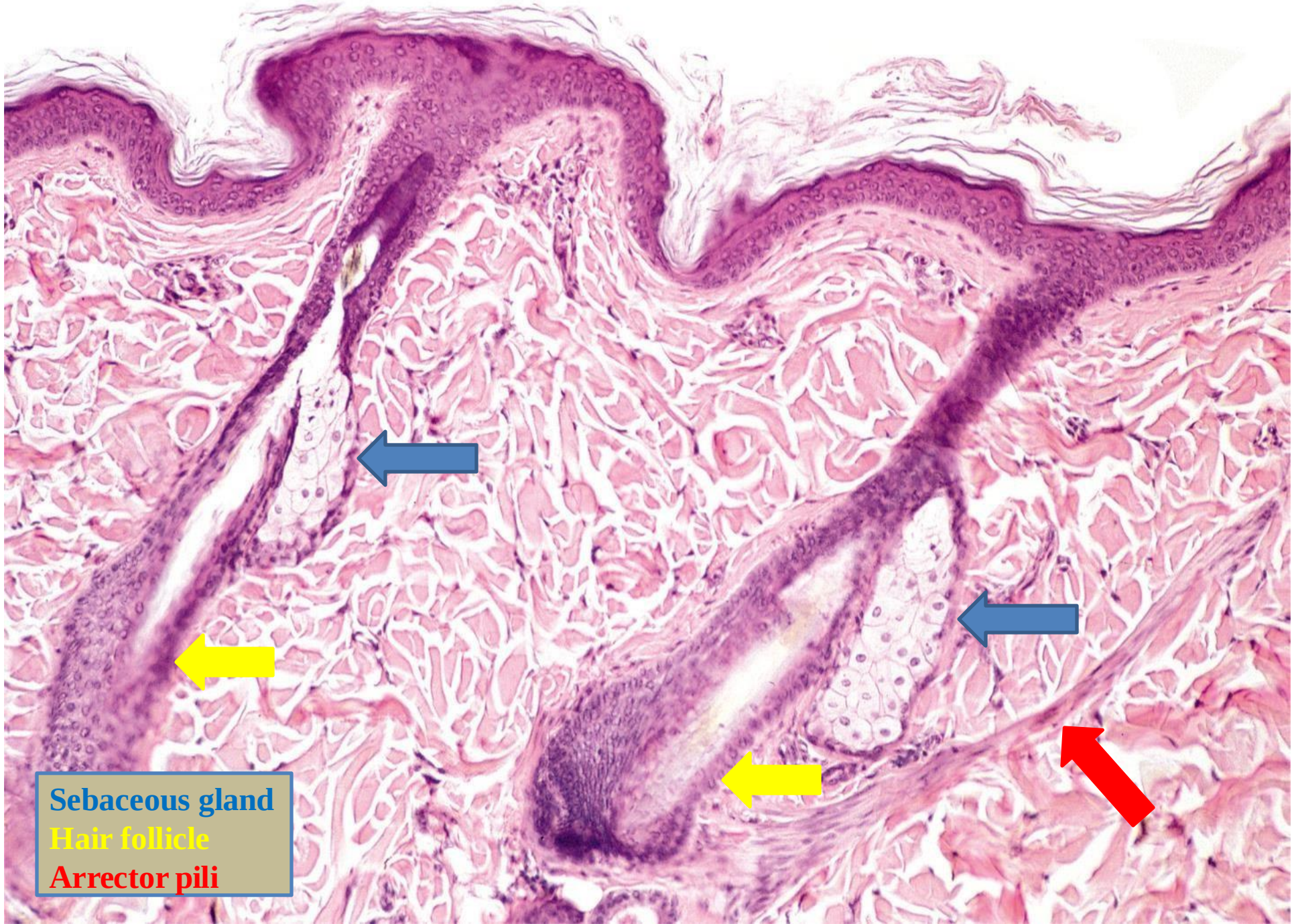
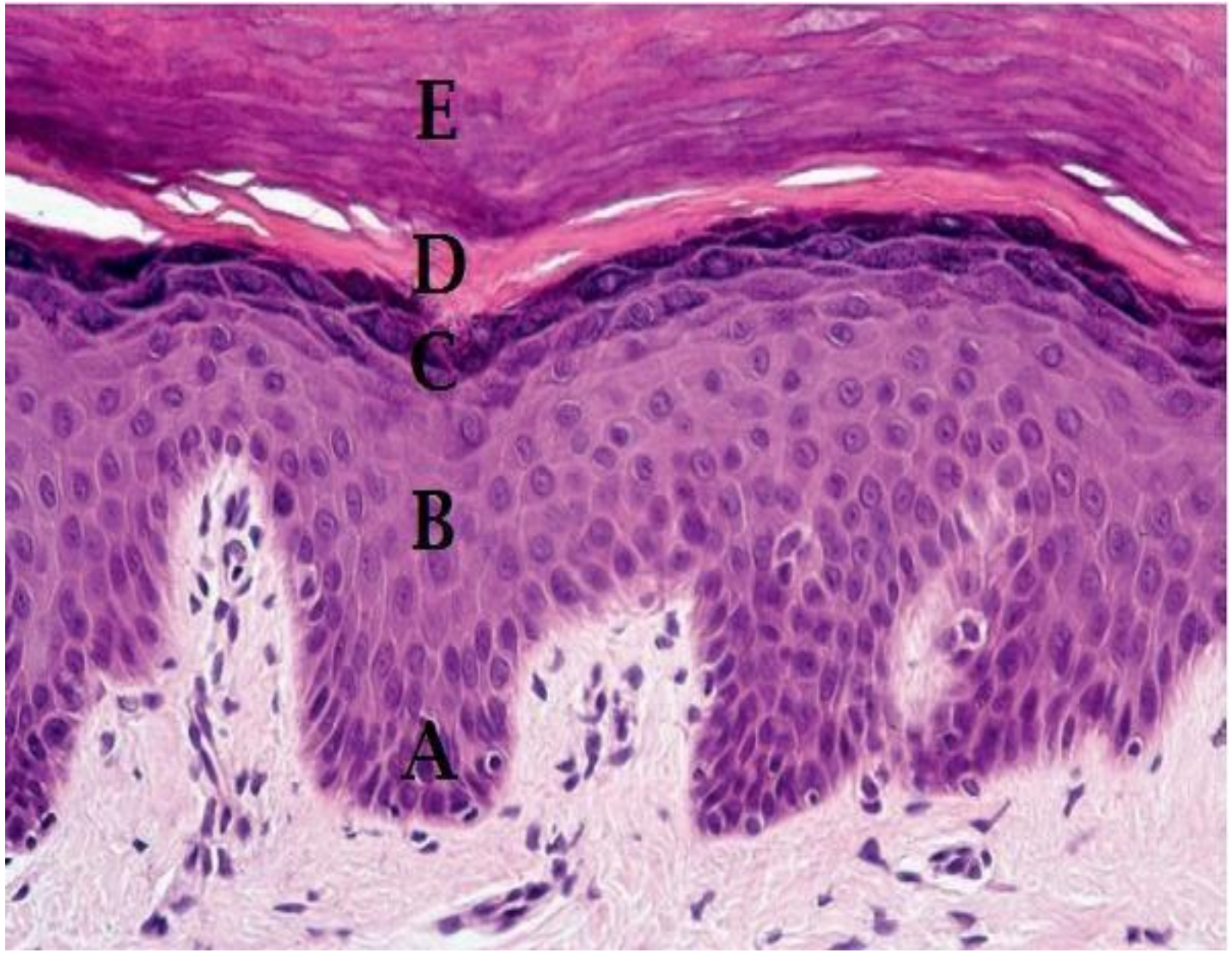
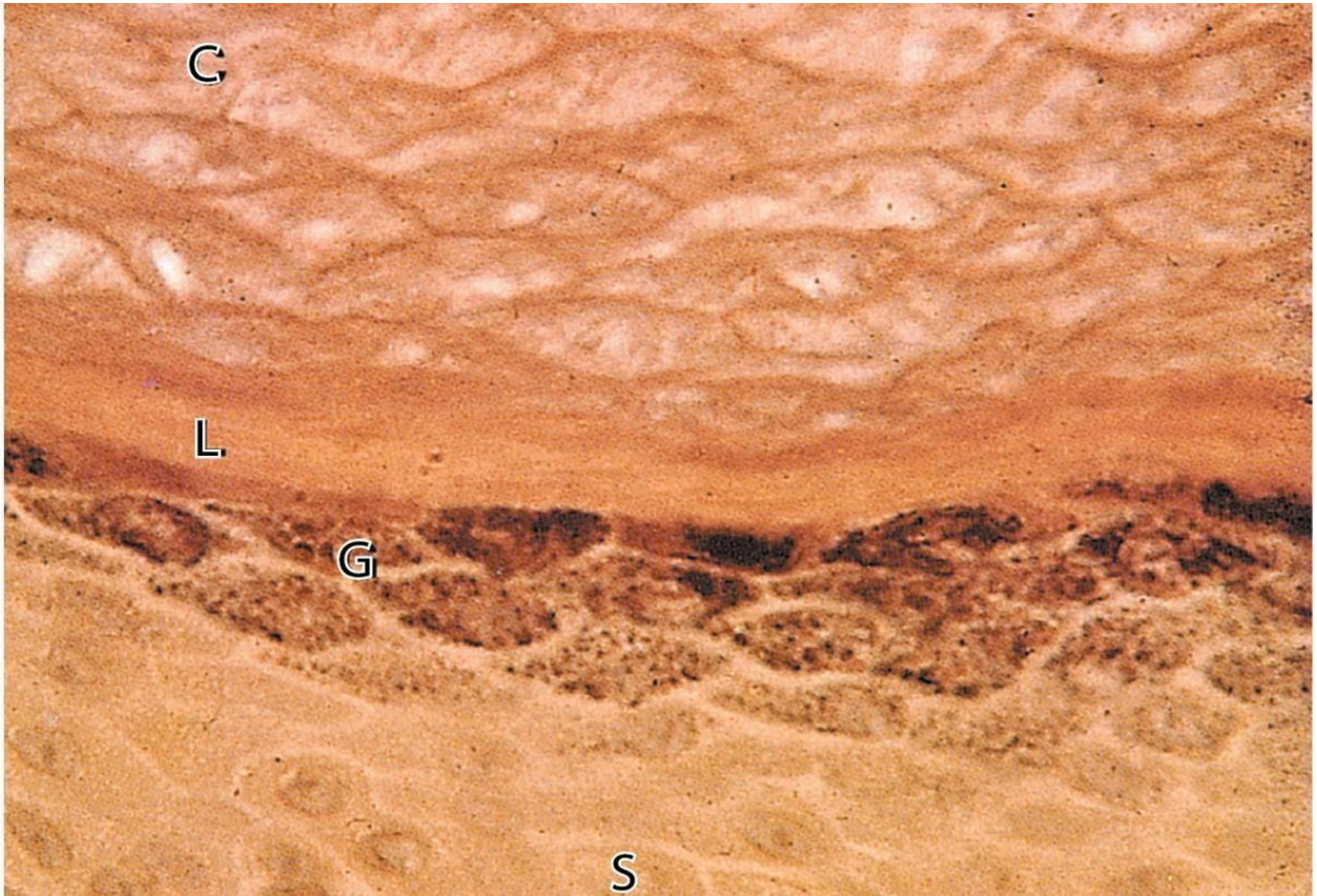



E
D
C
B
A

THICK OR THIN SKIN ????



For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

Additional Resources:

رسالة من الفريق العلمي: