

Histology of Skin

SKIN AND APPENDAGES

The skin and the specialized structures (appendages) form the integumentary system.

The skin – it's what keeps everything in.

Appendages

- Hairs
- Nails
- Sebaceous glands
- Sweat glands

Function

1- Protection: Physical barrier that protects underlying tissues from injury, UV light and bacterial invasion.

2- Regulation of body temperature: High temperature or exercise; sweat is evaporated from the skin surface to cool it down. **vasodilation** (increases blood flow) and **vasoconstriction** (decrease in blood flow) regulates body temp.

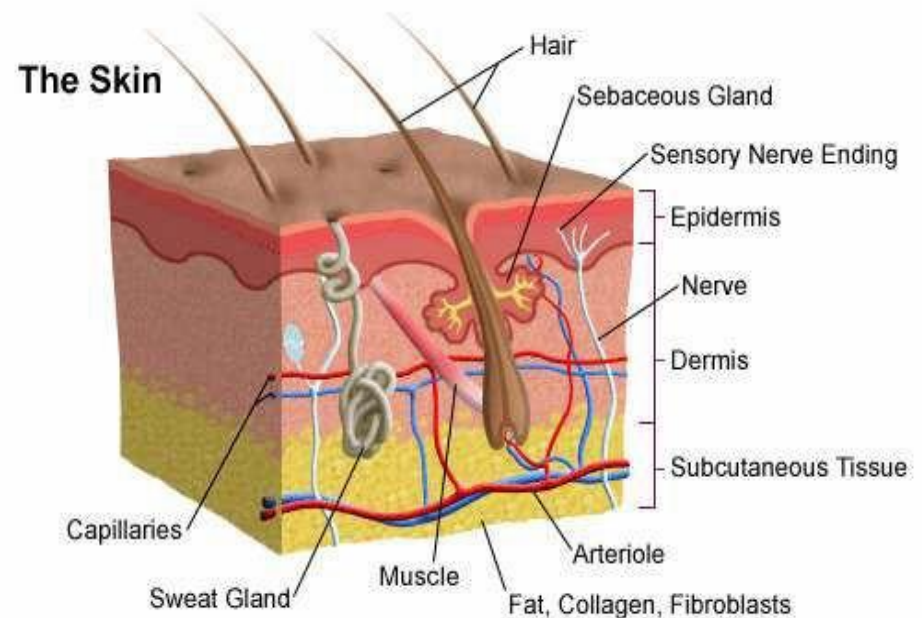
3- Sensation: Nerve endings and receptor cells that detect stimuli to temperature, pain, pressure and touch.

4- Excretion: Sweat removes water and small amounts of salt, uric acid and ammonia from the body surface.

5- Synthesis of Vitamin D (cholecalciferol) : UV rays in sunlight stimulate the production of Vit. D. Enzymes in the kidney and liver modify and convert to final form; **calcitriol** (most active form of Vit. D.)

Skin Histology

- The skin is considered the largest organ of the body .
- The skin is divided into two main regions, the **epidermis**, and the **dermis**. The dermis is attached to an underlying hypodermis, also called subcutaneous connective tissue.



Layers of the Skin

1. EPIDERMIS: Stratified squamous keratinized epithelium.

2. DERMIS : Dense irregular collagenous connective tissue.

Hypodermis: Loose connective tissue containing fat (not a part of the skin) (superficial fascia).

Classification of Skin

The skin is classified into:

Thick skin covers palms and soles.

Thin skin found on remainder of the body

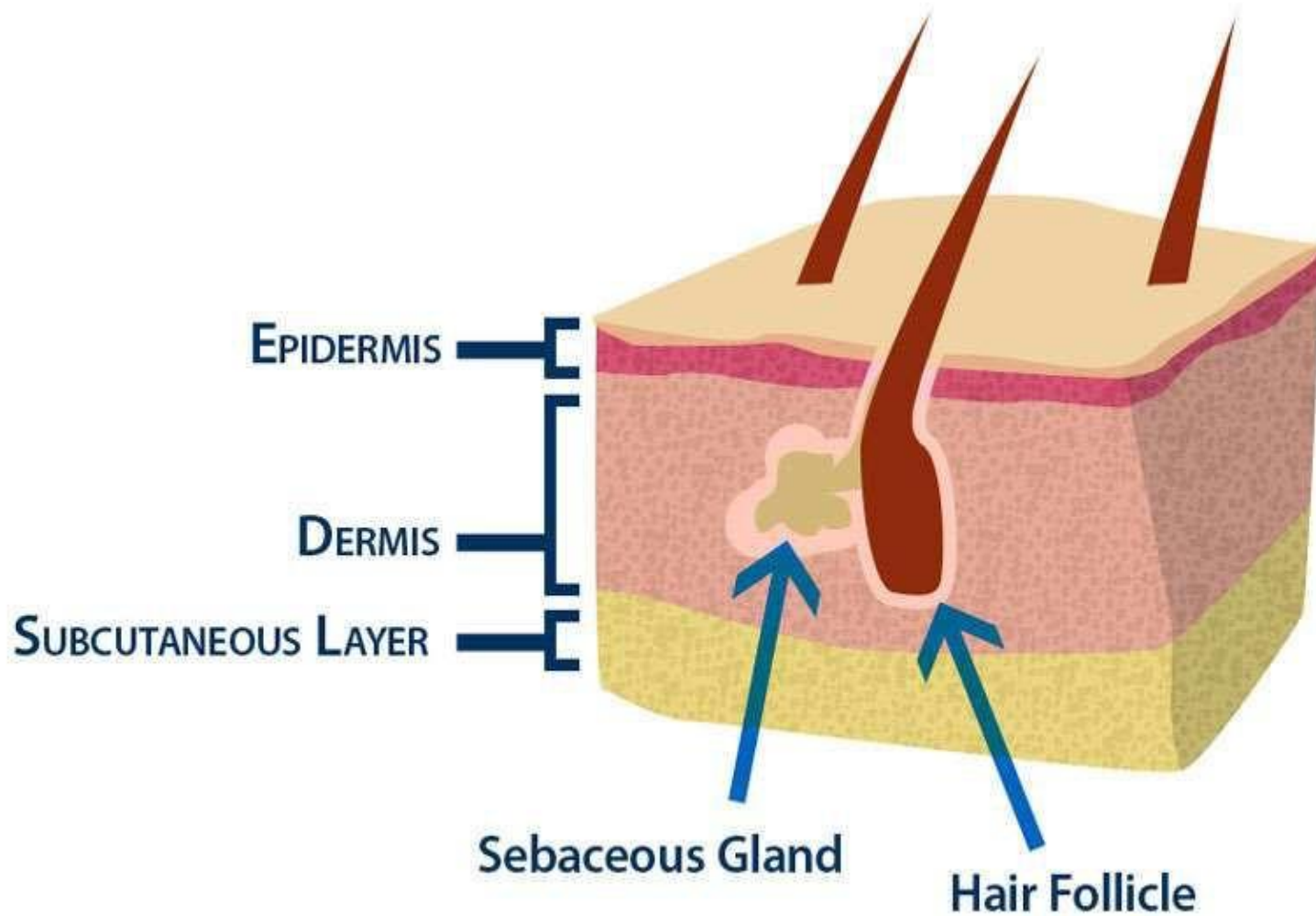
Differences between thin & thick skin

Thin Skin

- Entire body except thick skin areas.
- Less than 5 layers
- Stratum corneum is thin with no stratum lucidum
- Hair follicles present except lips, labia minora, glans and penis

Thick Skin

- Palms of hands and soles of feet
- 5 layers thick
- Stratum corneum with increased granular layer
- More sensory receptors
- Lack sebaceous glands
- No hair follicles



Layers of the Skin

Epidermis

Epidermis: Keratinized stratified squamous epithelium with four distinct cell types and five distinct layers.

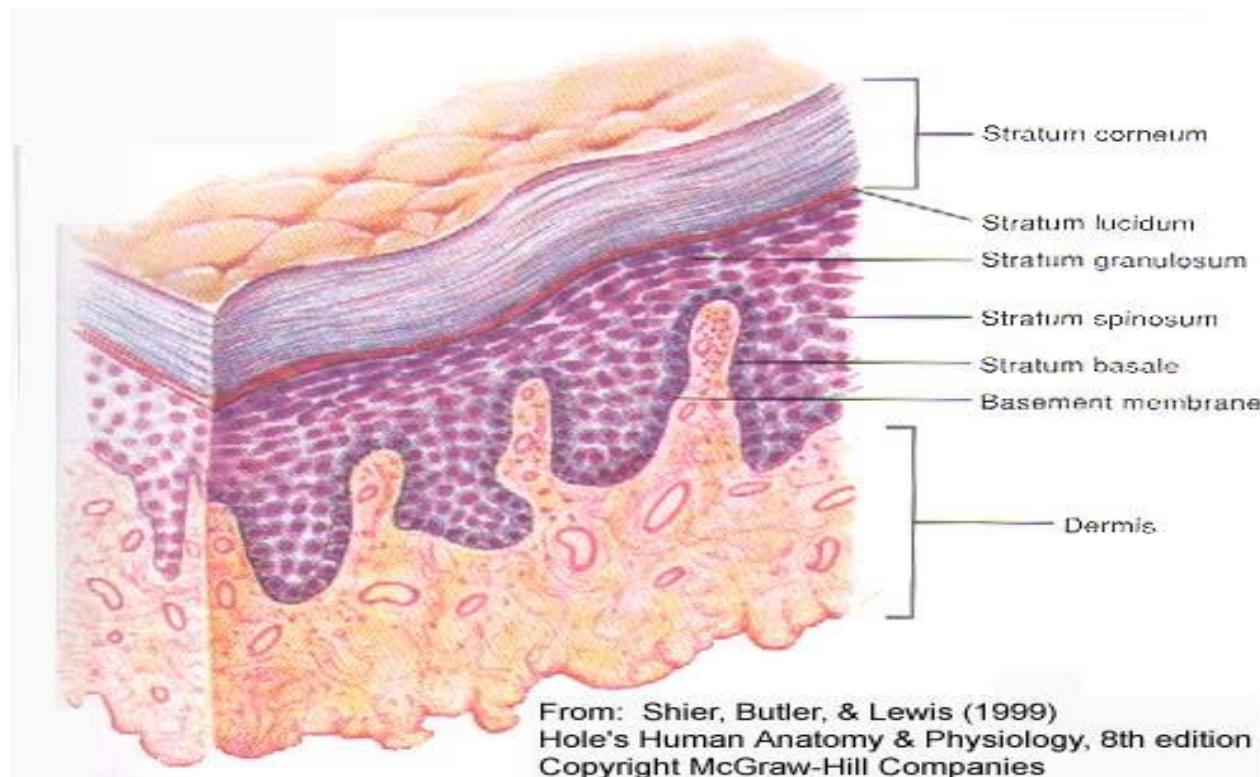
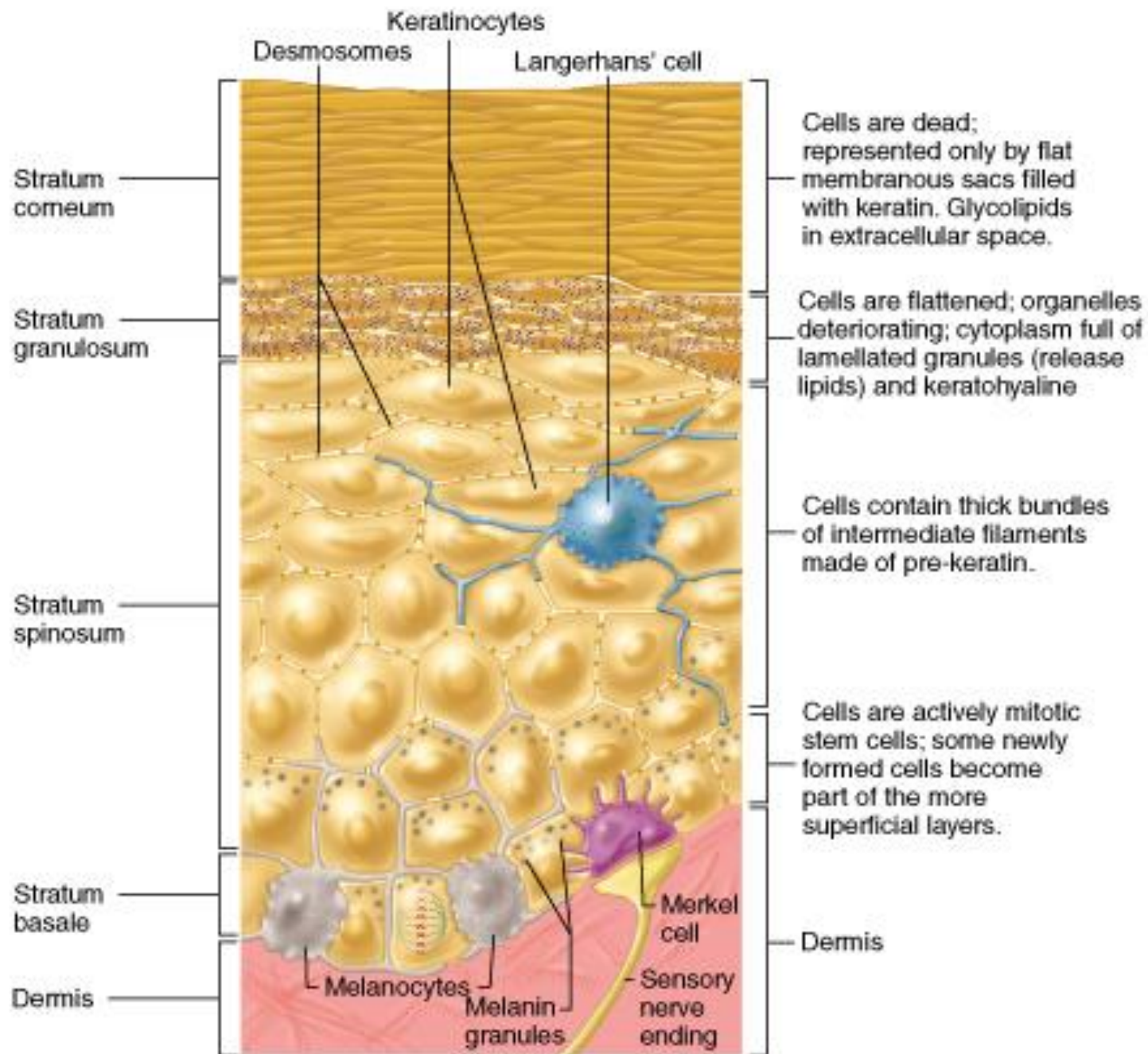


FIGURE 6.3



Epidermis

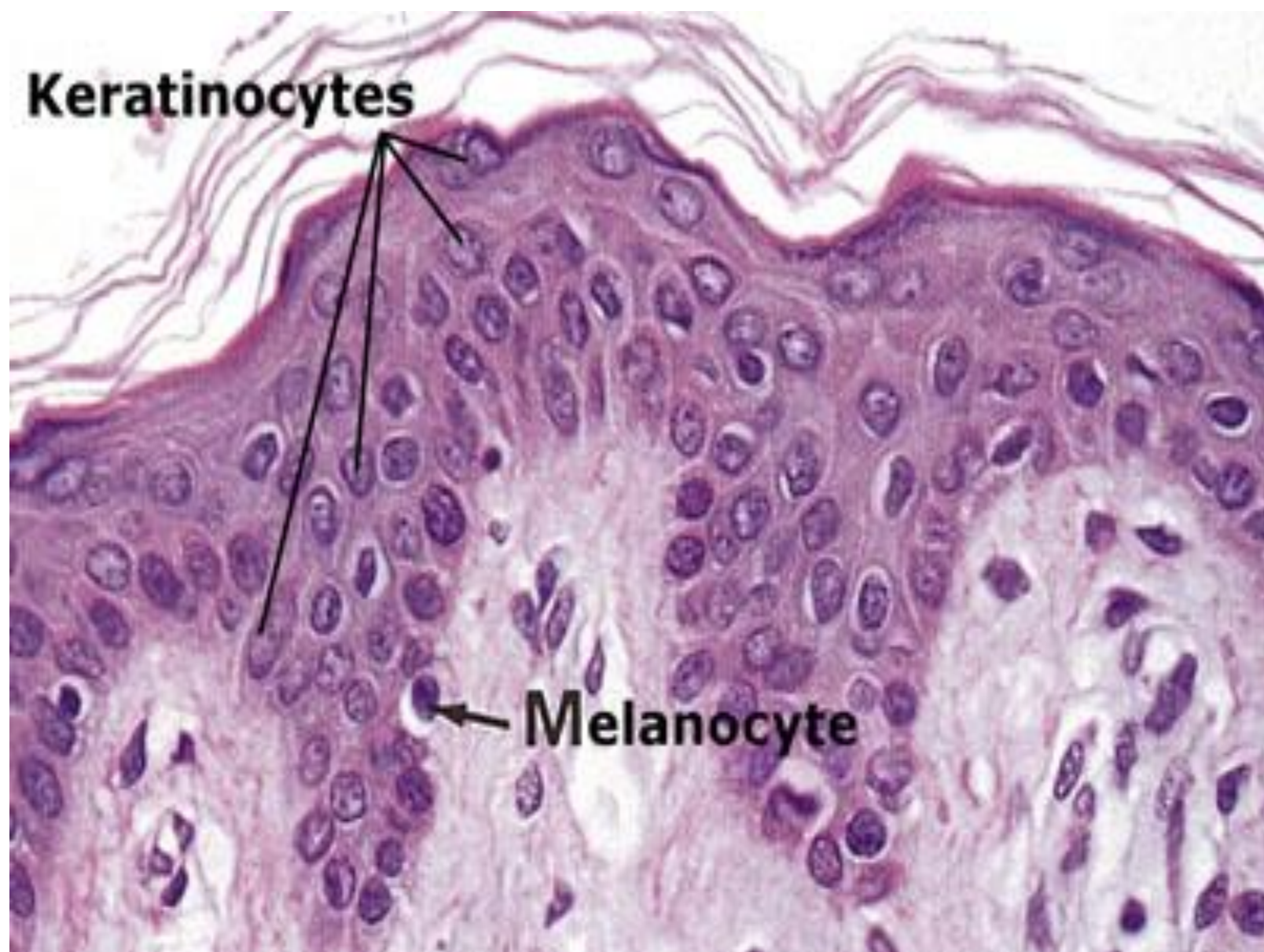
Cells in the epidermis: There are four types of cells.

- Keratinocytes
- Melanocytes
- Merkel cells
- Langerhans' cells

1- Keratinocytes:

- most abundant
- produce keratin (fibrous protein)
- continuous mitosis
- form in the deepest layer called the stratum basale.

Keratinocytes

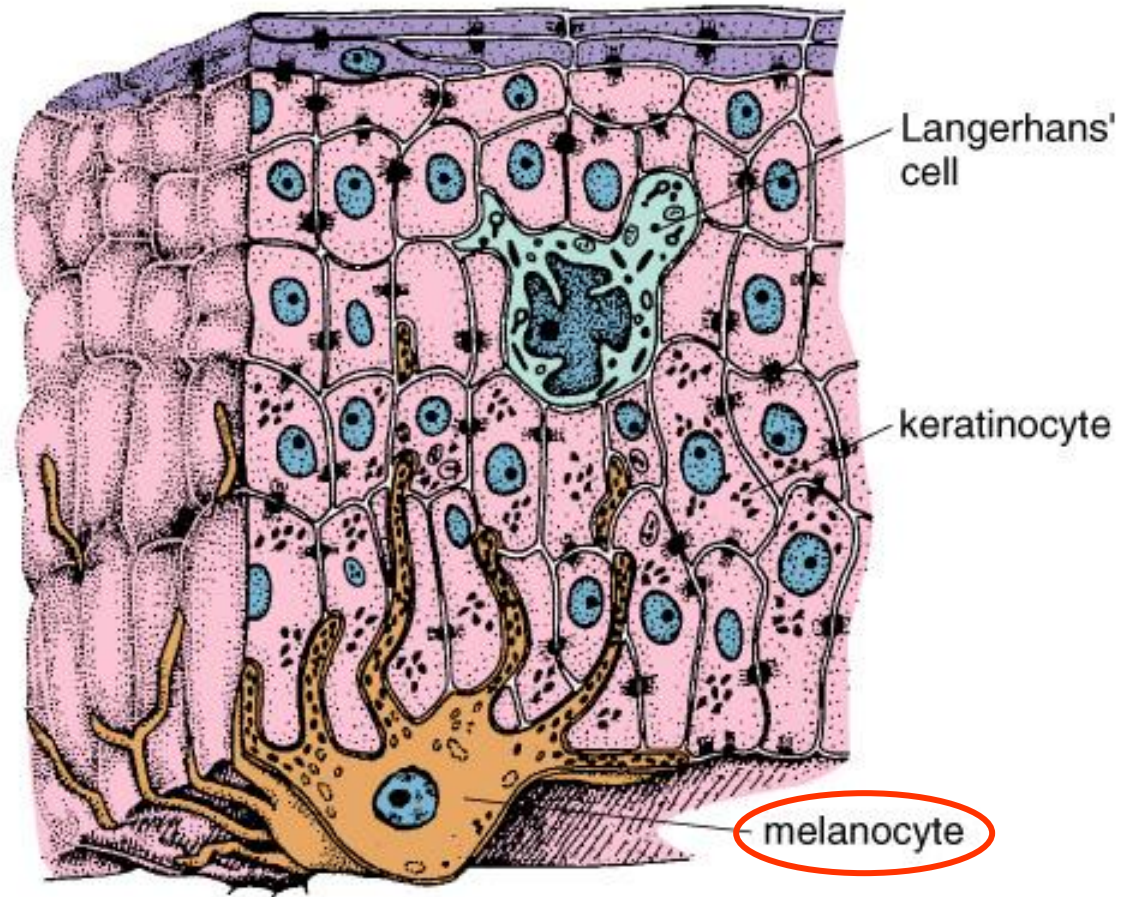


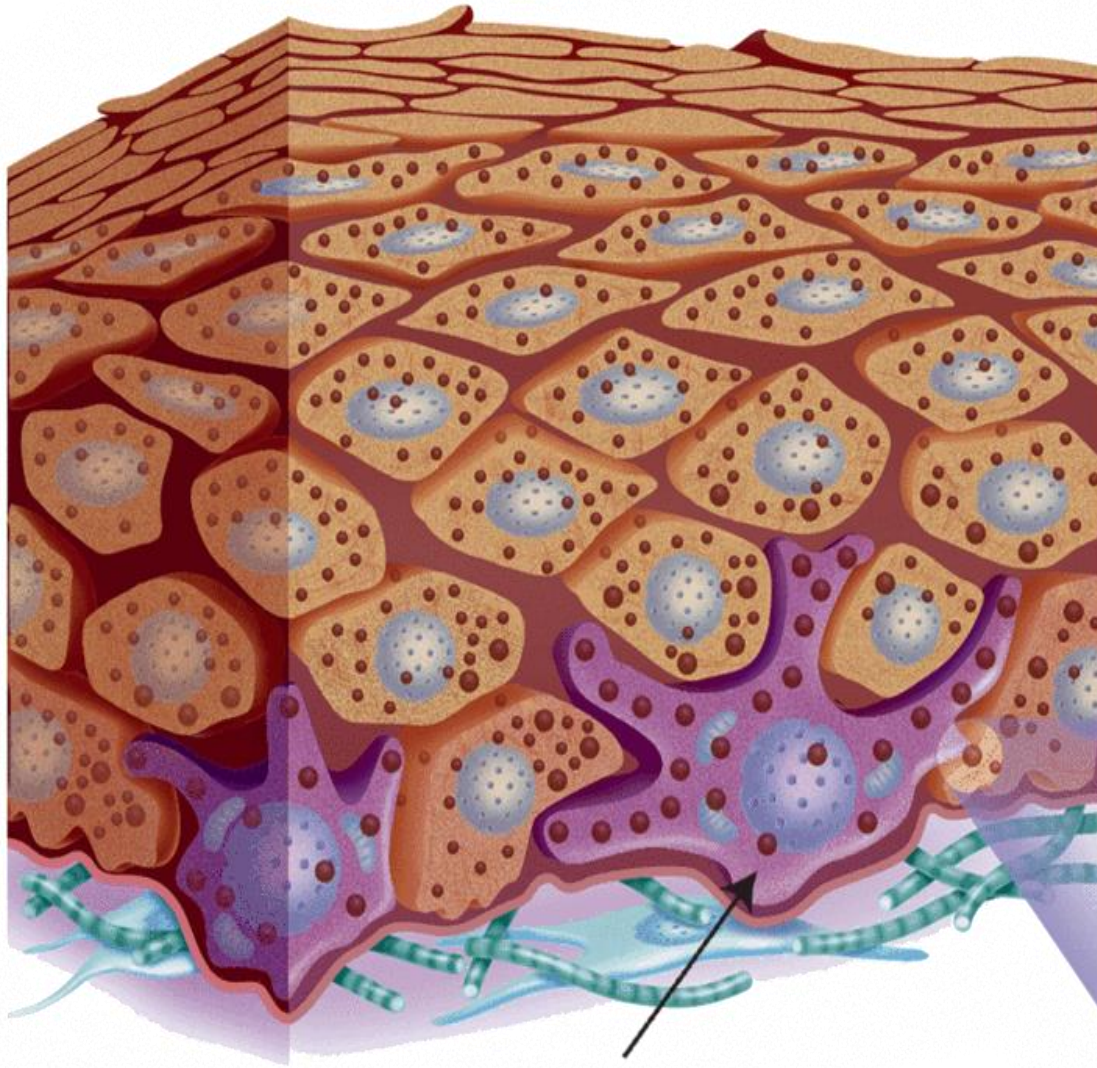
Melanocyte

2- Melanocytes:

- Cells produce brownish/black pigment called melanin.
- These cells are found in stratum basale and stratum spinosum.
- Branching processes (dendrites)
- Melanin accumulates in melanosomes and transported along dendrites of the melanocytes to keratinocytes.
- Melanin accumulates on the superficial aspect of the keratinocyte.

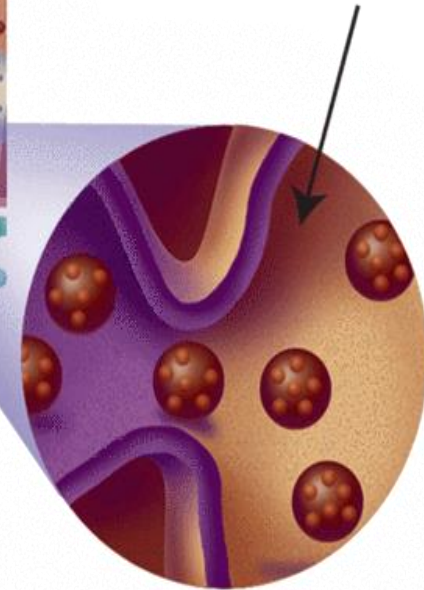
Melanocyte in stratum basale

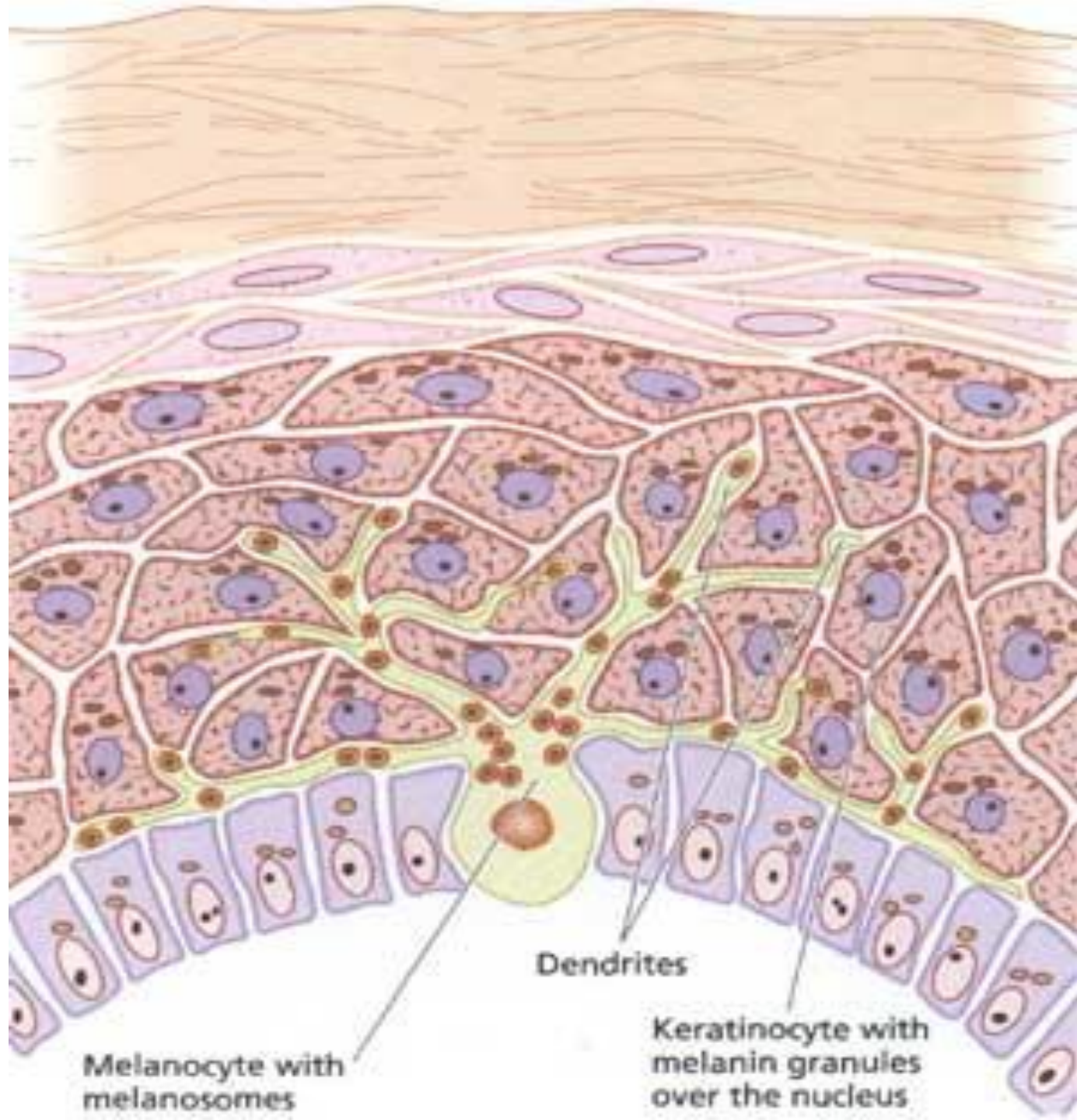




Melanocyte: skin cell that produces melanin

Melanin molecule being transferred to skin cells



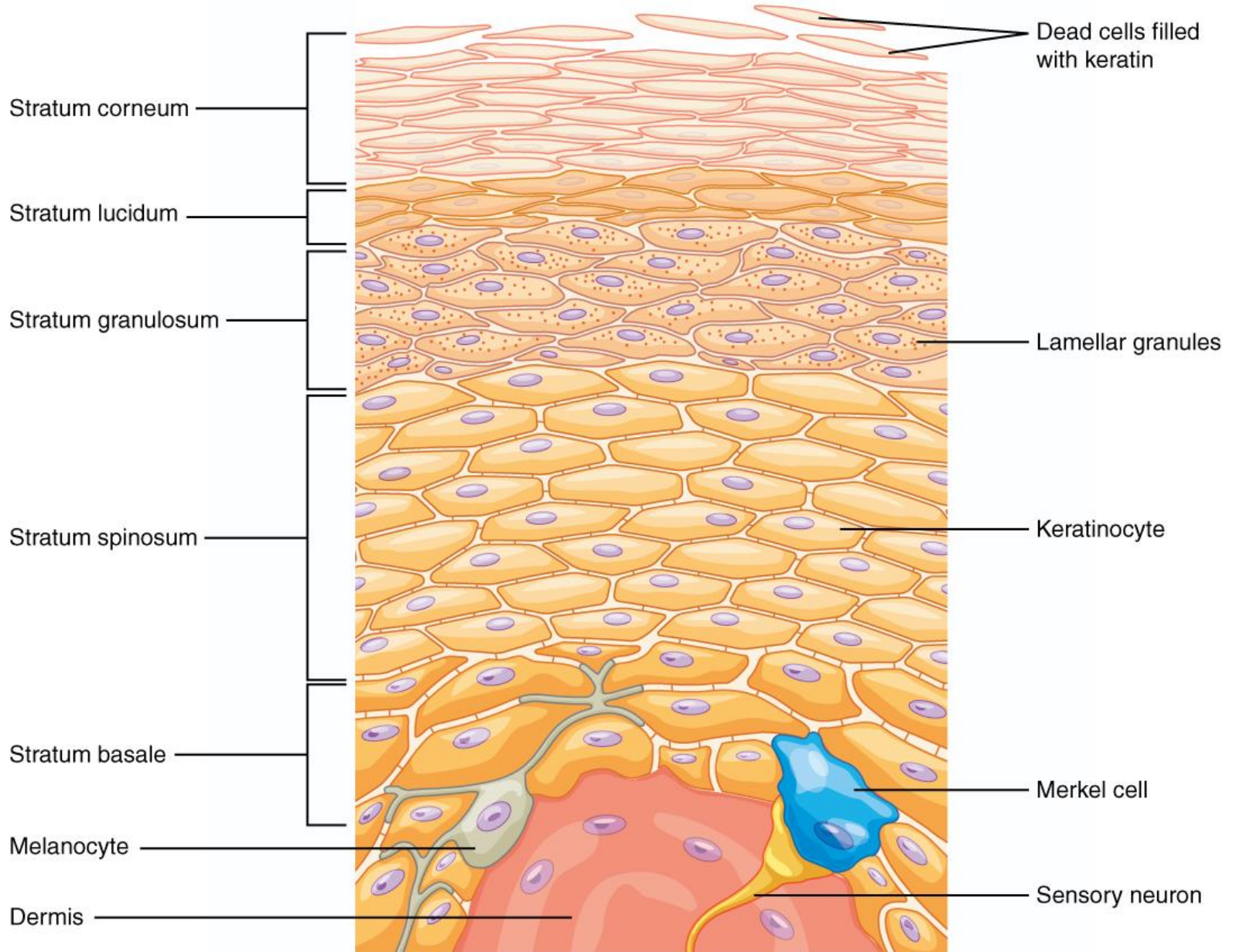


3- Merkel cells:

- These cells are found in Stratum basale of epidermis.
- Attach to keratinocytes by desmosomes.
- Make contact with a sensory neuron ending called a Merkel disc .
- Combination of axon and a Merkel cell is referred as **Merkel cell neurite complex** or **Merkel Corpuscle**.

Function of Merkel Cells:

- The Merkel cell neurite complex serve as **mechanoreceptors**, which are concerned with the sensation of light touch.
- They are more abundant in fingertips, lips, etc.



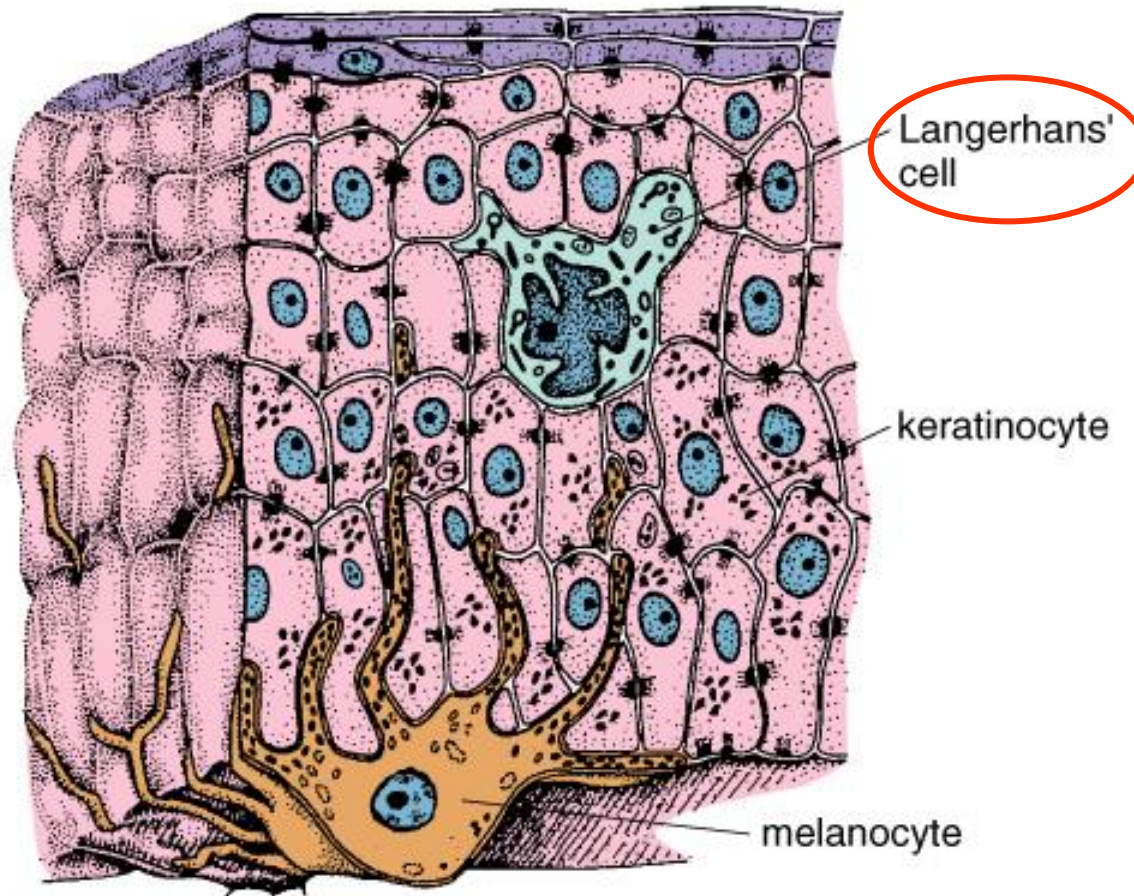
4- Langerhans cells:

- These cells are located in the stratum spinosum
- Star-shaped cells having dendritic process.
- Epidermal macrophages cells.

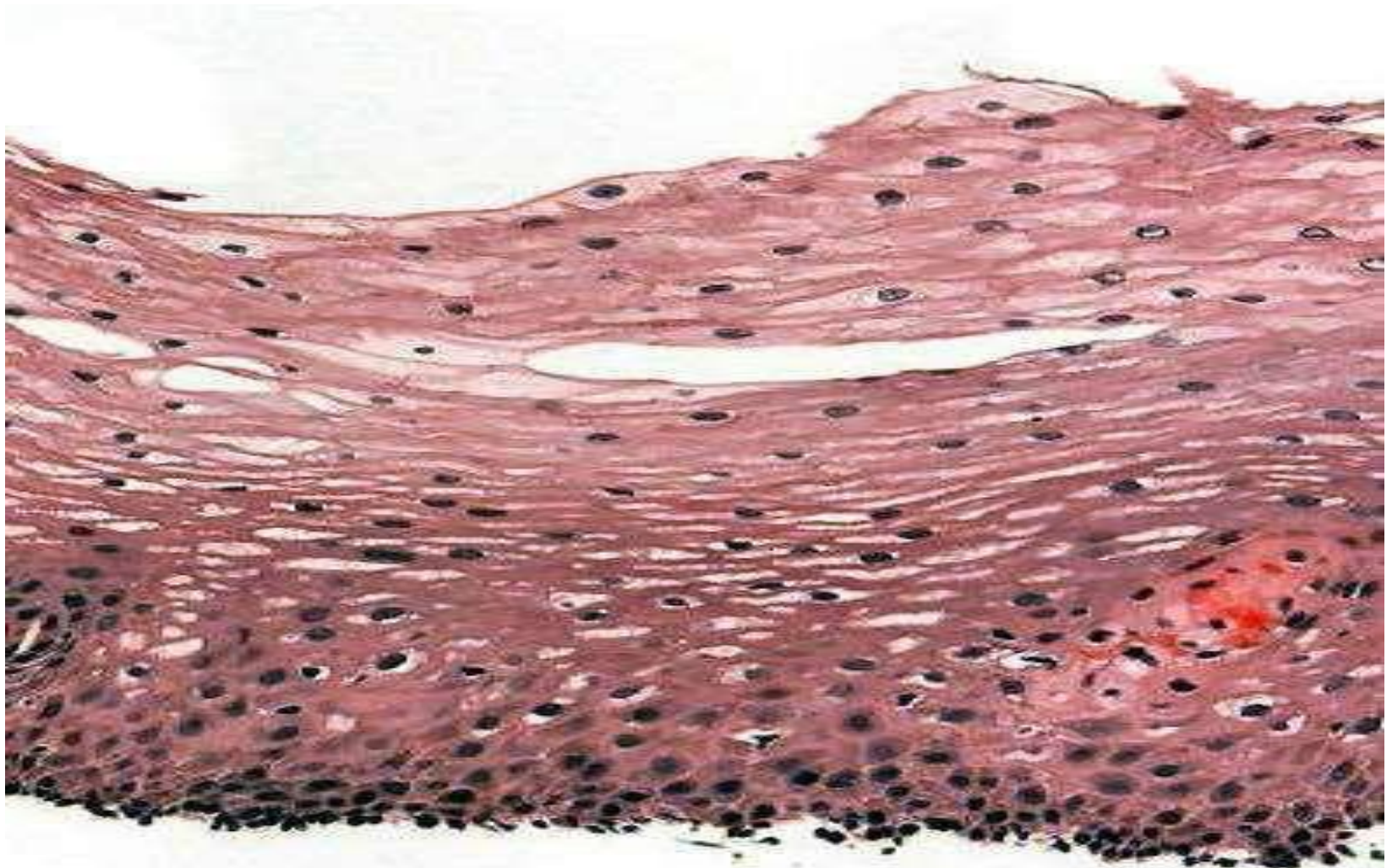
Function:

- Acting as antigen presenting cells.
- The cells phagocytose those foreign antigens that manage to penetrate the epidermis.

Langerhans cell in stratum spinosum



- Has stratified epithelium



5 layers

Basal layer
Stratum basale

Stratum spinosum
(Malpighian layer)

Stratum
Granulosum

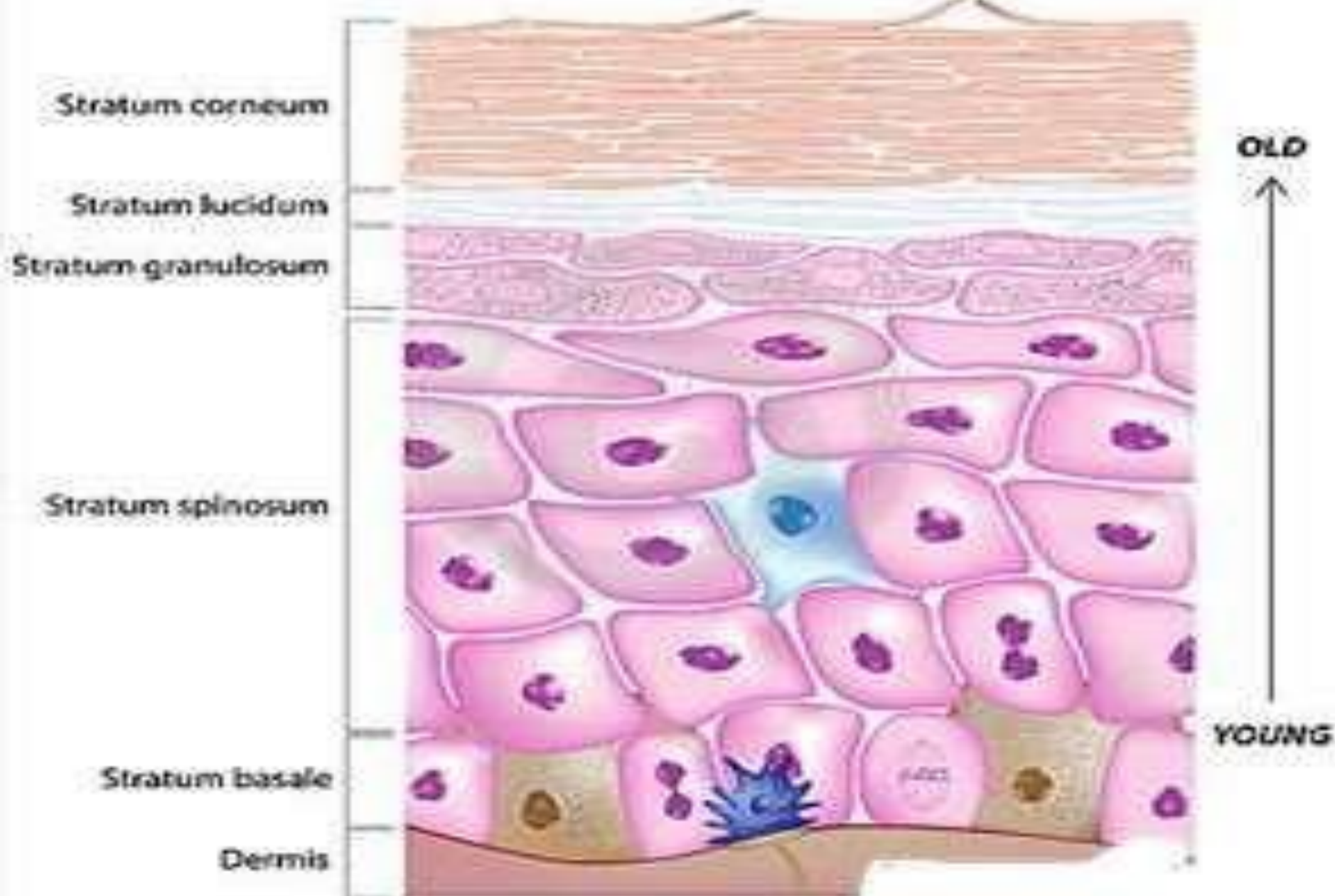
Stratum Lucidum

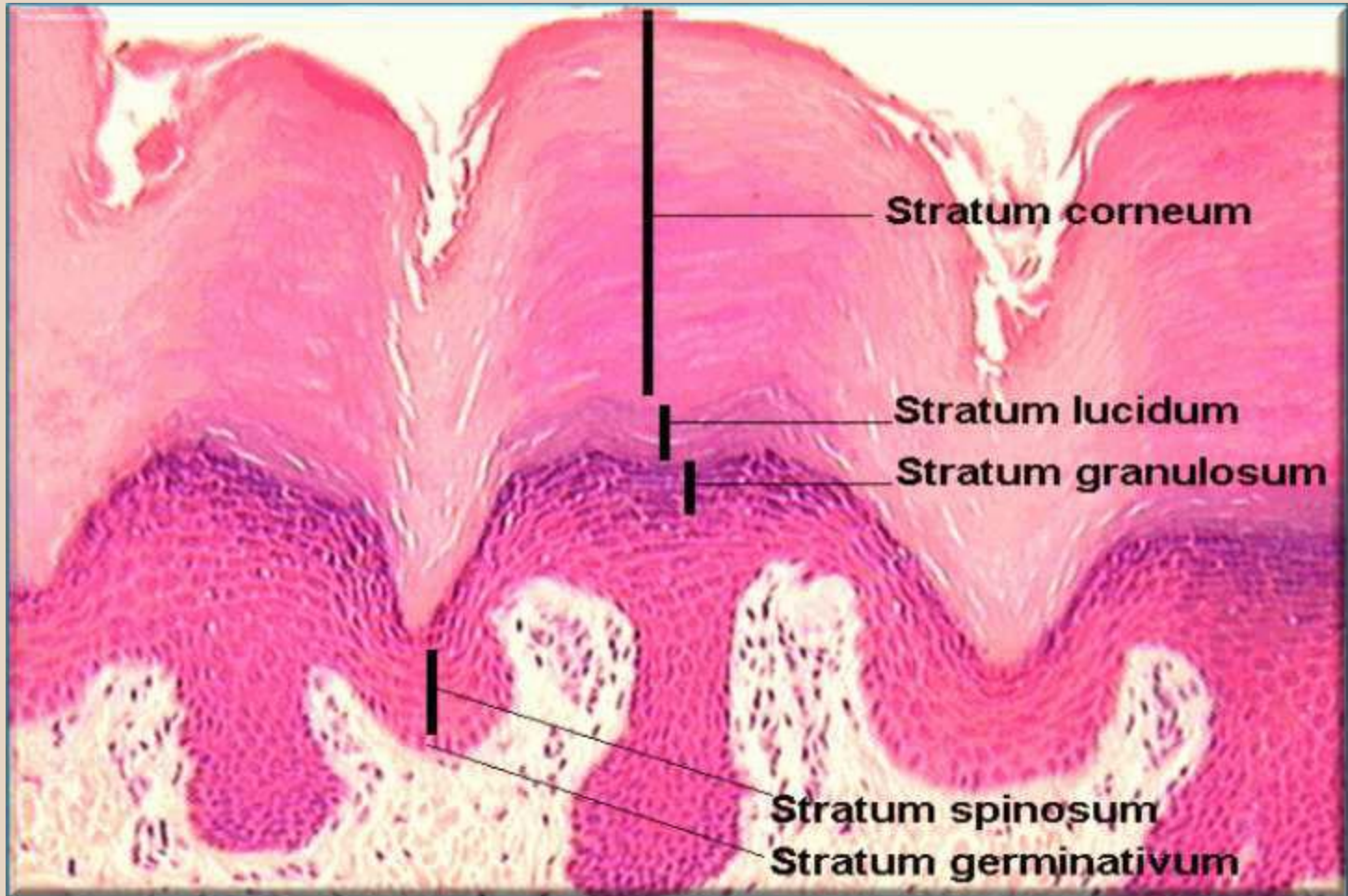
Stratum Corneum

Stratum Basale

- Deepest layer of epidermis
- Also known as **Germinal layer/ Stratum Germinativum**
- A single layer of cuboidal or columnar keratinocytes resting on basement membrane.
- Undergo mitosis & give off cells called **Keratinocytes**.
- The stratum basale contains **Merkel cell and Melanocytes**.

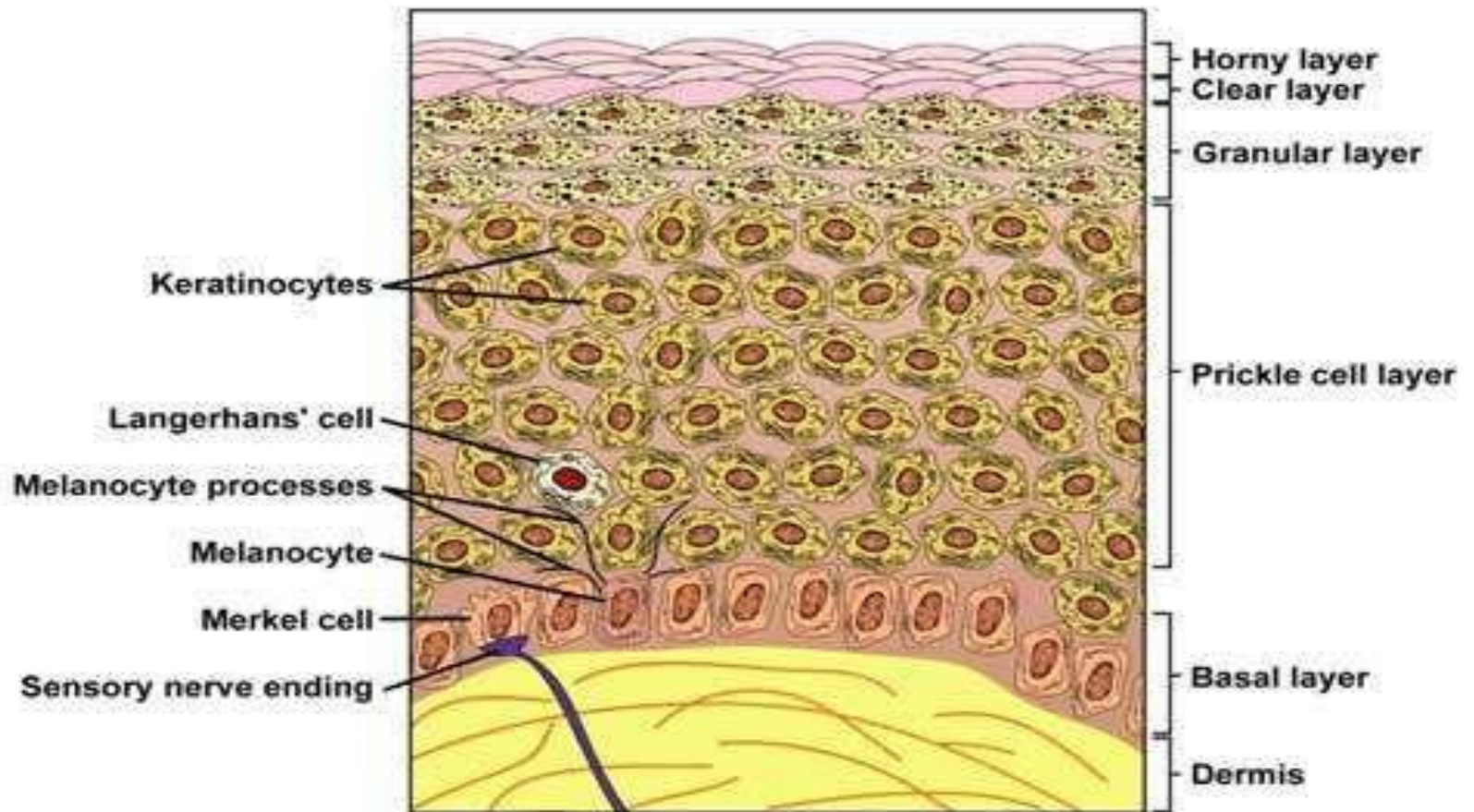
Structure of the Epidermis

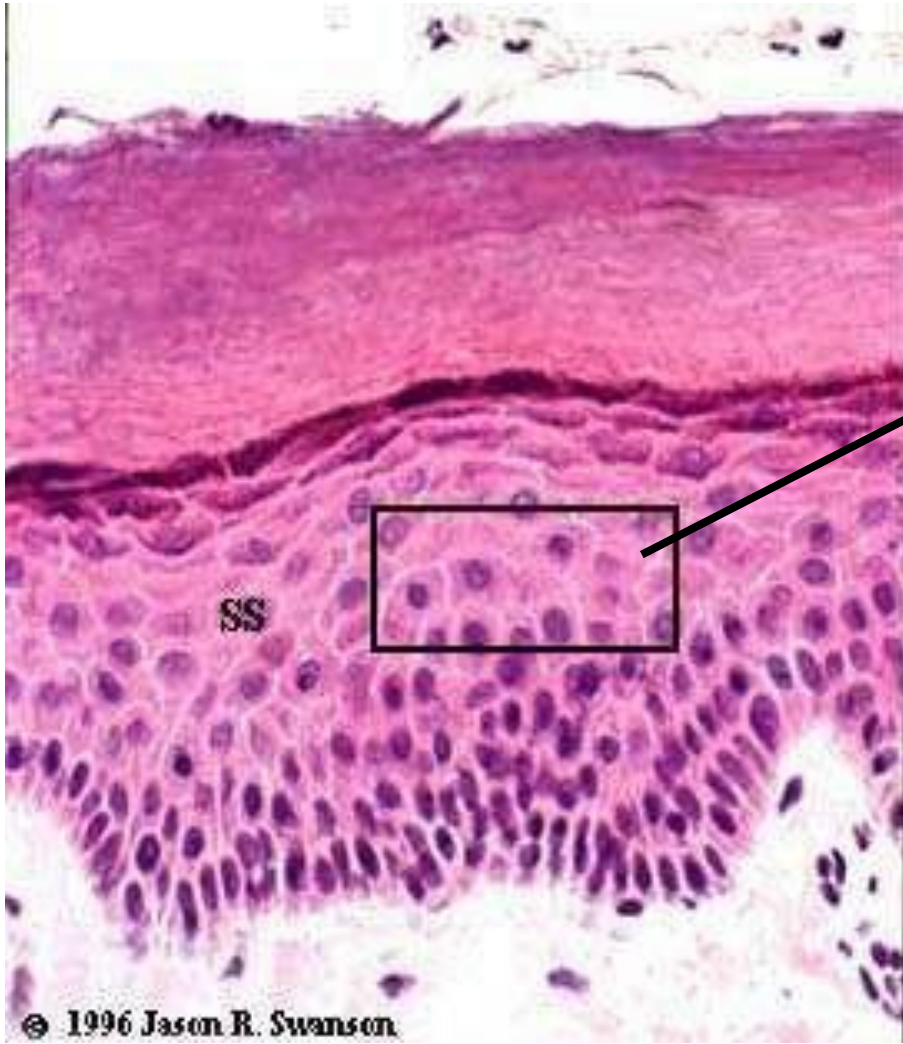




Stratum spinosum

- Several layers (4 to 6) of irregular polyhydral keratinocytes
- Cells are attached to one another by numerous Desmosomes.
- Some mitosis may occur in the deeper cells.
- The stratum basale and stratum spinosum are collectively known as **Malpighian layer**.
- Production of new keratinocytes occurs only in the Malpighian layer.



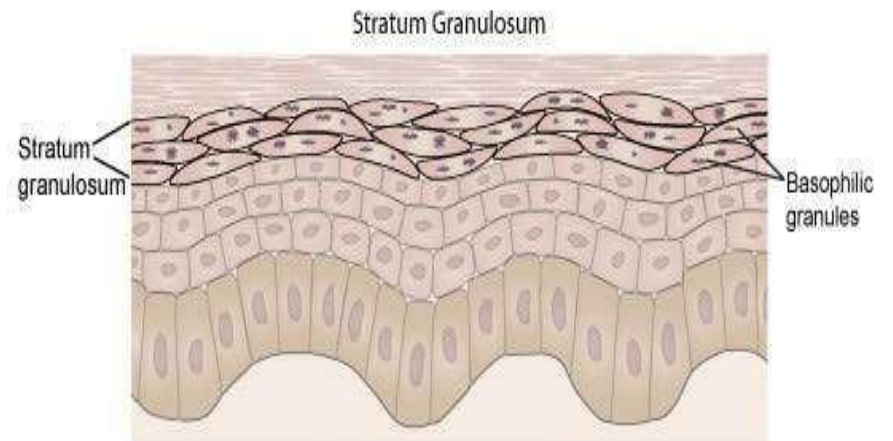
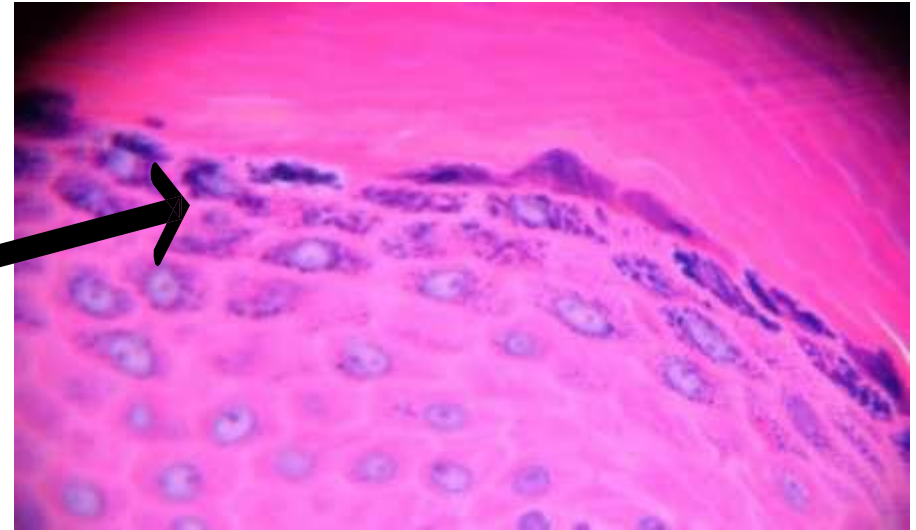
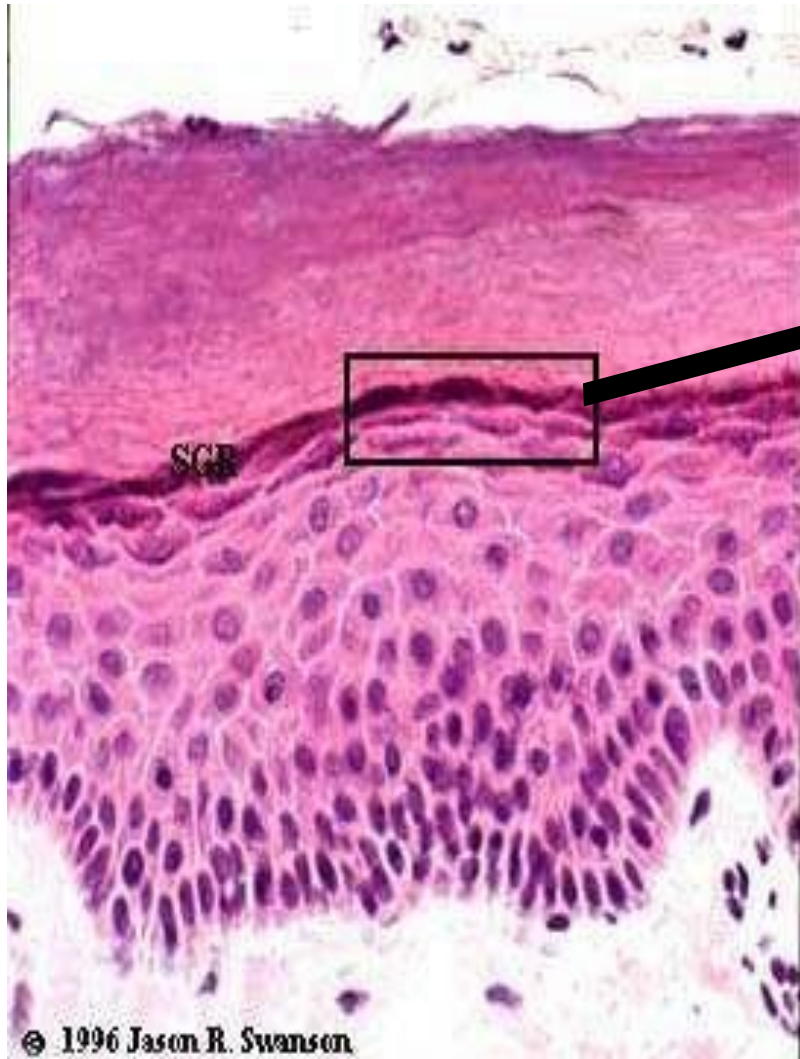


Desmosomes in the stratum spinosum



Stratum Granulosum

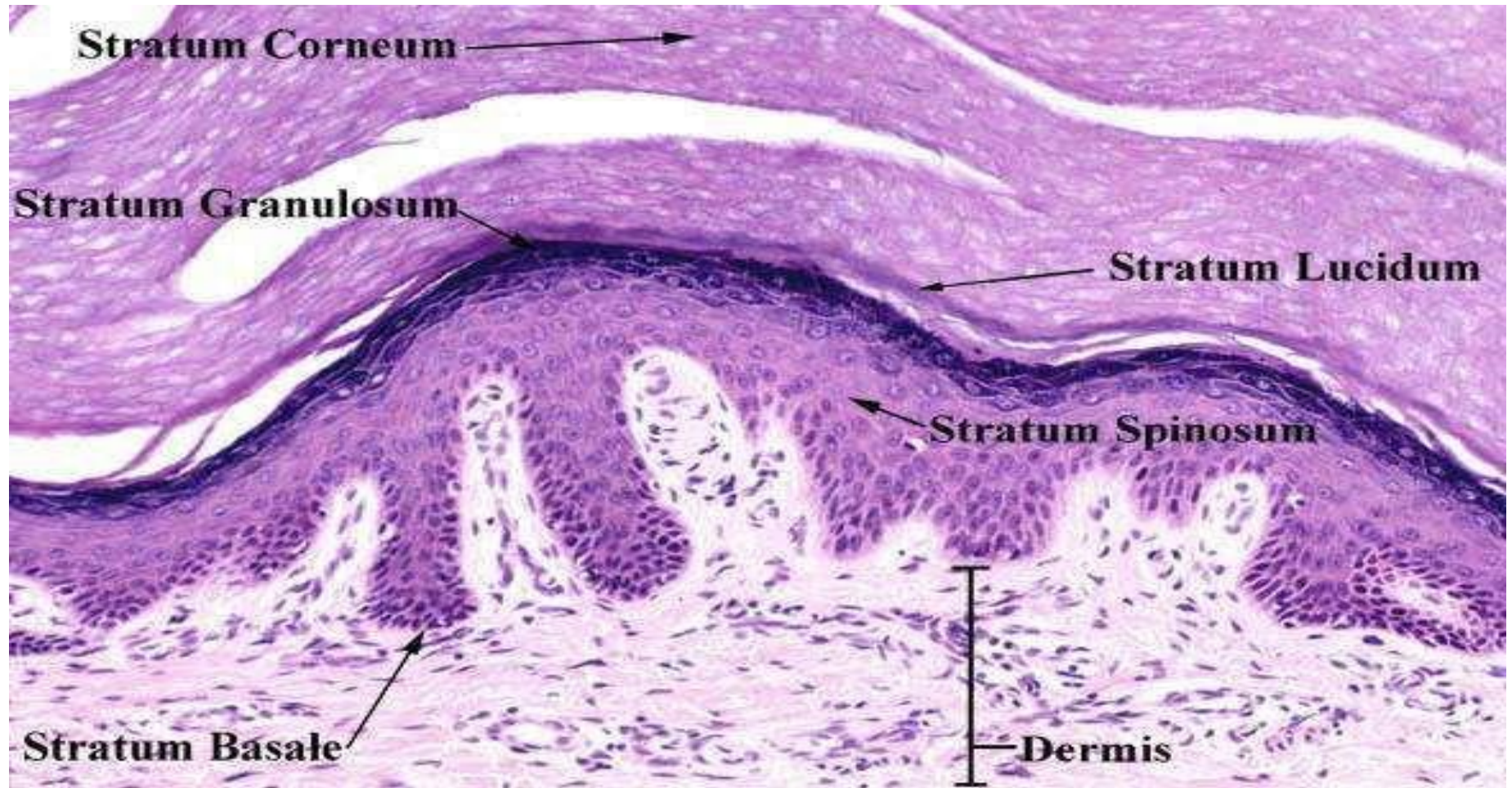
- Overlies the stratum spinosum consist of 3 to 5 layers of flattened rhomboid keratinocytes.
- The cytoplasm of these cells contains a large number of granules known as **keratohyalin granules**.
- The cytoplasm also contain **lamellar granules** formed by lipid which seal the skin and creates a barrier which is impermeable to water.



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Stratum Lucidum

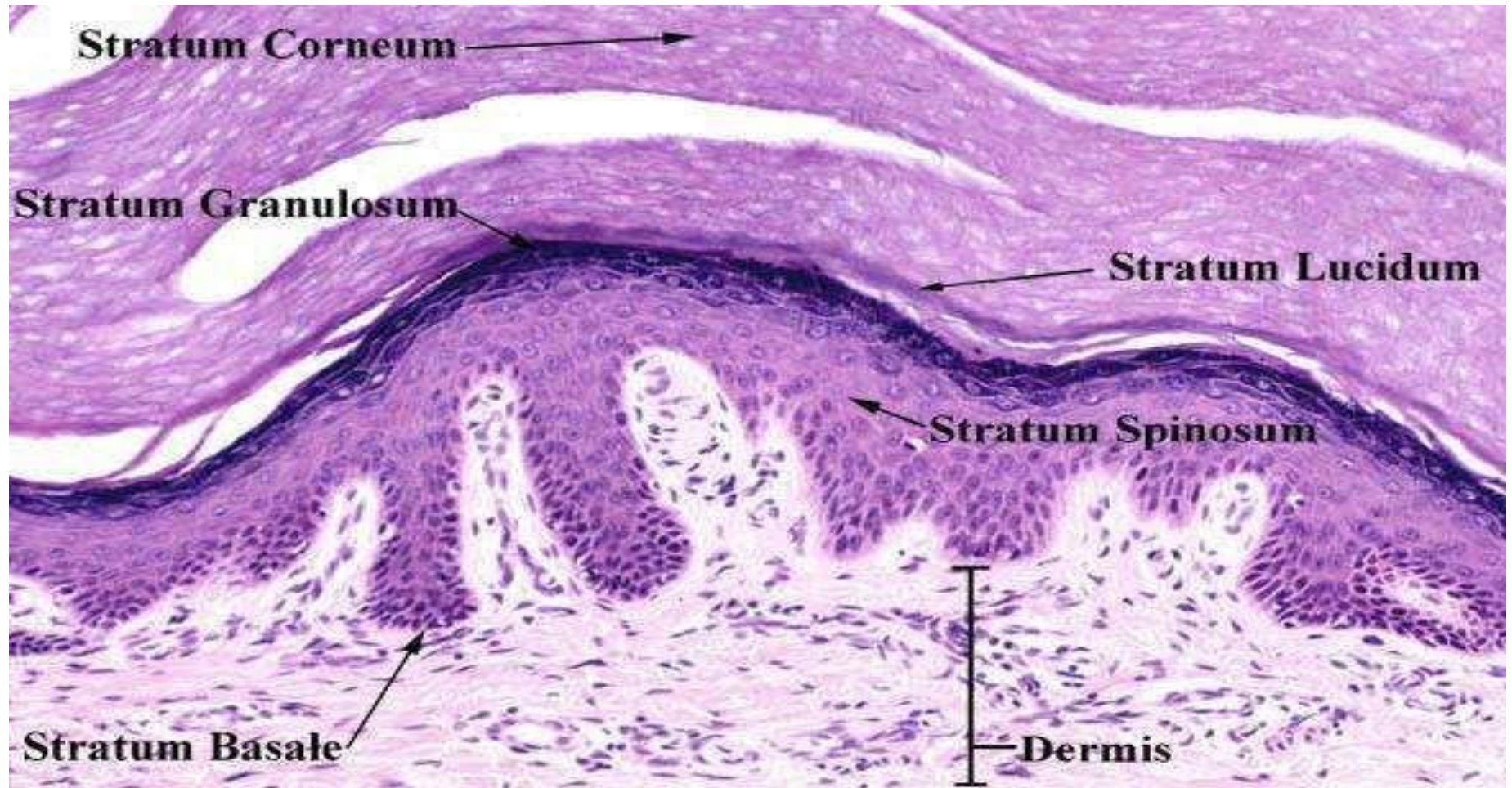
- This layer is present only in the skin of palm and sole.
- It appears as a thin translucent zone composed of three to five layers.
- Appears homogenous and translucent.
- Cell boundaries extremely indistinct.
- The flattened cells lack nuclei or organelles and contain densely packed keratin filaments.

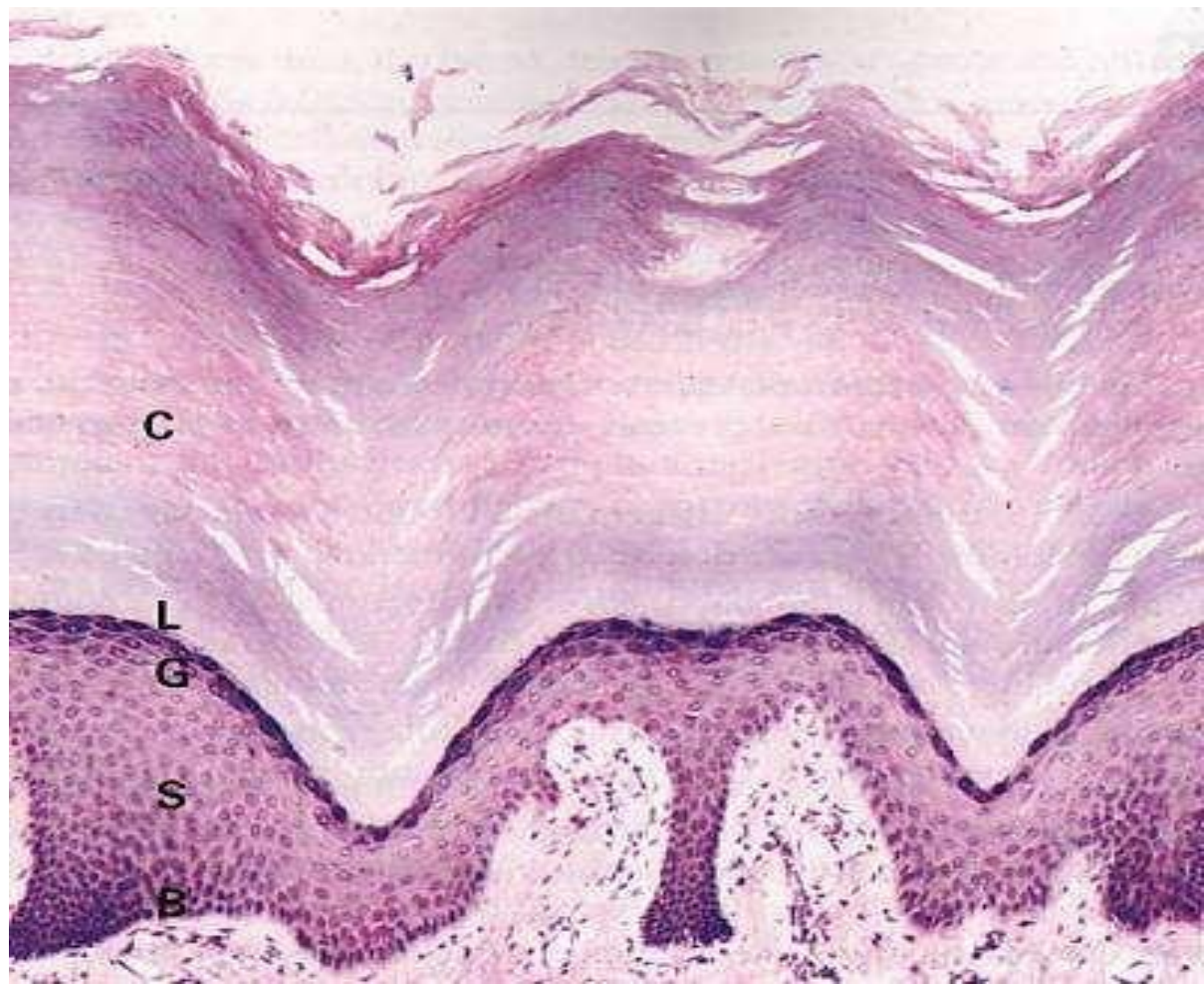


Stratum Corneum

- Superficial layer
- Acellular
- Made up of flattened scale like elements containing **keratin filaments.**
- Resistant to permeability

- The thickness of this layer is greatest where the skin is exposed to maximal friction
Eg:- Soles and palms
- The superficial layer constantly sheds off & replaced by proliferation of cells in deeper layers





Dermis

➤ The dermis is a sheet of connective tissue that supports the epidermis and binds it to the subcutaneous tissue.

➤ The dermis also contains hair follicles ,sweat glands and sebaceous glands.

The dermis is composed of two layers.

➤ Papillary layer

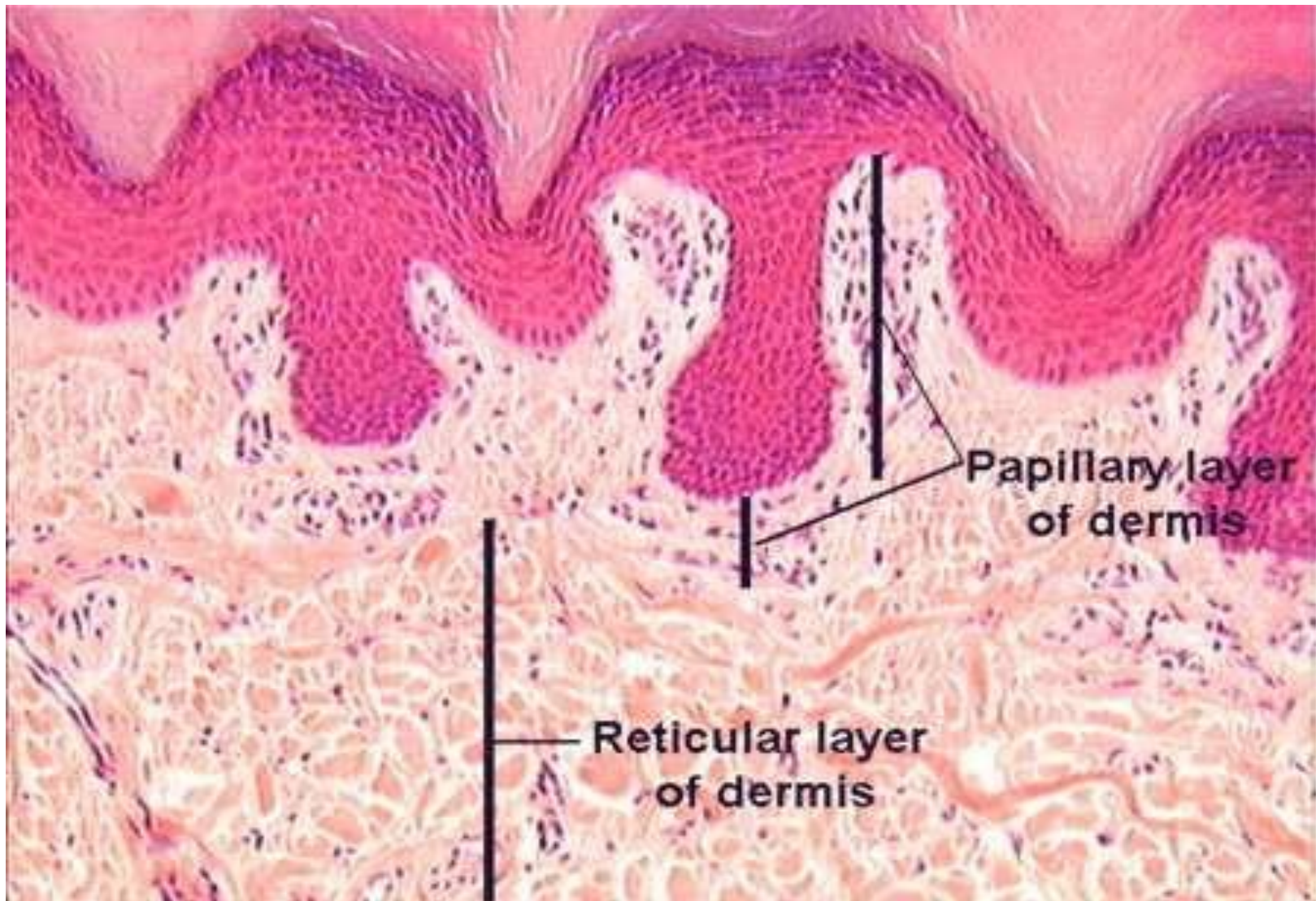
➤ Reticular layer

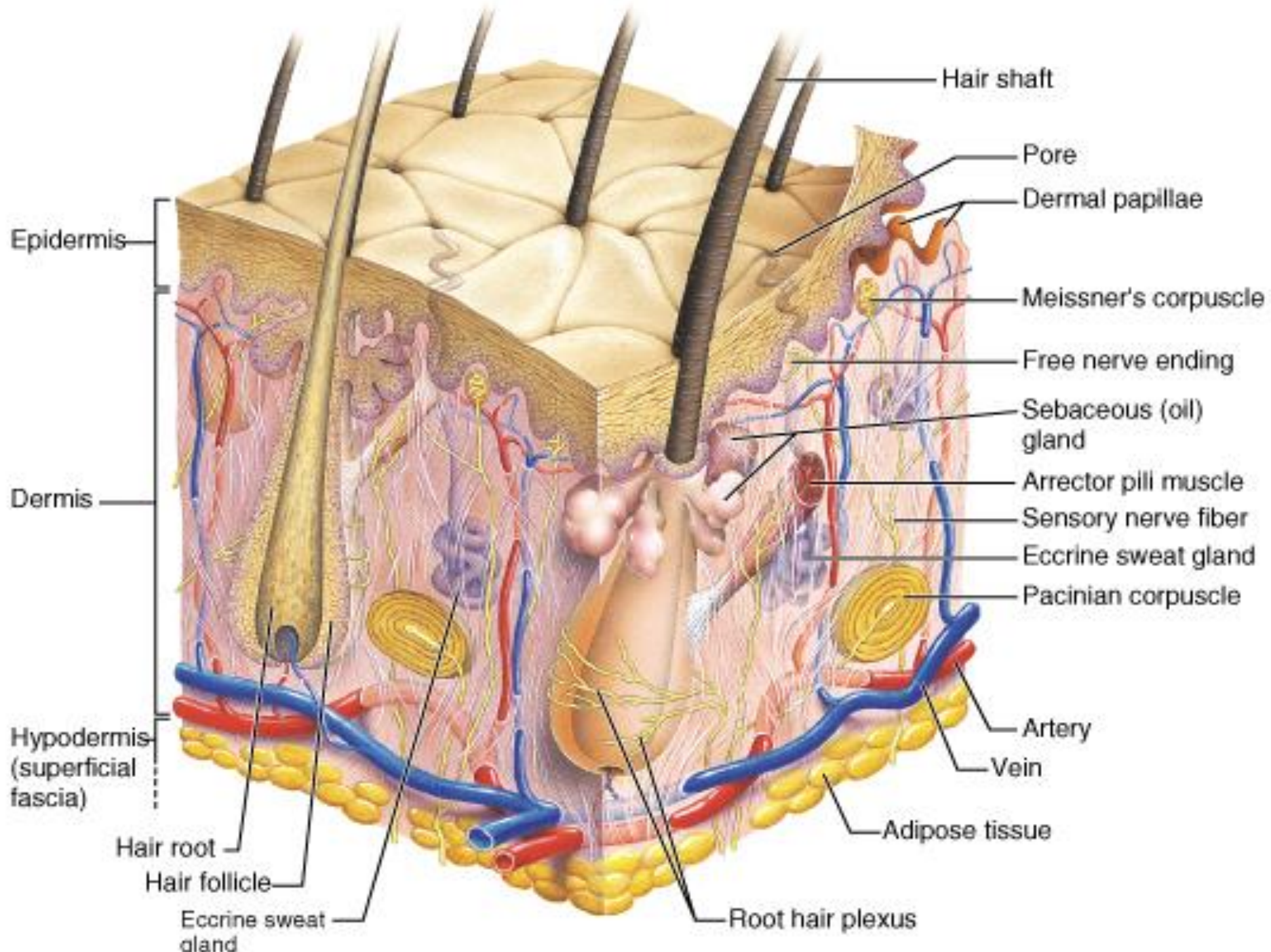
Papillary Layer

- It consists of loose connective tissue composed of a network of fine collagen type I fibres, elastic fibres and reticular fibres.
- The papillary layer is highly vascular and contains numerous capillary.
- The capillaries regulate the body temperature and provide nourishment to epidermis.
- Also contains sensory nerves and sensory receptors.
- **Meissners corpuscle** located in dermal papillae.
- More commonly found in fingertips and lips.

Reticular layer

- This layer is thicker and consists of dense irregularly arranged connective tissue.
- The reticular layer is less cellular than the papillary layer.
- The reticular layer also contains sensory receptors include **Pacinian corpuscle** and **Ruffini's corpuscle**.





Appendages

- Hairs
- Nails
- Sebaceous Glands
- Sweat Glands



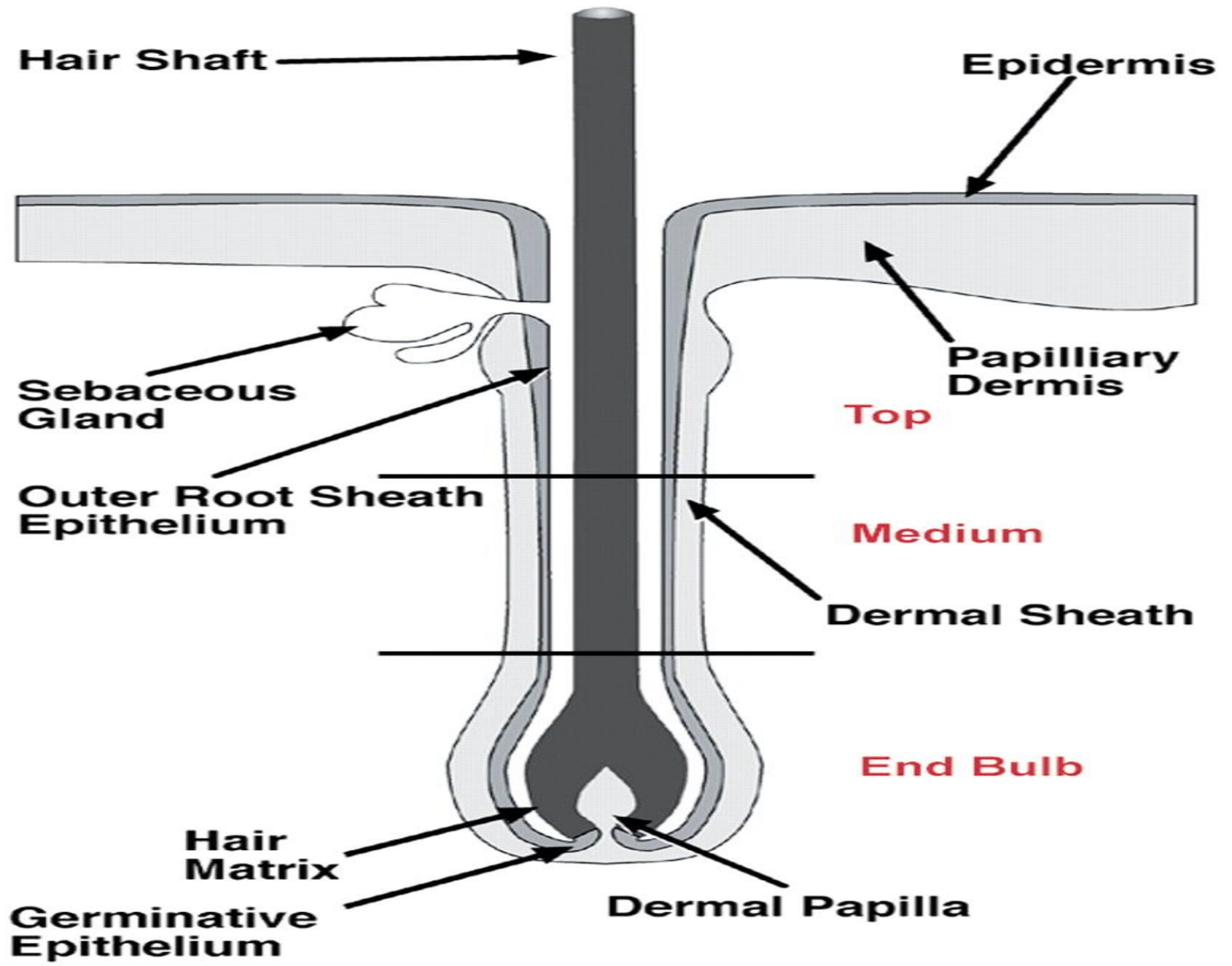
Hairs

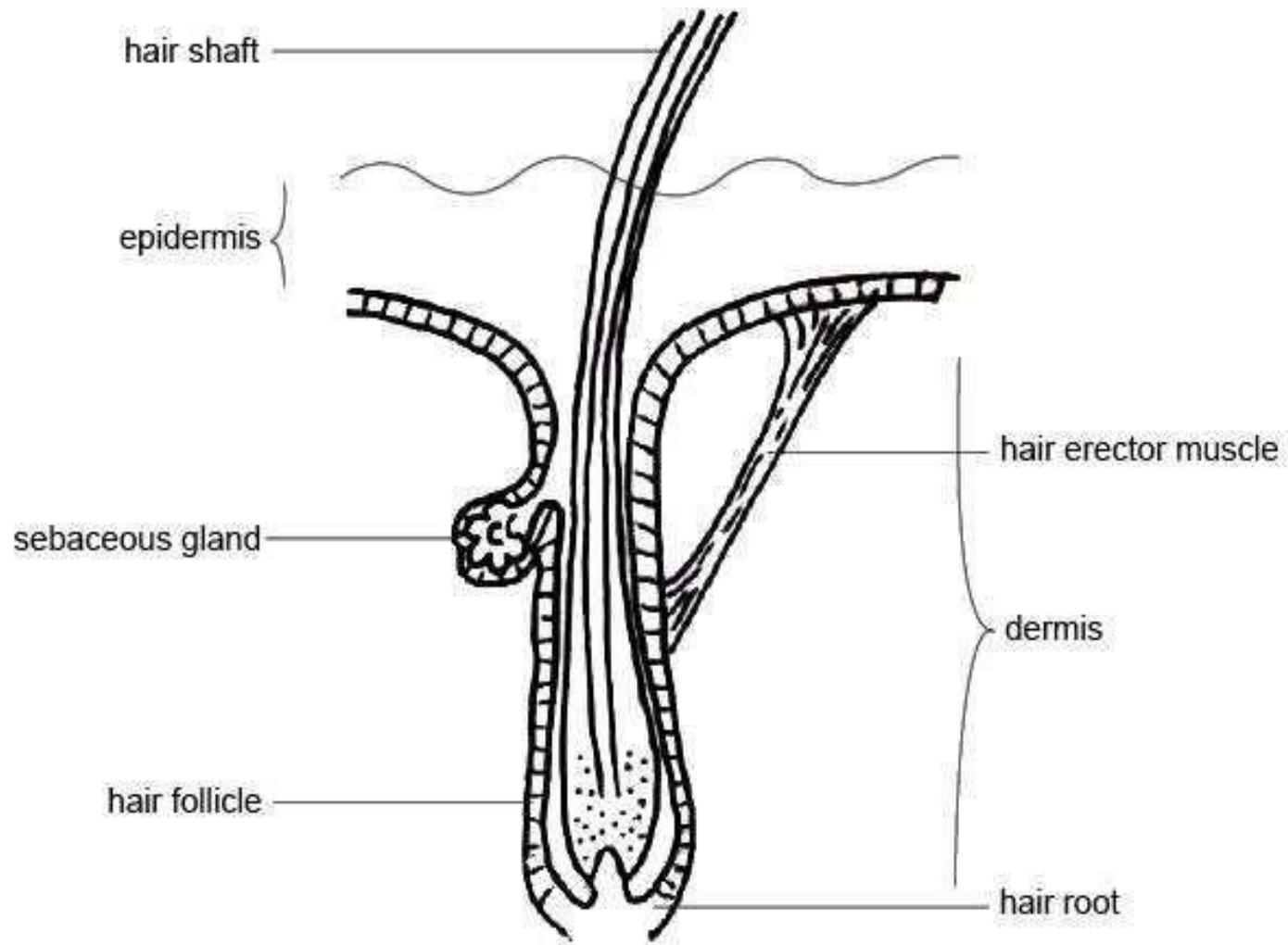
- Present almost the whole body
- Not present : Palms, Soles, sides of the digits & some parts of the male & female external genitalia



Portions

- The visible part – **shaft**
- Embedded part in the skin – **root**
- Expanded lower end of the root – **hair bulb**
- The bulb is generated invaginated from below by part of the dermis – **dermal papilla**
- Root is surrounded by a tubular sheath – **hair Follicle** (epithelial and dermal connective tissue)

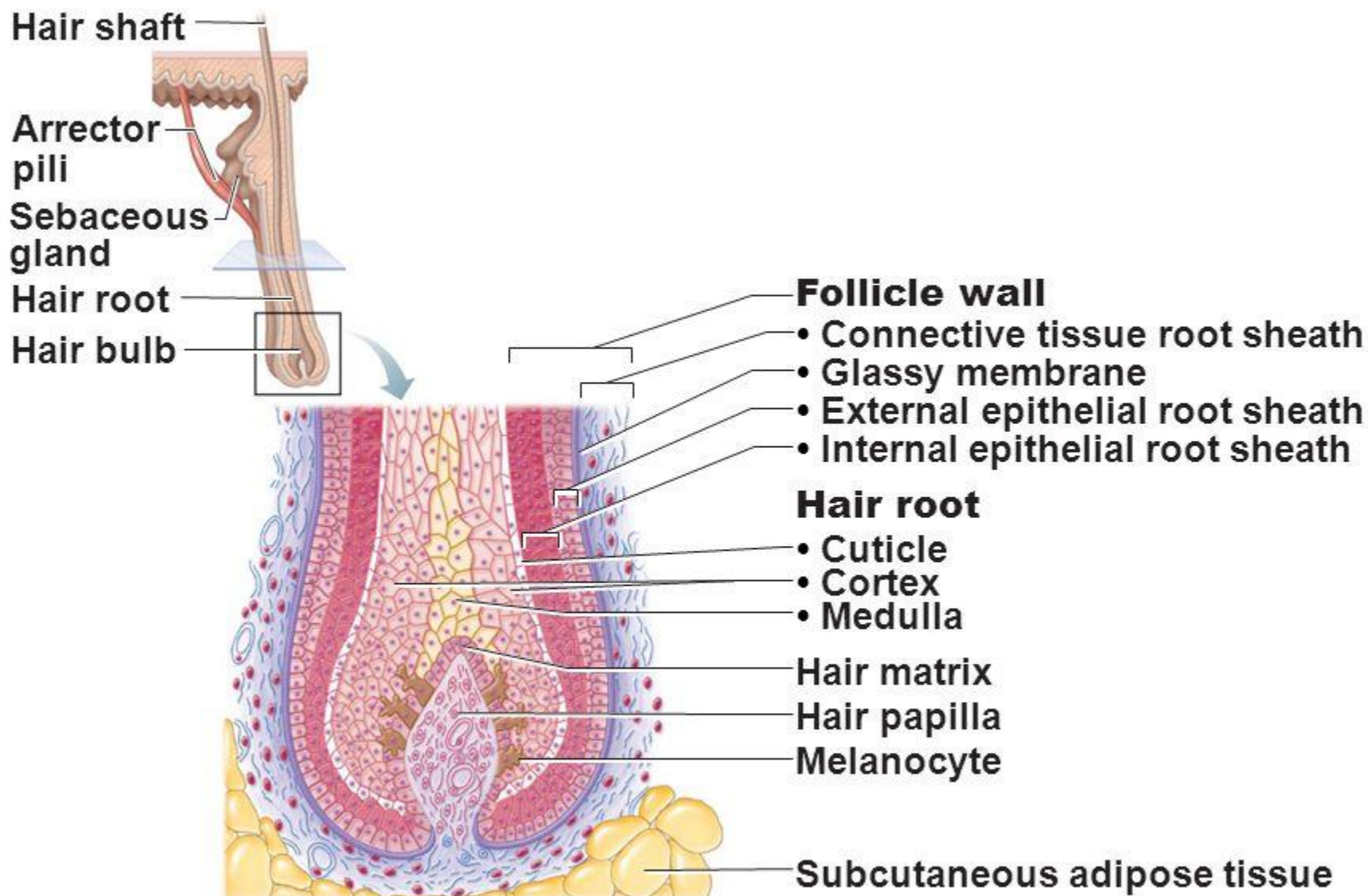




Structure of hair shaft

- Hair – Modified part of stratum corneum
- Has outer **cortex** and inner **medulla** in large hairs, no medulla in thin hairs
- **Cortex** is **acellular** & is made up of keratinized cells.
- In dark hair the cells contain granules of melanin pigment.
- **Medulla** consists of **cornified** cells of irregular shapes usually contain air.
- Both in medulla & cortex minute air bubbles are present

Figure 5.6c Structure of a hair and hair follicle.



(c) Diagram of a longitudinal view of the expanded hair bulb of the follicle, which encloses the matrix

Surface is covered by a thin membrane



Cuticle



formed by

flattened cornified cells

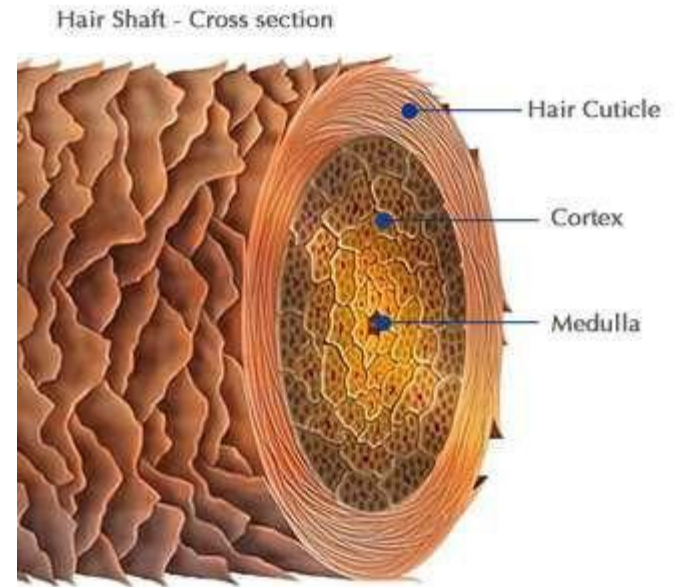


contains

melanin

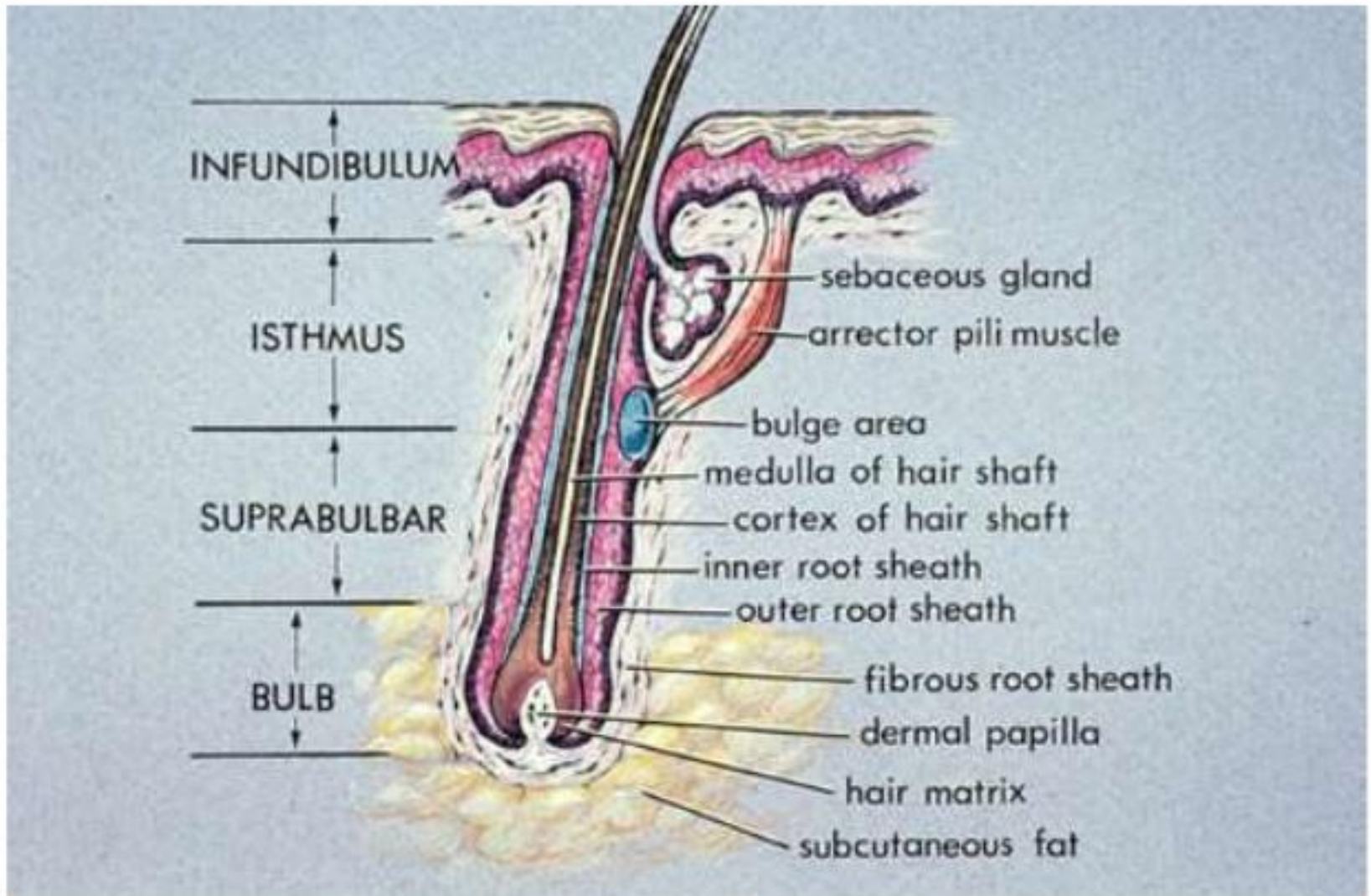


responsible for colour



Structure of Hair Follicle

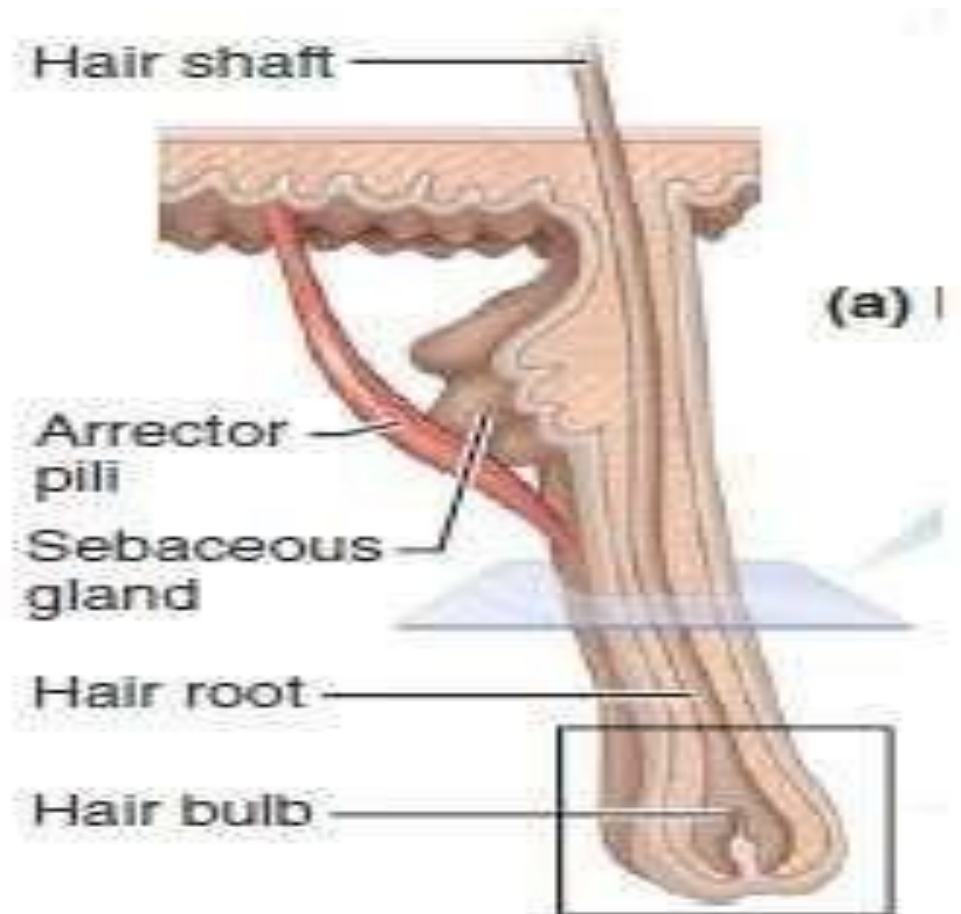
- Part of the epidermis that has been invaginated into the dermis around the hair root is known as **Hair follicle**.
- *Infundubulum* (from the surface opening of follicle to the level of opening of duct of sebaceous gland).
- *Isthmus* (lies between the opening of sebaceous gland and attachment of arrector pili muscle)
- *Inferior segment* (from the arrector pili muscle to the proximal end of follicle)
- Its innermost layer continues with the surface of the skin & outermost layer continues with the dermis



Arrector Pili Muscles

- These are **bands of smooth muscles** attached at one end to the dermis, just below the dermal papilla .
- The other end to the connective tissue sheath of the hair follicle.

- Contraction of arector pilorum muscle results in erection of hair shaft



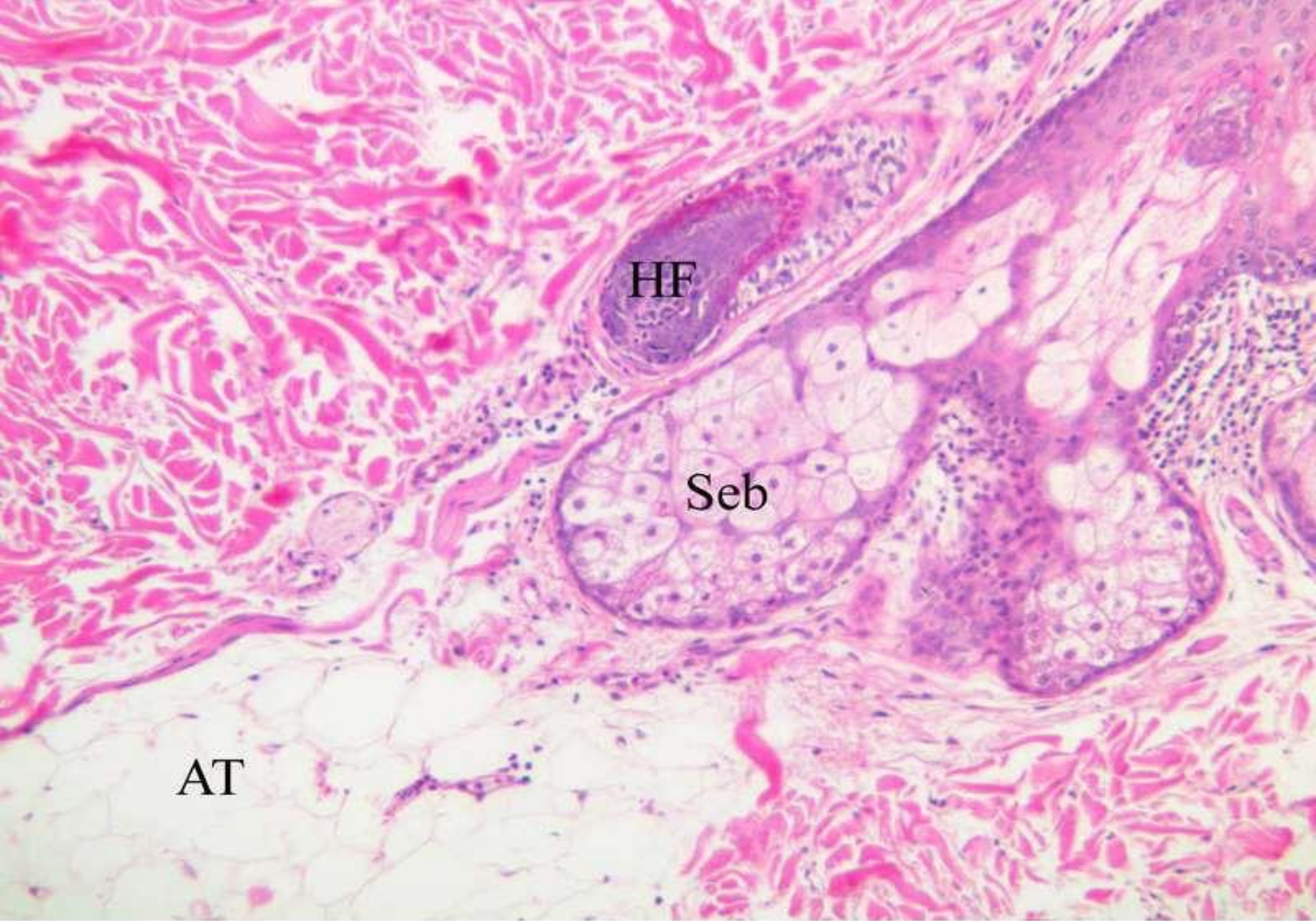
Nails



- Nails are plates of **keratinized epithelial cells** on dorsal surface of distal phalanges of fingers and toes.
- Microscopically the nails are homologous with stratum corneum.
- Body rests on **nail bed** which is composed of stratum basale & stratum spinosum
- Consists of 3 parts
 - Proximal part or **Root**
 - Exposed part or **Body**
 - Free distal border or **Free edge**

Sebaceous Glands

- Found in dermis of the skin
- Secretes **sebum** is passed through the duct of the gland into the infundibulum of the hair follicle and then onto the skin.
antifungal & anti bacterial properties.
- Holocrine gland (entire cell is shed along with secretory product)
- Contains lipids & cholesterol
 - Oily in nature
 - Prevents dryness



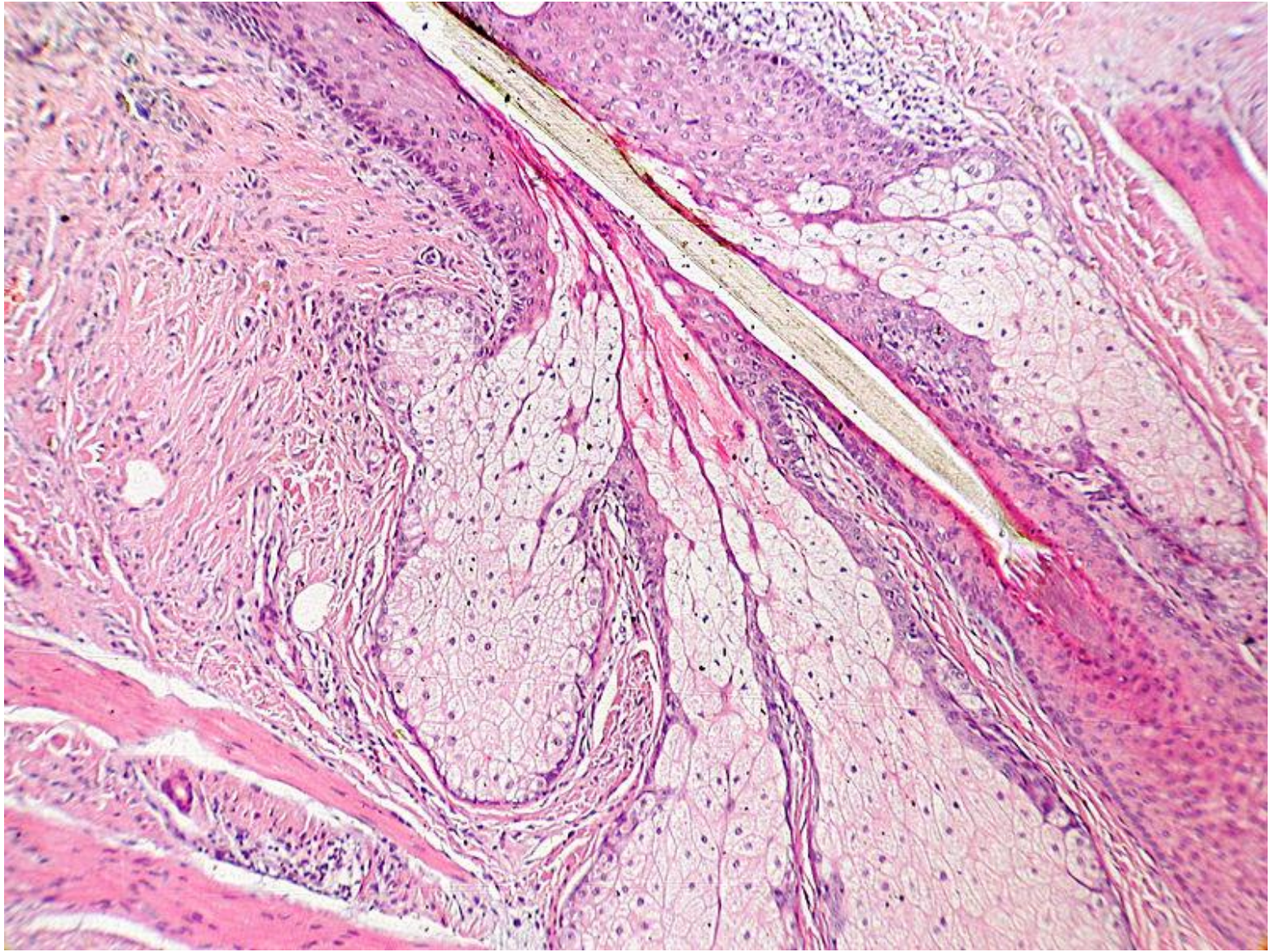
Seb - sebaceous gland HF - hair follicle AT - adipose tissue

Hairy Skin trichrome

hair canal

sebaceous gland





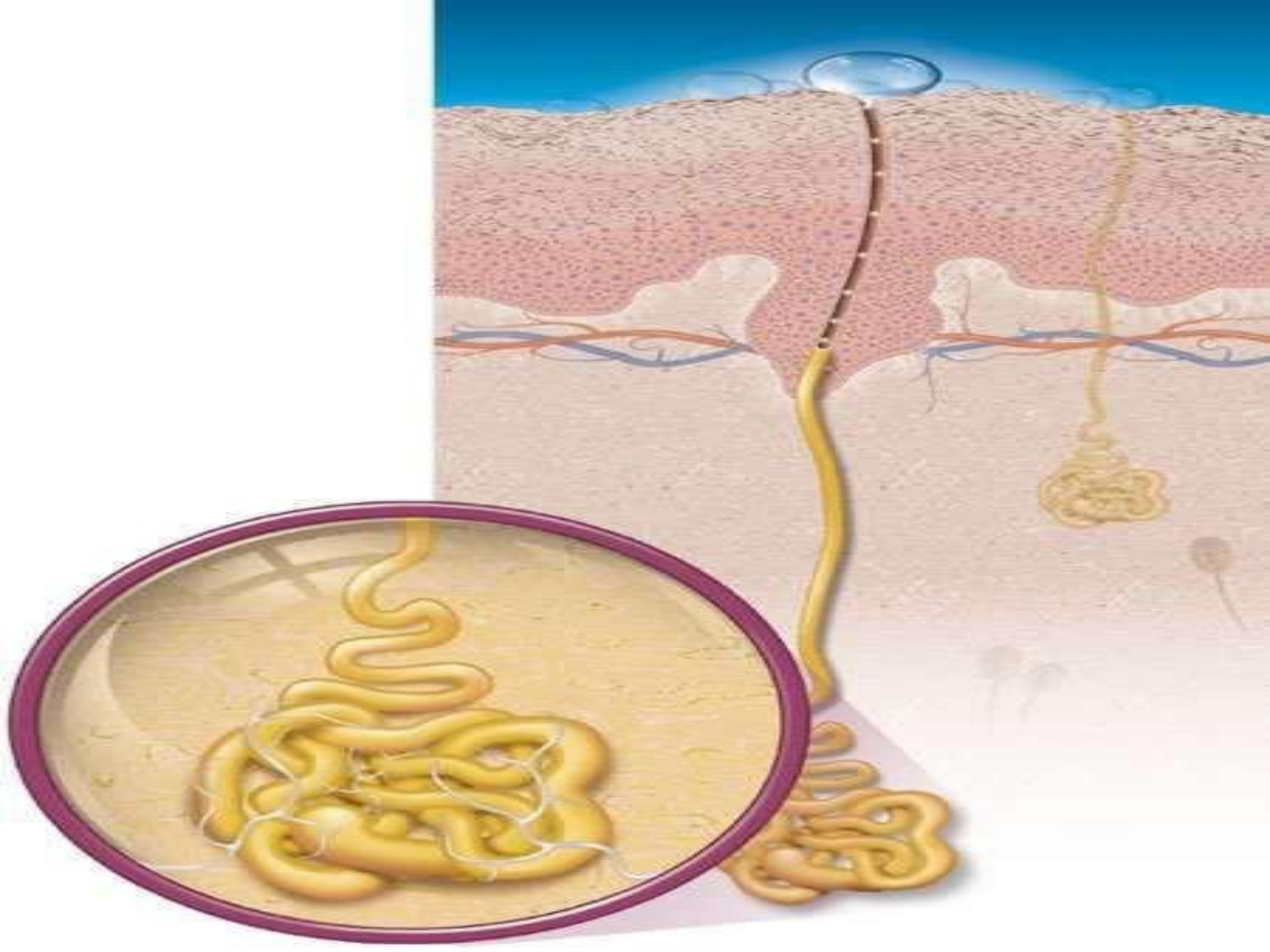
Sweat Glands

- Found in deeper parts of the dermis

2 Types

Eccrine Glands

Apocrine Glands



The Two Types of Sweat Glands in Humans



ECCRINE GLANDS
(ALL OVER BODY)



APROCRINE GLANDS
(UNDERARMS AND PELVIC AREA)

ECCRINE GLANDS

- Widely distributed
- Numerous on *forehead, scalp, palms & soles*.
- Presents a highly coiled **secretory portion** called as **body** within the dermis lined by a **simple cuboidal or low columnar epithelium** & a narrower **ductal portion**, which opens on skin surface lined by **stratified cuboidal epithelium**.

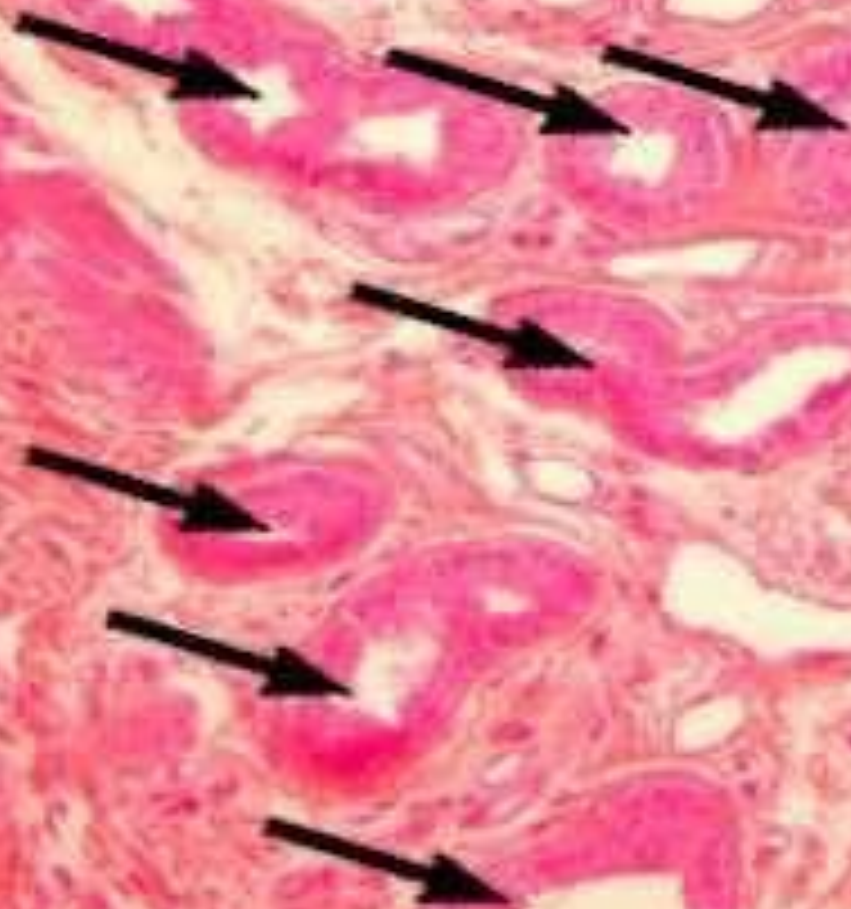
- Each gland is long, unbranched tubular structure
- Secretions of sweat glands are clear, colourless and hypotonic

APOCRINE GLANDS

- Found in
 - Axilla
 - Areola
 - Perianal region
 - Labia majora

- The duct of apocrine sweat gland opens into the canal of a hair follicle just distal to the entry of the duct of sebaceous gland.
- These glands secrete a protein rich, milky fluid which is initially odourless but acquires a distinct odour due to bacterial decomposition

**Apocrine
sweat gland**



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=
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