

Systemic Module

MSS

“Anatomy”

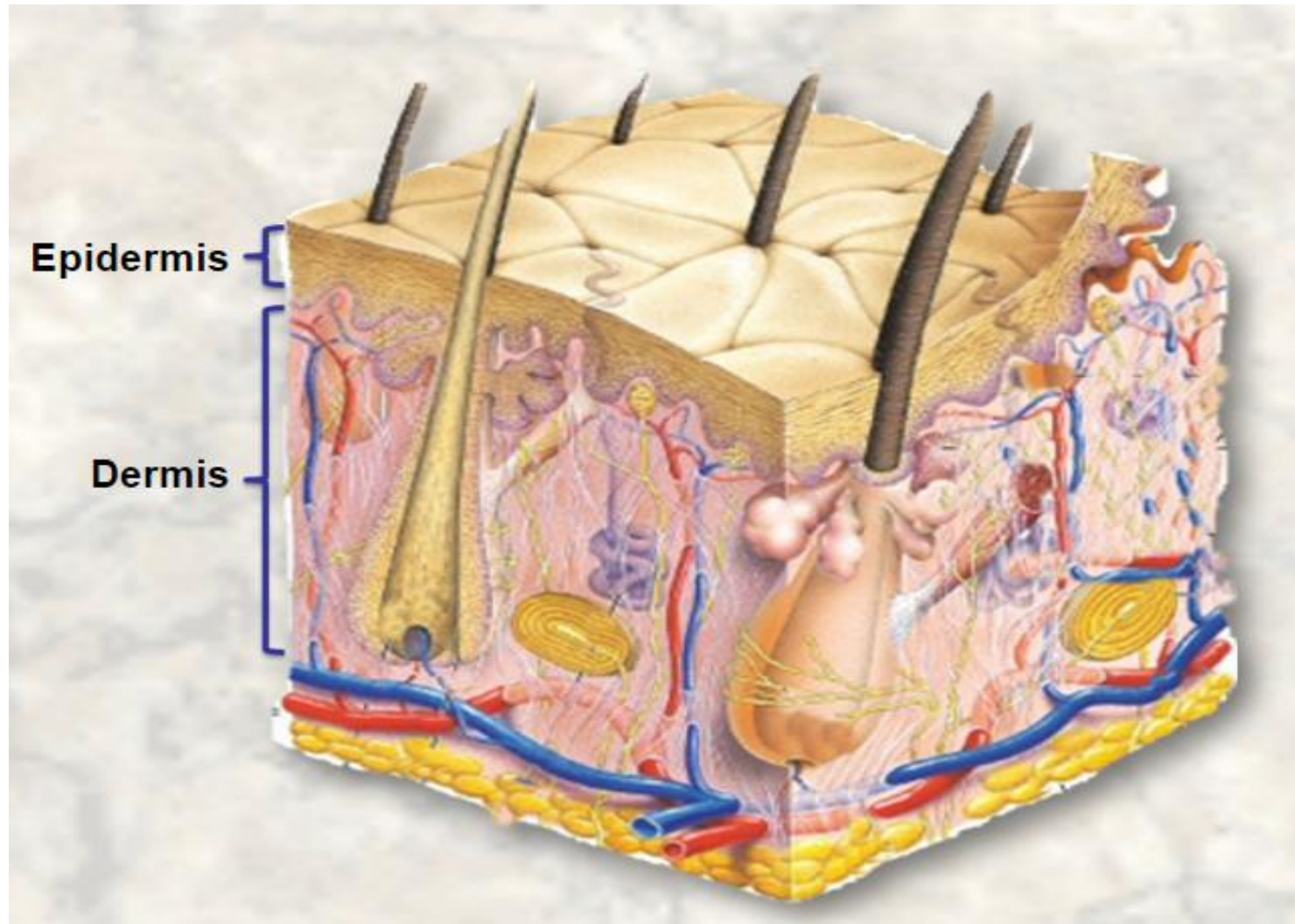
Histology of the Skin

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Introduction

- The skin is **Largest** and heaviest organ in the body (about **16%** of body weight)
- Thickness:
 - Thickest is on the **Upper Back** (5mm),
 - Thinnest is on **upper & lower eyelids** (<1mm)
- The skin is composed of two layers:
 - The **epidermis**, an epithelial layer of ectodermal origin.
 - The **dermis**, a layer of connective tissue of mesodermal origin.
- The dermis is attached to an underlying hypodermis, also called subcutaneous C.T
- Hypodermis is **NOT** a skin layer, it consists of Loose C.T and fat cells.

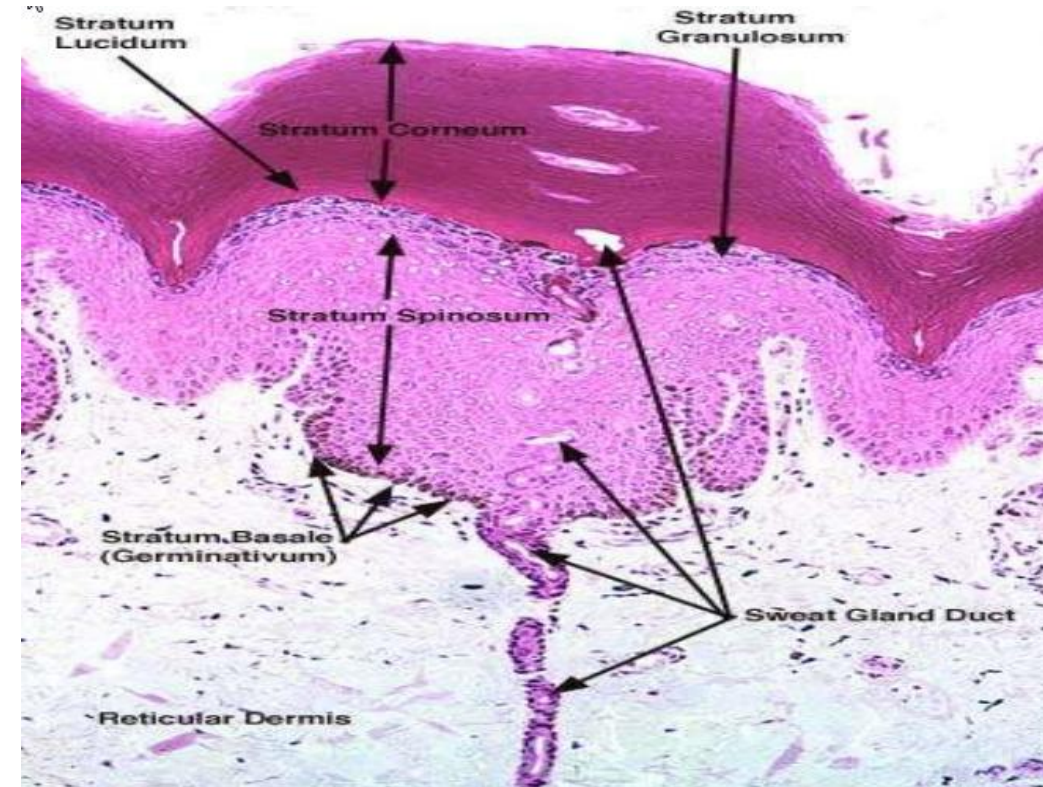


Function of Skin

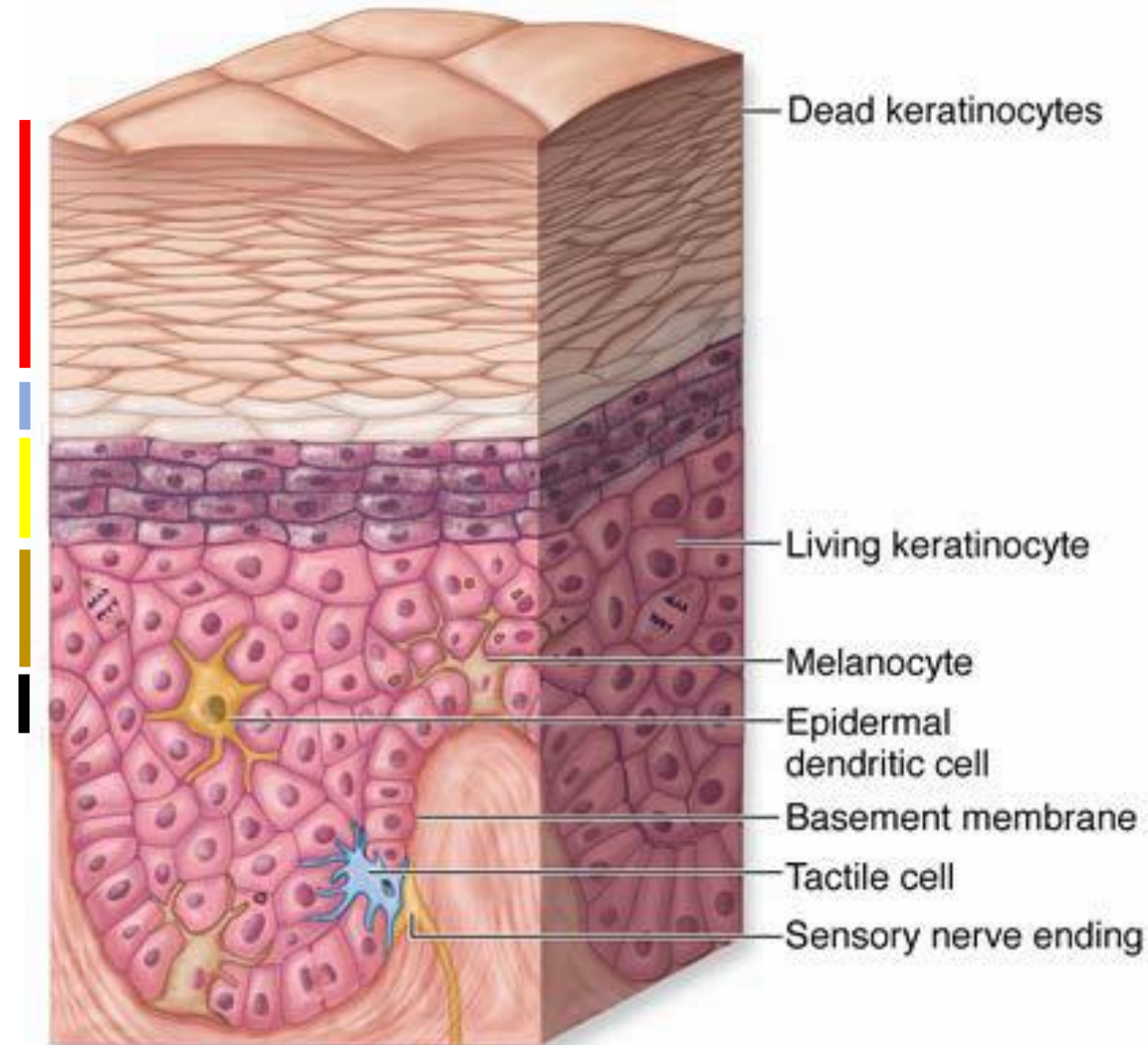
- **Protective function:** It is the first line of defense. It protects our body from infection, pathogens, and harmful UV irradiation.
- **Sensory function:** Free nerve endings on the skin are sensitive to pain, touch, heat and cold, resulting in either voluntary or reflex activities.
- **Secretory function:** Sweat help in temperature regulation and sebum makes skin smooth.
- **Heat regulatory function:** Sweating and cutaneous blood flow help in temperature regulation
- **Excretory function:** Through the secretion of glands of the skin – water, salt, fatty substances and urea are excreted.
- **Synthetic function:** Sun's ultraviolet rays help in synthesis of natural vitamin D. skin can also manufacture melanin pigment.
- **Water balance:** Skin serve a useful means in regulating water balance of the body by perspiration.

Epidermis

- The most superficial layer, it consists of **stratified squamous keratinized epithelium**.
- Cells of the Epidermis – **KERATINOCYTES**.
- Consist of 5 layers (stratum = layer)
 1. **Stratum Basale (Stratum germinativum)**
 2. **Stratum Spinosum**
 3. **Stratum Granulosum**
 4. **Stratum Lucidum (only in thick skin)**
 5. **Stratum Corneum**



- **Stratum Basale**
- **Stratum Spinosum**
- **Stratum Granulosum**
- **Stratum Lucidum**
- **Stratum Corneum**



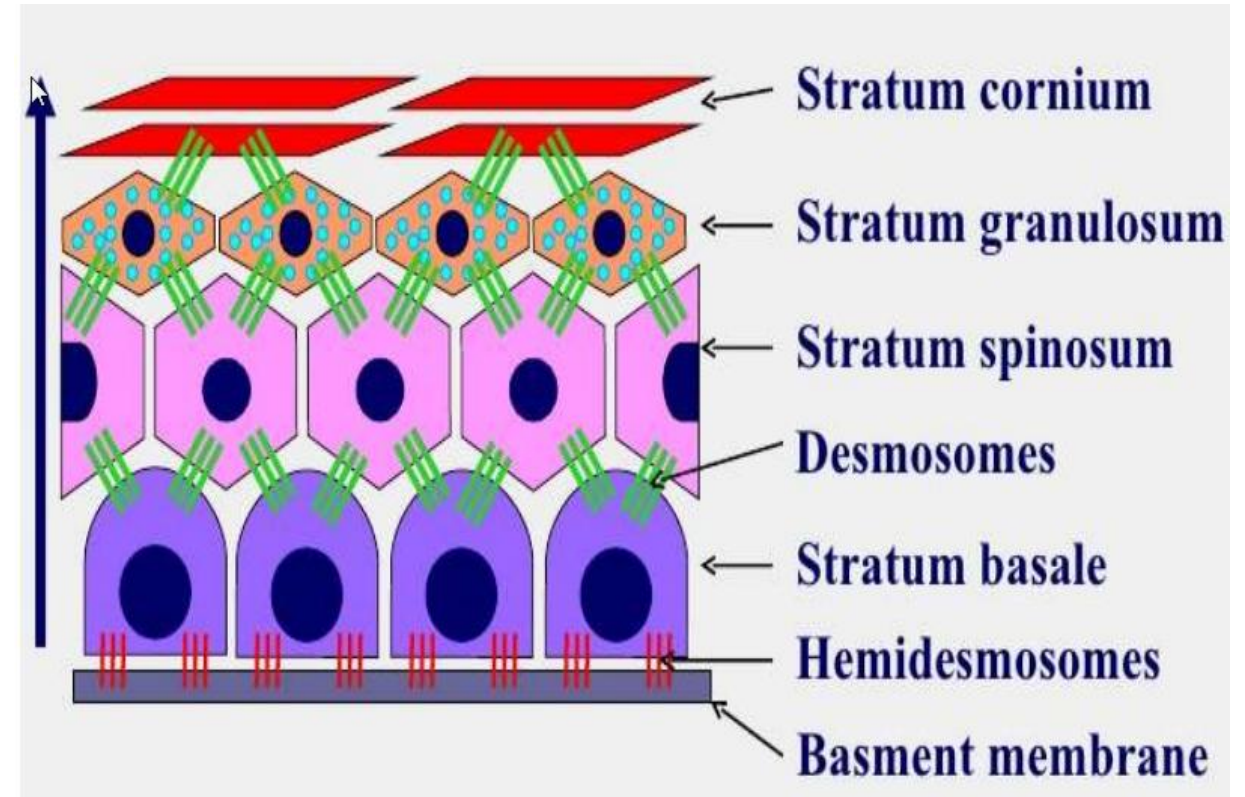
1- Stratum Basale

- Basal layer of Epidermis, perpendicular to the basement membrane.
- The stratum basale contains **stem cells**, is characterized by **intense mitotic activity** and is responsible for constant renewal of epidermal cells (Keratinocytes).
- The mitotic rate approximates the rate at which cells are sloughed off at the surface.



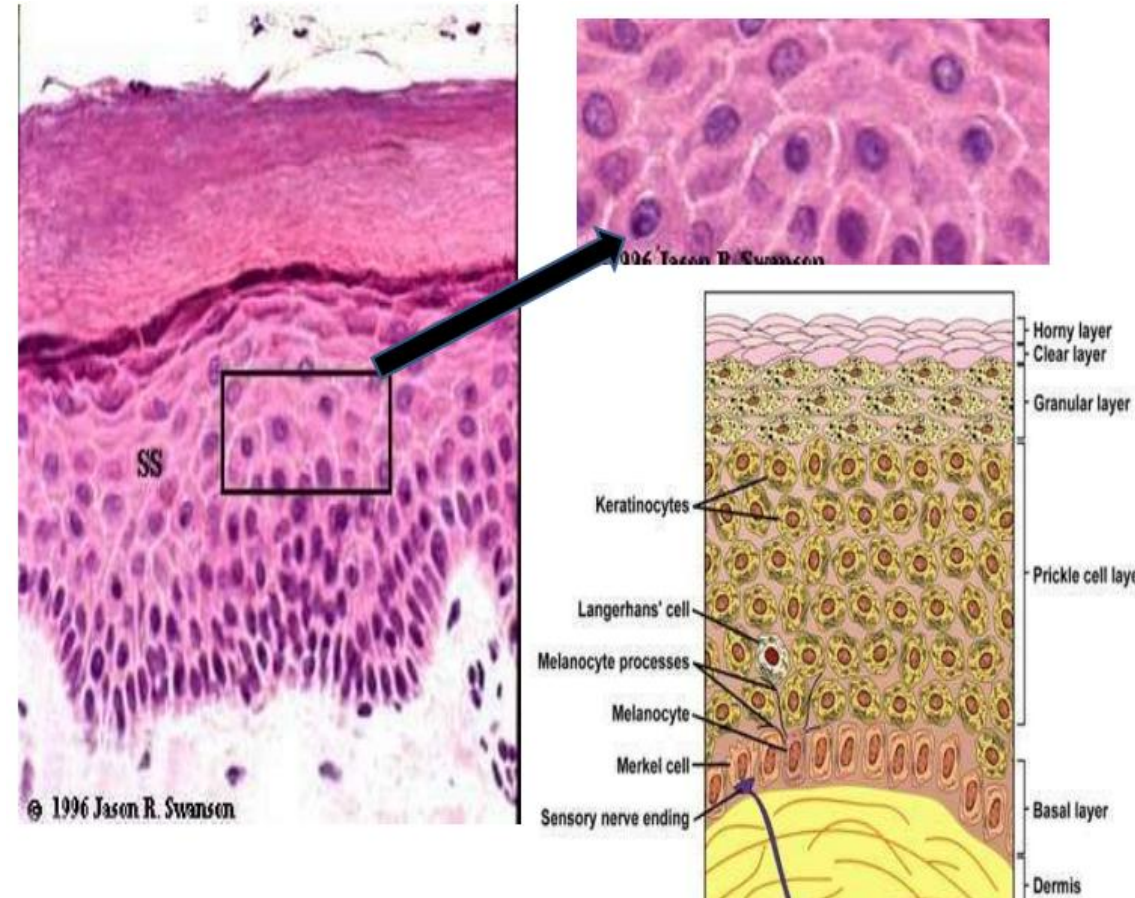
After a mitotic division, the newly formed cells undergo a progressive maturation called **keratinization** as they migrate to the surface.

- Basal cells linked to the basement membrane by **HEMIDESMOSOMES**.
- Basal cells linked to each other and to prickle cells by **DESMOSOMES**.

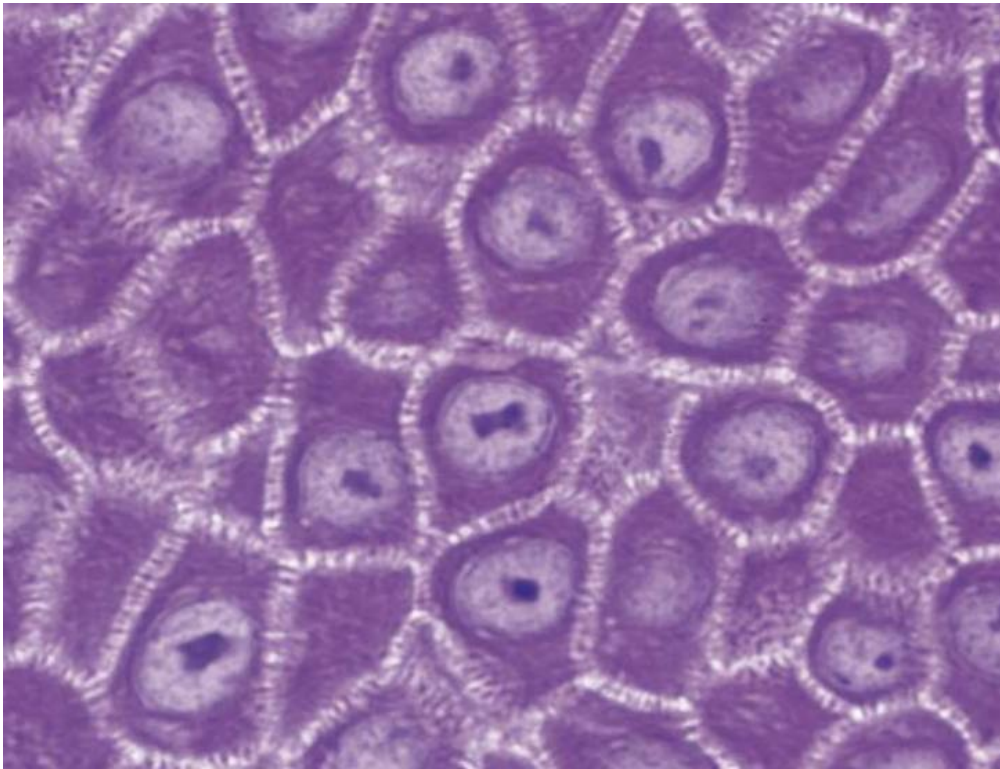


2- Stratum Spinosum (Prickle cell layer)

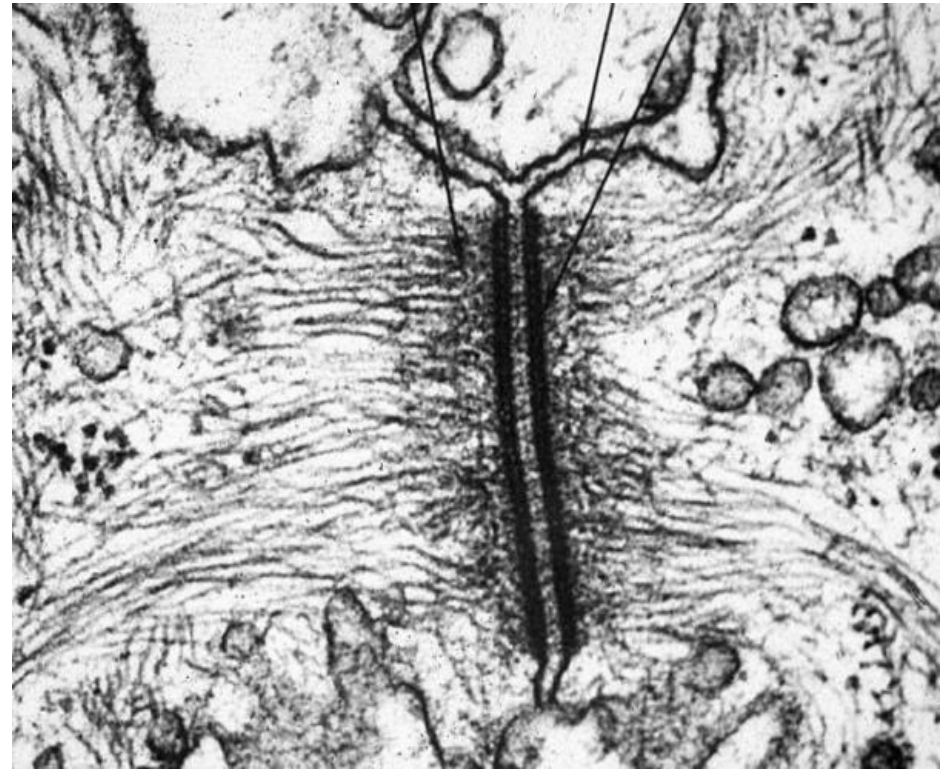
- Majority of the Epidermis, **Multi-layered.**
- Polyhedral shaped keratinocytes, with round or oval nuclei, and prominent cytoplasm
- Have spiny projections (Desmosomes + tonofibrils) >> Desmosome junctions are seen as **Prickles or Spines** between the cells.



Prickle cell layer

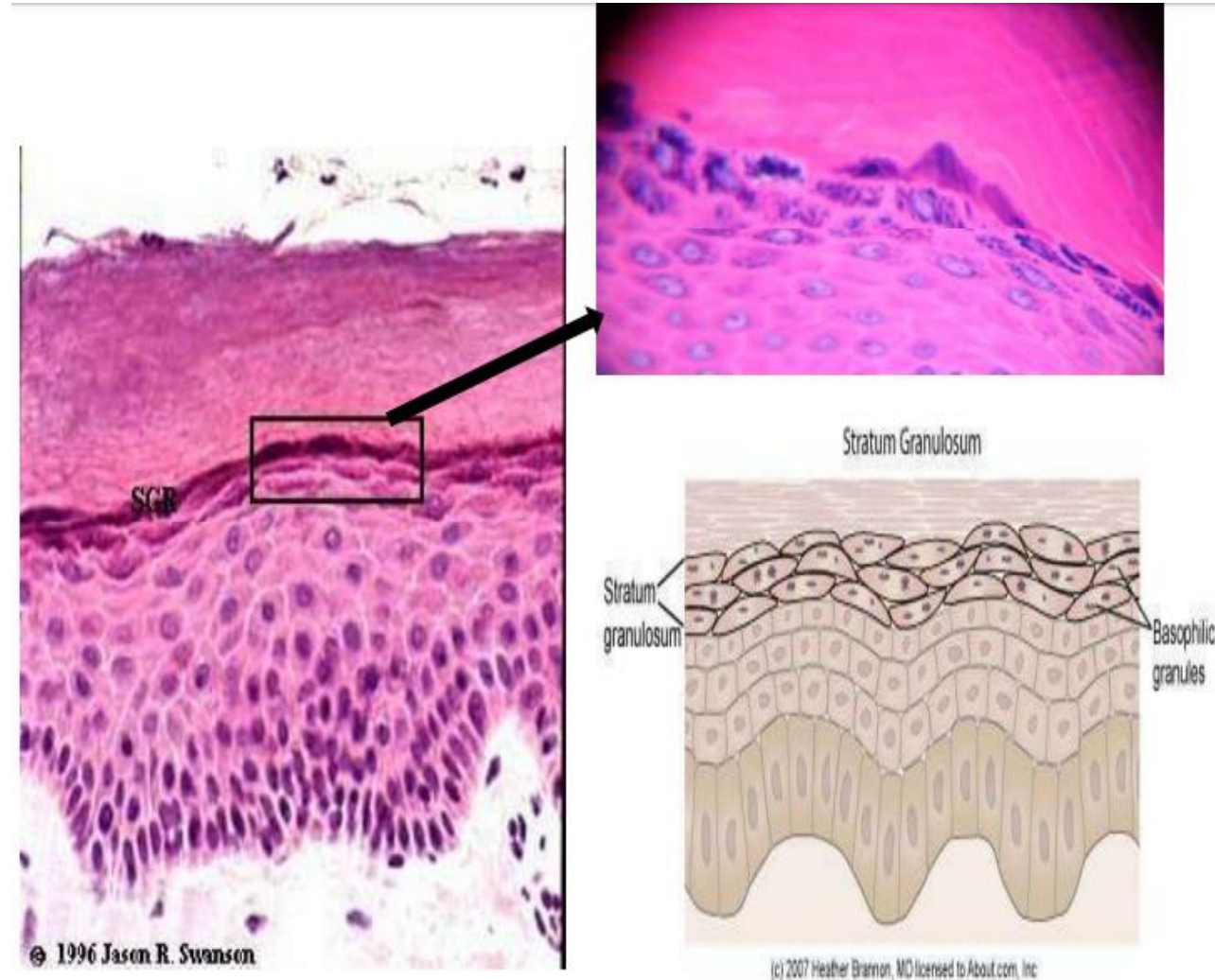


TEM of Desmosomes with Tonofibrils



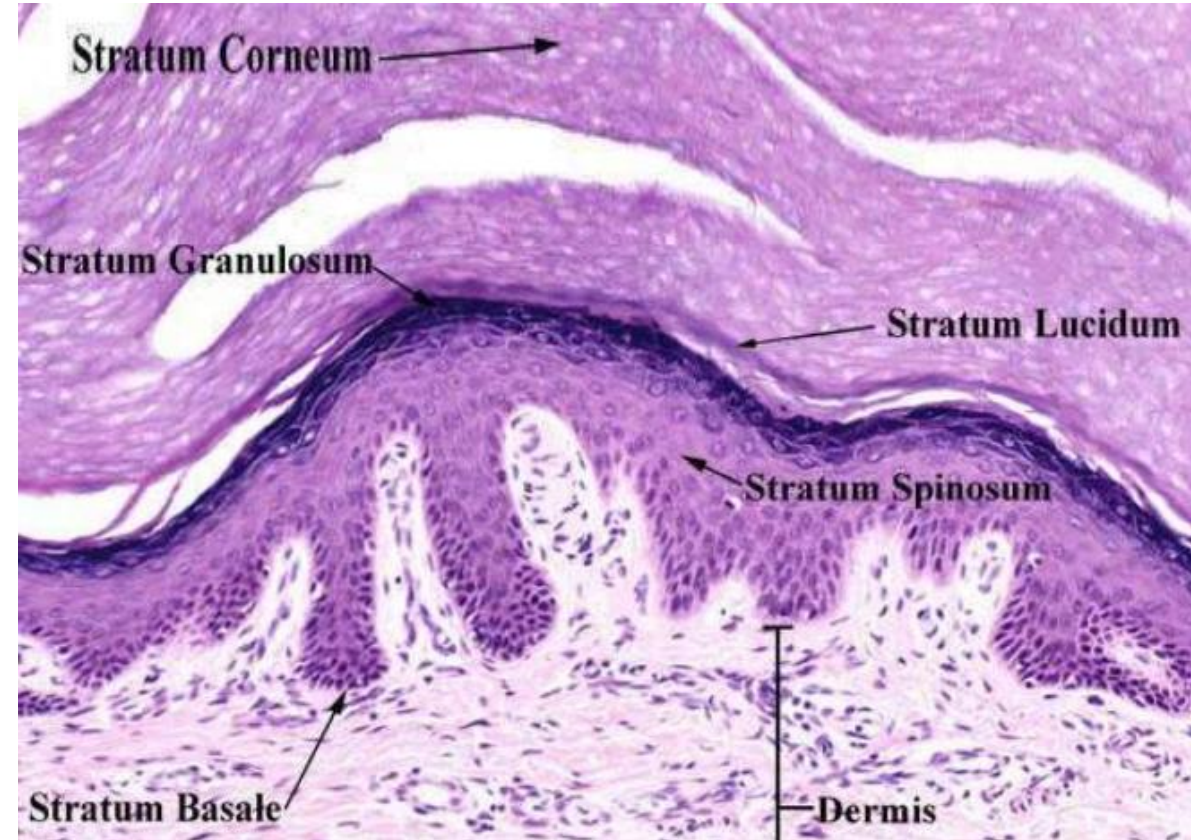
3- Stratum Granulosum

- 3-5 layers of flattened polygonal cells whose cytoplasm is filled with basophilic **keratohyalin granules**.
- Keratinocytes (in stratum spinosum) mature into Stratum Granulosum



4- Stratum Lucidum

- Thin translucent layer of extremely flattened cells.
- No nuclei or organelles
- More apparent and well developed in thick skin (the skin of palm and sole)

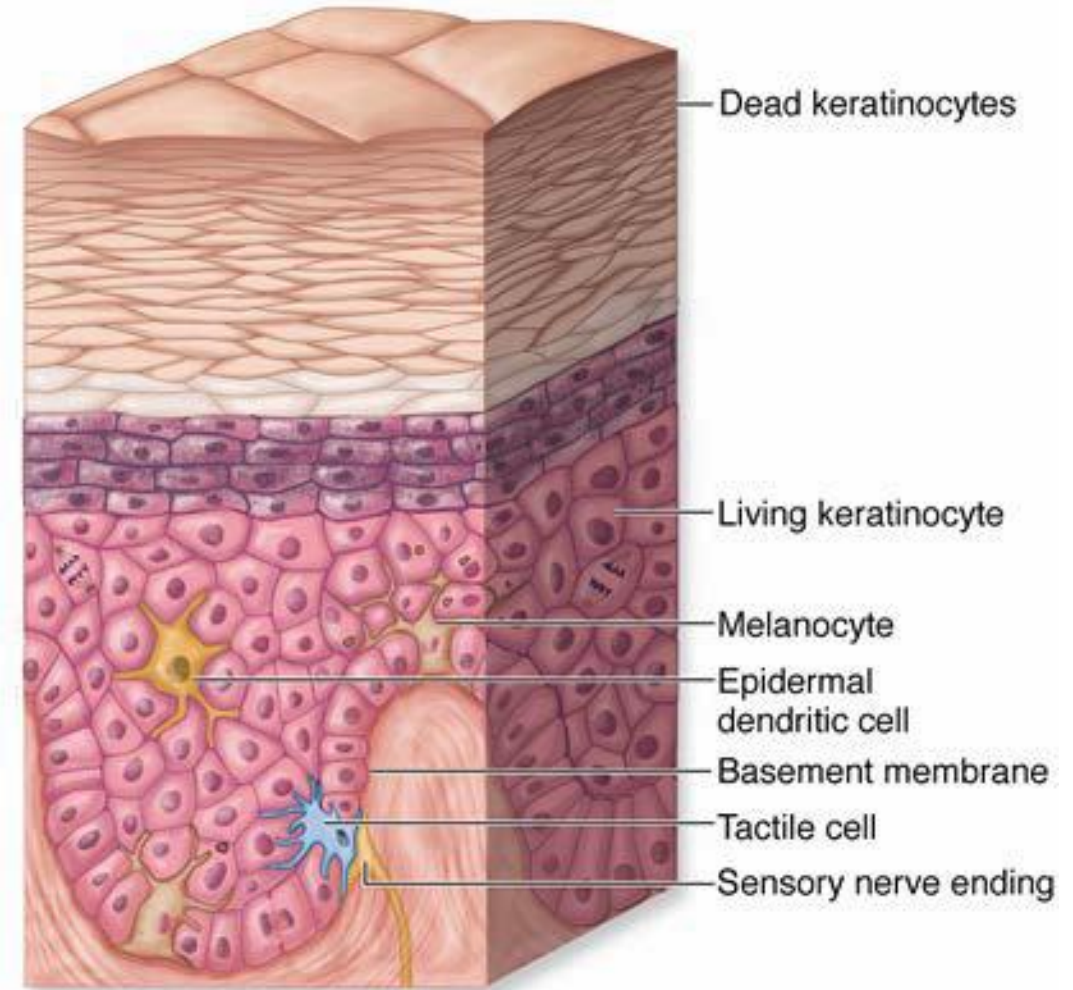


5- Stratum Corneum

- The stratum corneum consists of 15-20 layers of **flattened nonnucleated keratinized cells whose cytoplasm is filled with keratin.**
- Movement of the epithelial cells away from the supportive basement membrane is accompanied by the **production of keratin, progressive dehydration, and flattening.**



- The outer layers of the skin are dead, but glandular secretions keep them soft.
- **Function of Keratin:**
 1. Makes the epidermis somewhat waterproof
 2. Protects the epidermis from bacterial invasion.
 3. Prevent water loss



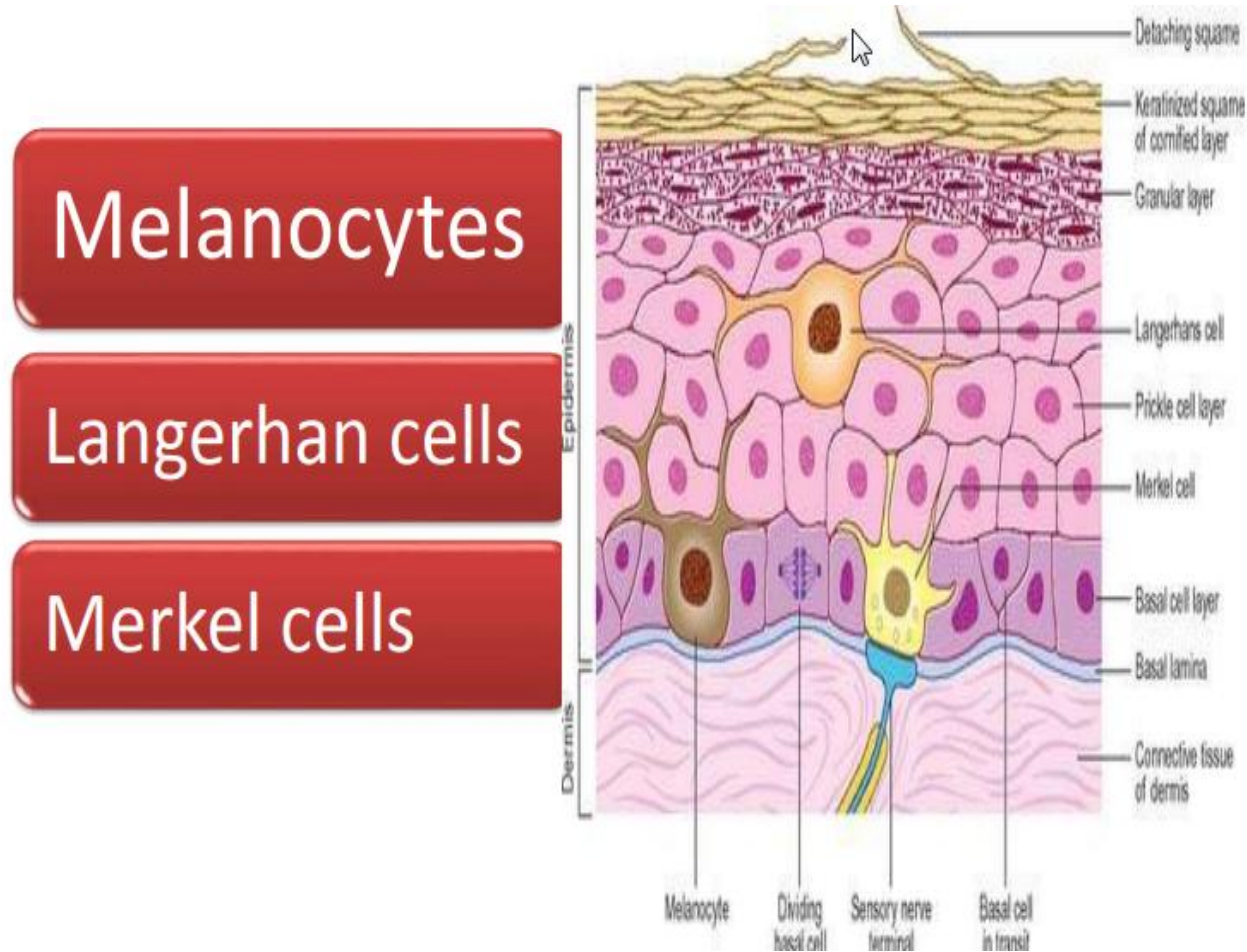
Specialized Cells in Epidermis

- The epidermis mainly consists of Keratinocytes but it also contains three less abundant cell types:

1. Melanocytes

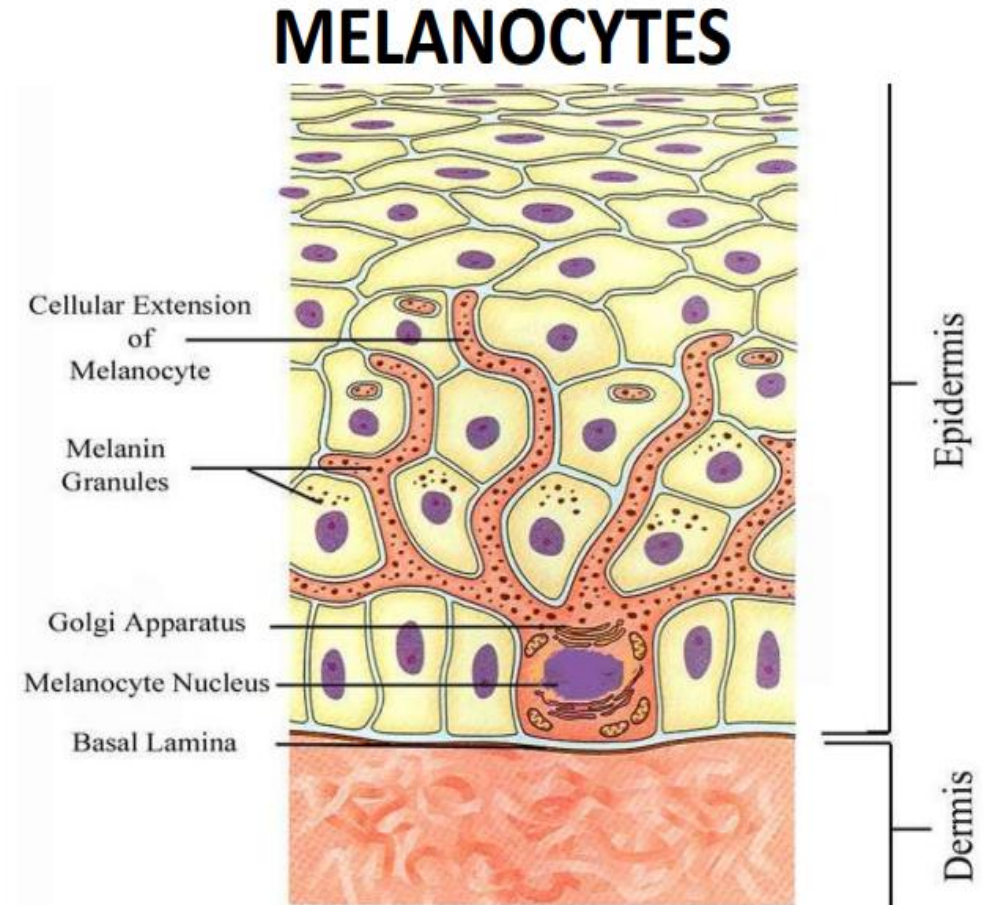
2. Langerhans cells

3. Merkel's cells.

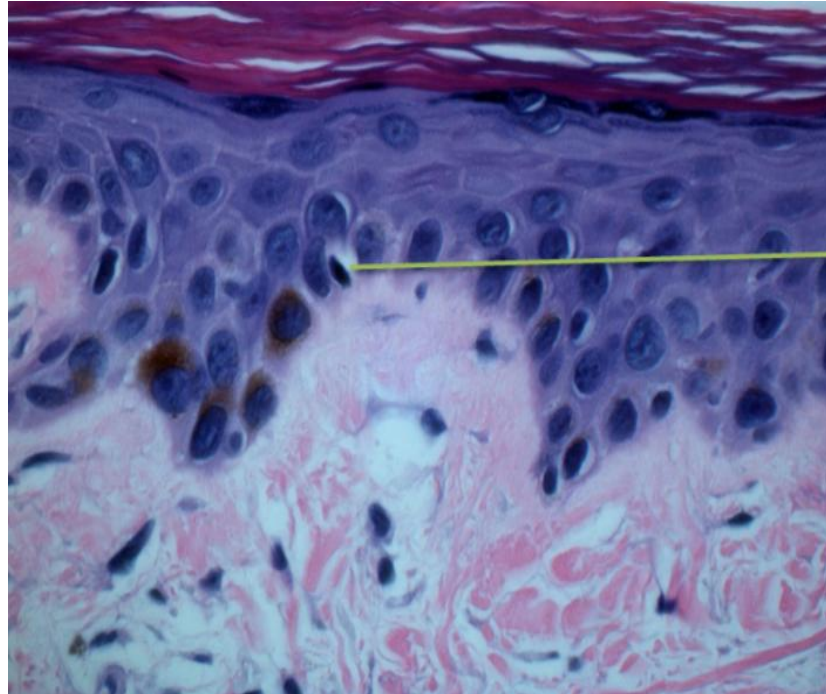


1- Melanocytes

- Have rounded **cell bodies**, **clear cytoplasm** with **slender cytoplasmic processes** (Dendrites)
- They are present in **stratum basal** and **stratum spinosum**
- Give the skin its color >> Melanin granules migrate through the cytoplasmic extensions to enter the keratinocytes



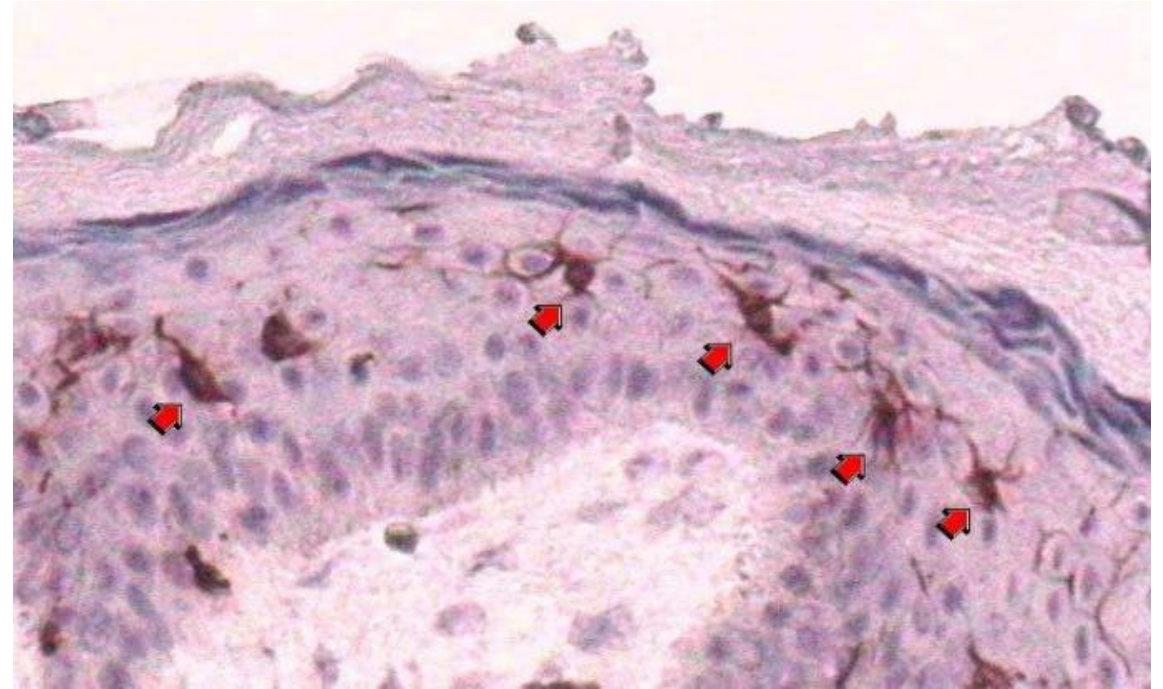
- Ratio of Melanocytes to Keratinocytes *in Epidermal basal layer* **1:4 to 1:10** depending on the site of the body. (**constant per area in human regardless of sex or race**).
- More numerous in area exposed to sunlight
- RACIAL DIFFERENCE is due to **differences in the amount of melanin contained in the Keratinocytes** rather than the number of Melanocytes



Melanocytes: clearish cells in basal layer with dark nuclei ; ratio of 1: 10.

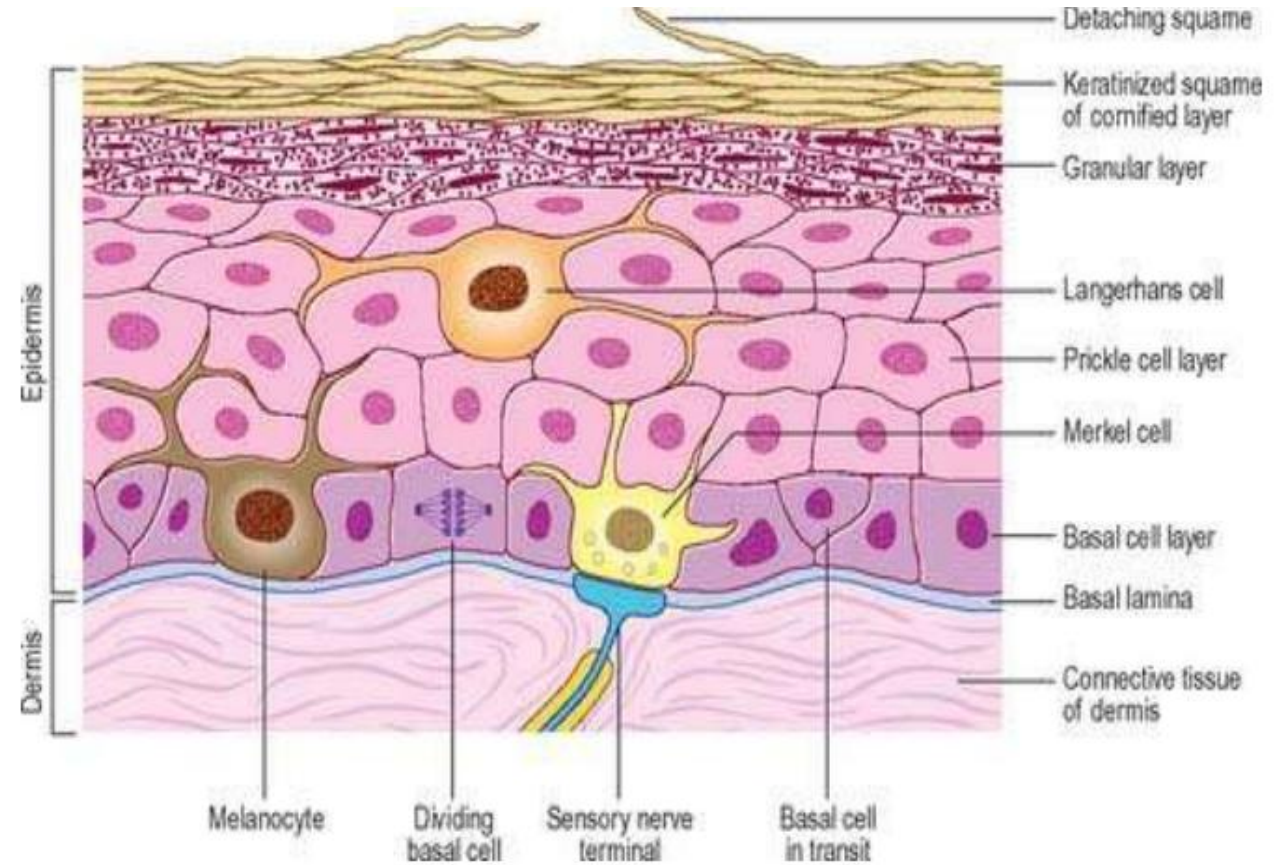
2- Langerhans cells

- Star-shaped cells mainly **found in stratum spinosum**
- Derived from macrophages
- They are **Antigen Presenting cells**



3. Merkel's cells

- Found in the basal layer
- Originated from keratinocytes
- Function as touch receptors



Dermis

- The dermis is the connective tissue that **supports the epidermis and bind it to the hypodermis** (subcutaneous tissue).
- Contains **blood vessels, nerves, sensory receptors**.
- The surface of the dermis is very irregular and has projections called **dermal papilla** that interdigitate with evaginations of the epidermis known as **epidermal ridges**.

- **Consists of 2 layers:**

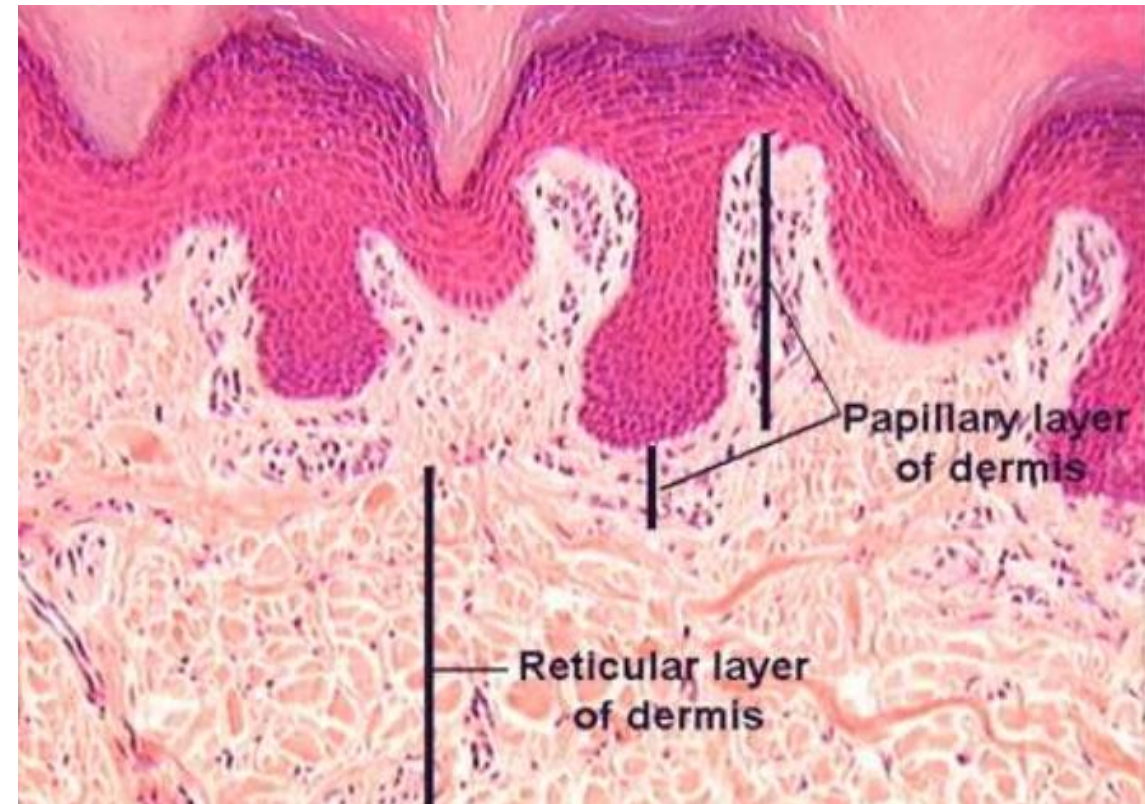
- 1. Outer papillary dermis**

- Constitutes the dermal papilla
- Composed of loose C.T

- 2. Inner reticular dermis**

- Thicker than papillary dermis
- Composed of irregular dense C.T
- Network of elastic fibers is also present, providing elasticity of to the skin

Dermis



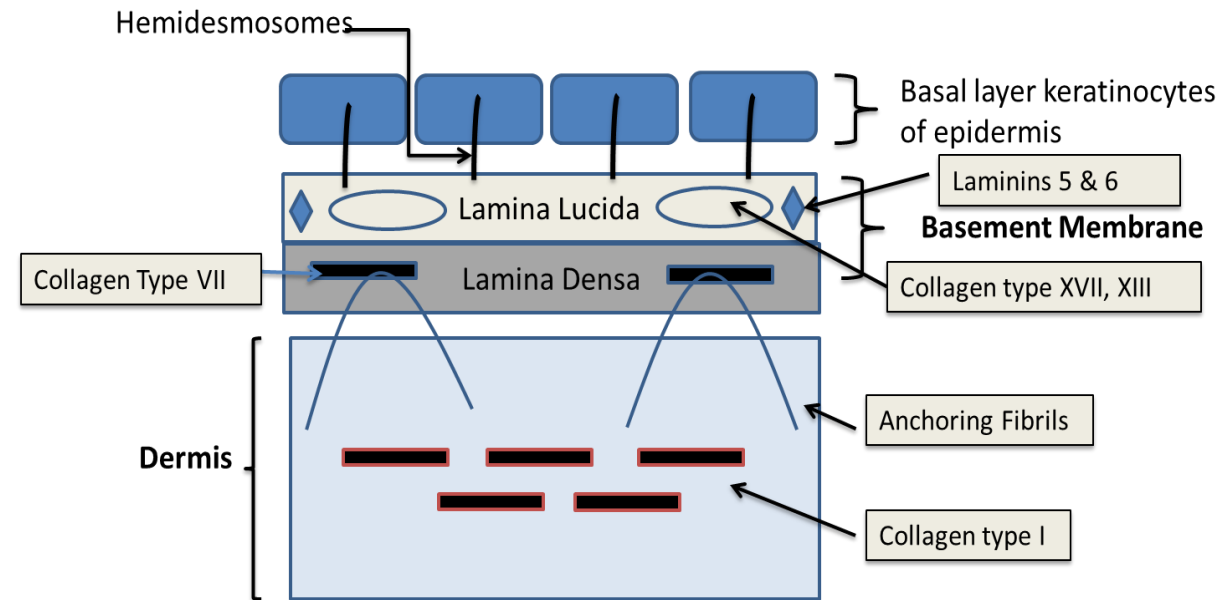
Dermal-Epidermal Junction

- Connects the epidermis and dermis
- It is composed of proteins which provide a firm connection :

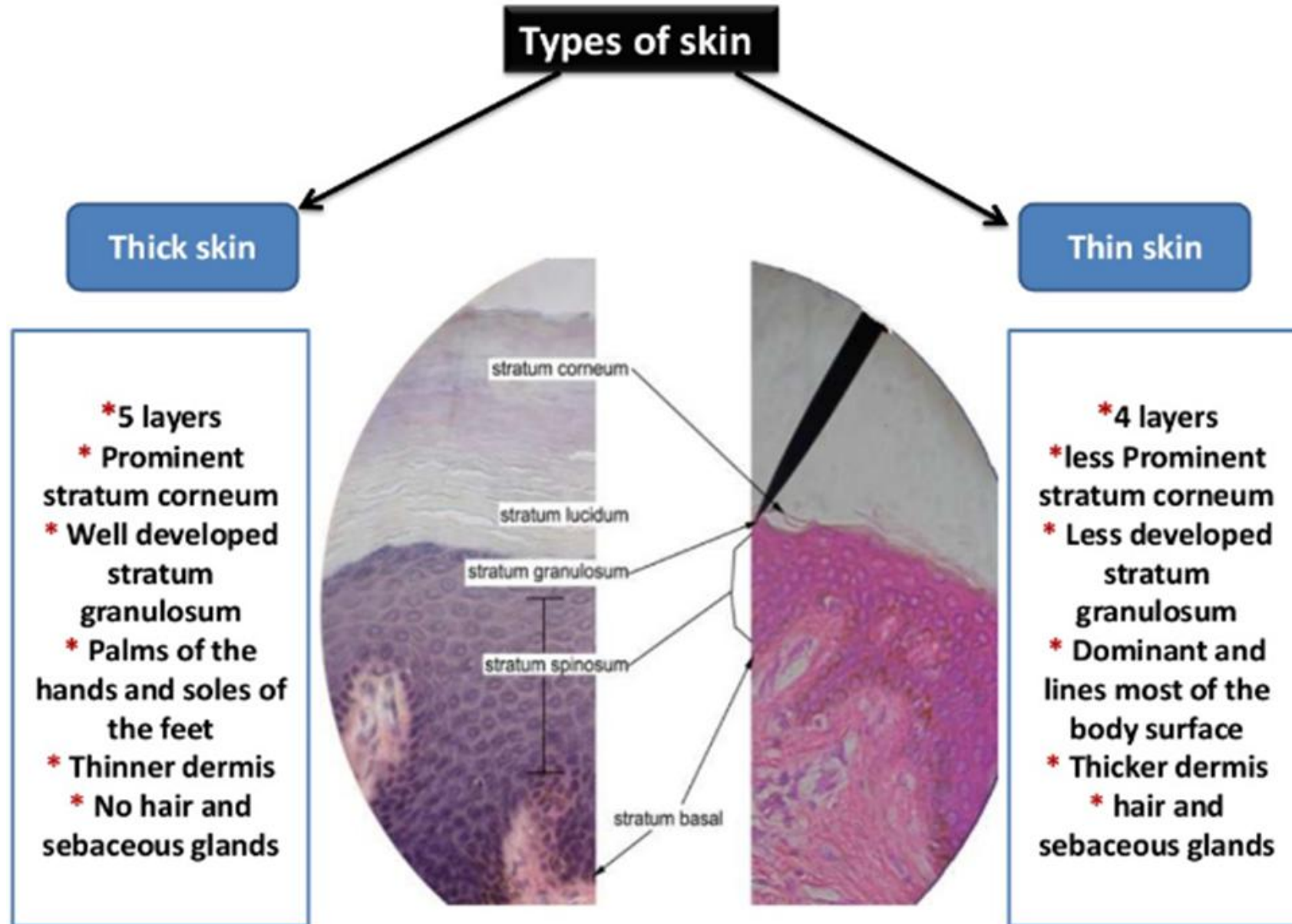
1. Hemidesmosome: connects basal keratinocytes to basement membrane.

2. Basement membrane

3. Anchoring fibrils attach the basement membrane to the dermis hooking on to collagen **VII** and collagen **I**.

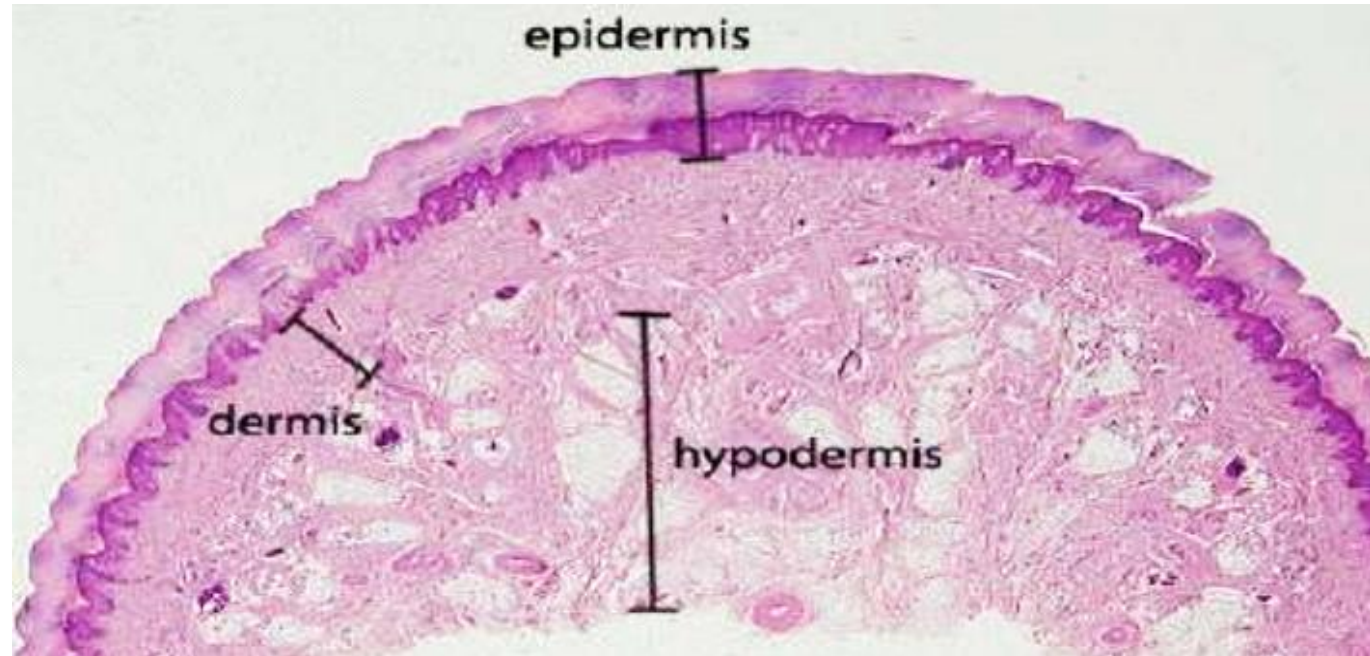


Comparison between Thin and Thick Skin



Hypodermis

- The hypodermis (subcutaneous layer) consists of **loose connective tissue that binds the skin loosely to the subjacent organs**, making it possible for the skin to slide over them.



- Also called **superficial fascia**

Skin Appendages

- 1. Hairs**
- 2. Sweat Glands**
- 3. Sebaceous Glands**
- 4. Nails**

Hairs

- Hairs are elongated keratinized structures, arises from the **hair follicle** which is an epidermal invagination with terminal dilatation called **hair bulb**.

- **Associated hair structures:**

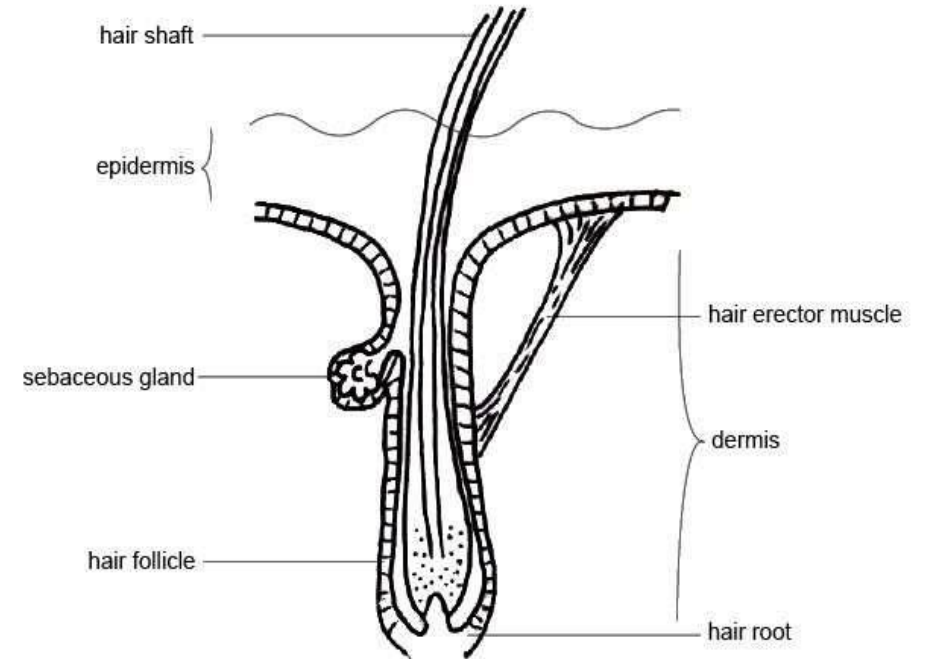
- **Hair follicle**

- Dermal and epidermal sheath surround hair root

- **Arrector pili muscle**

- Smooth muscle Pulls hairs upright when cold or frightened

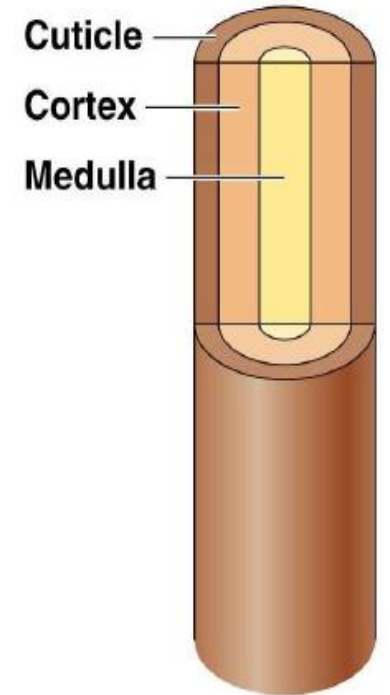
- **Sebaceous gland**



Hairs are found everywhere on the body except on the **palms, soles, lips**, and some parts of male and female external genitalia (**glans penis, clitoris, and labia minora**).

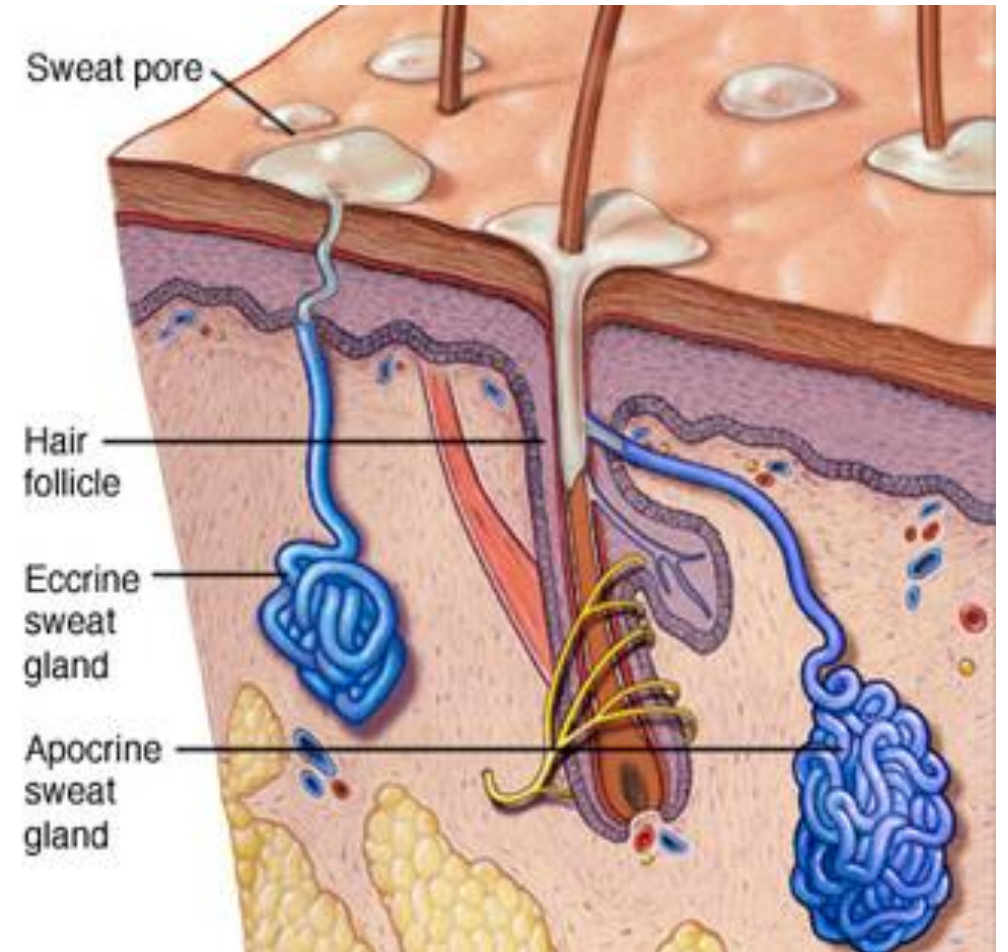
Hair anatomy:

- Central medulla
- Cortex surrounds medulla
- Cuticle on outside of cortex
(Most heavily keratinized)



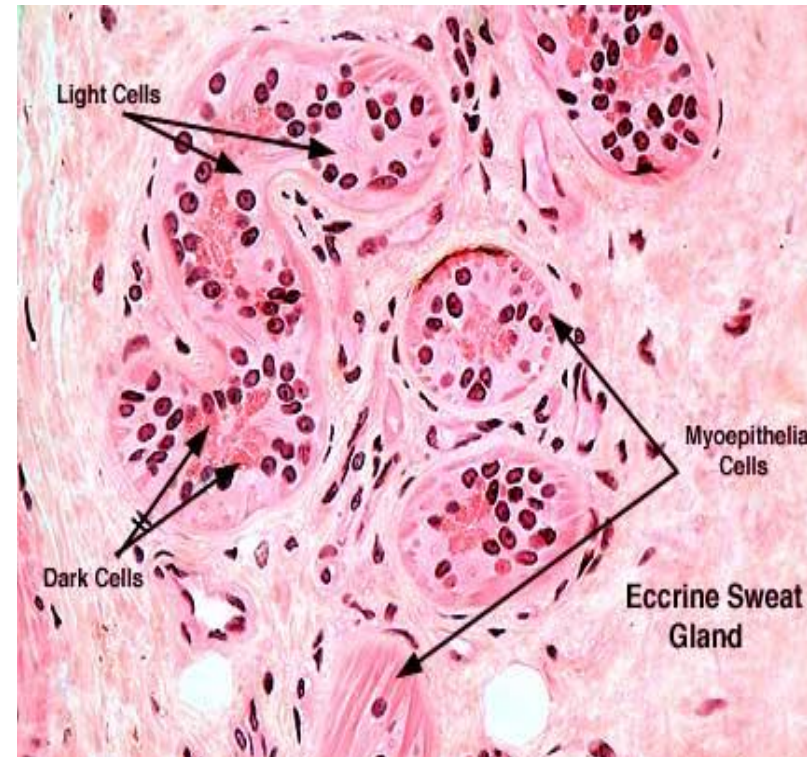
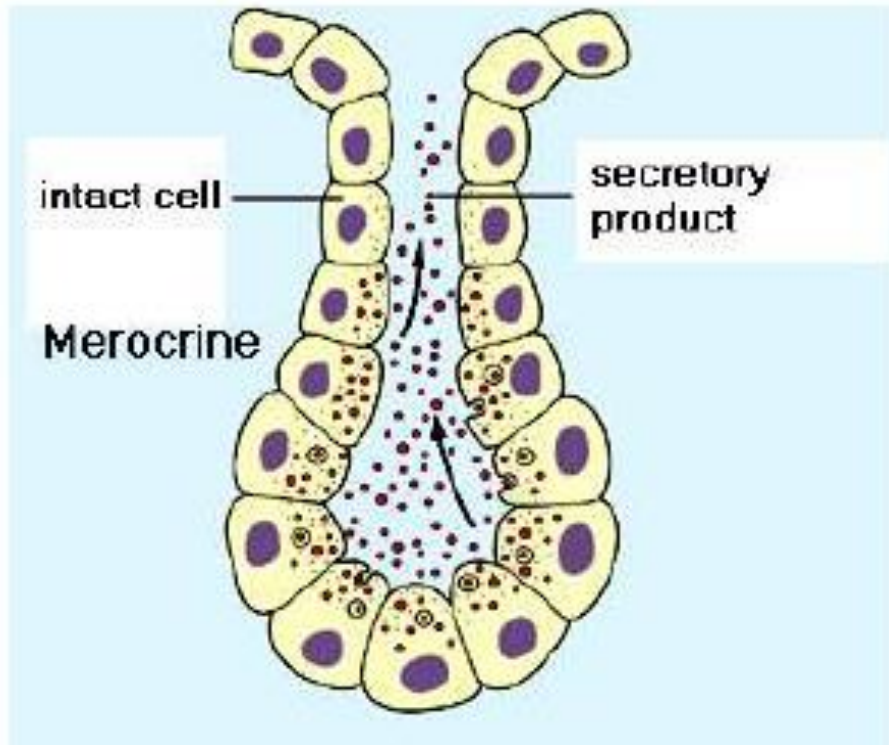
Sweat Glands

- Found in deeper parts of the dermis.
- **Two types:**
 1. **Eccrine Glands**
 2. **Apocrine Glands**



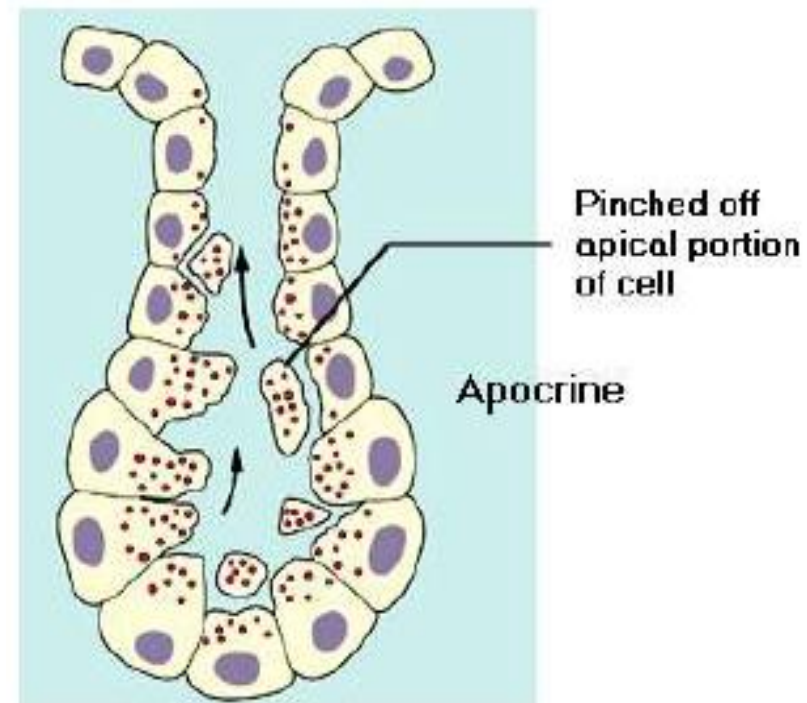
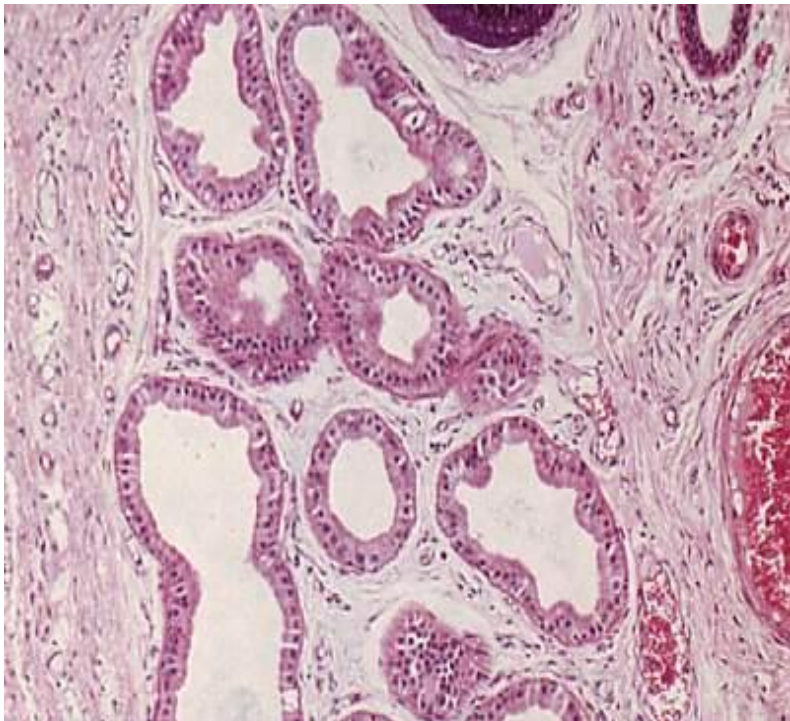
Ecocrine sweat glands:

- Merocrine secretion
- Empty directly onto skin surface
- Location: most all over body (esp. abundant on palms & soles)
- Clear, watery secretion (99% H₂O; rest NaCl + some waste products)



Apocrine sweat glands:

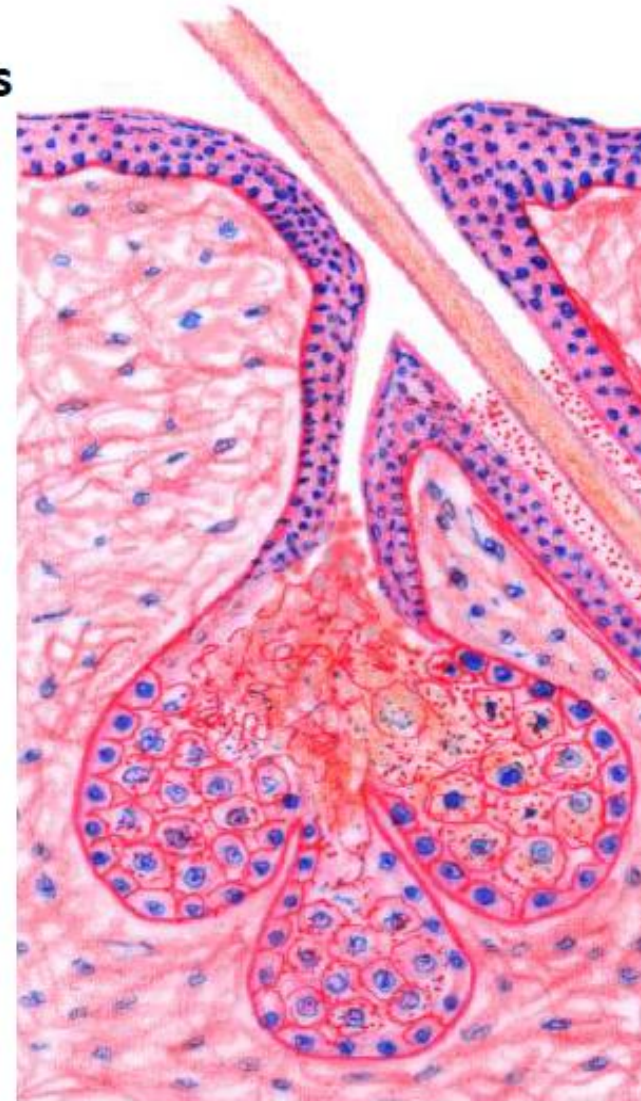
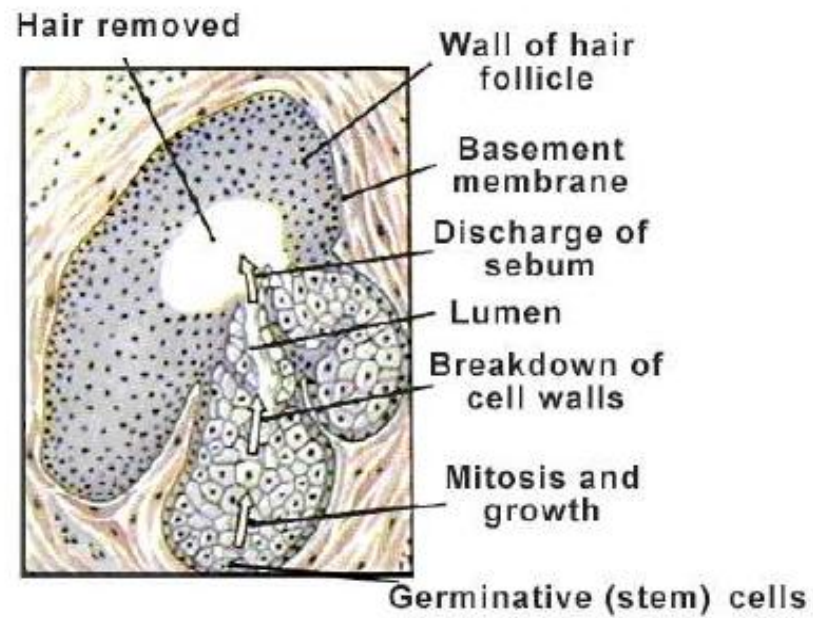
- Empty into hair follicle
- Location: armpits, groin, nipples
- Viscous, cloudy secretion, good nutrient source for bacteria (odor !!)



Sebaceous Glands

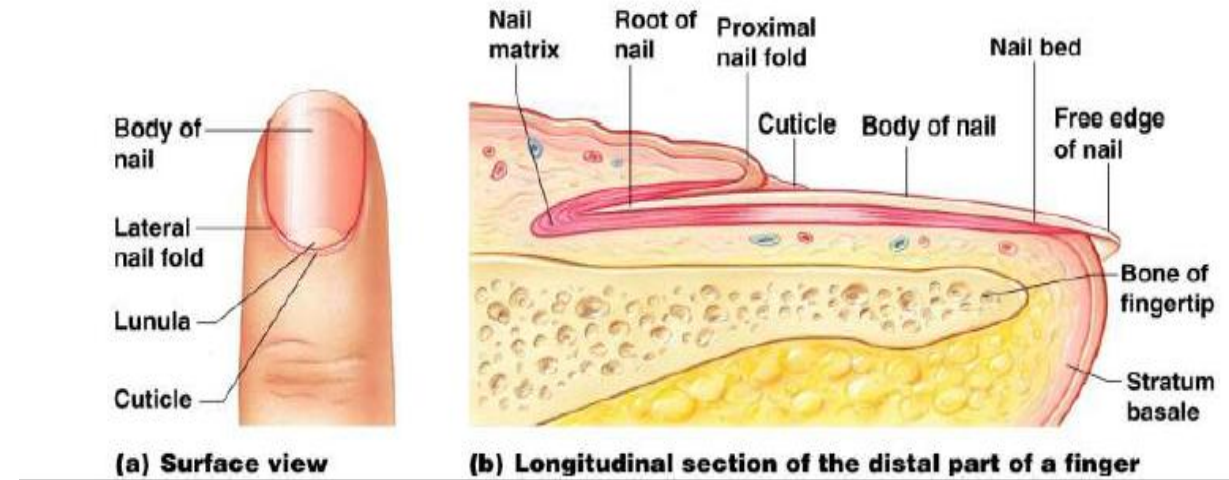
- Secrete an **oily or waxy matter**, called **sebum**, to lubricate and waterproof the skin and hair
- Found in dermis of the skin
- **Ducts open into the hair follicle**, secretion is gradually moved to the surface of the skin.
- Not found in the skin of the **palms and soles**
- **Holocrine gland**
- Function of sebum:
 - Weak antibacterial, antifungal, and soften skin and hair.
 - Prevents dryness
 - Resistant to moisture

Sebum discharged mostly into hair follicles (lubrication & bactericidal)



Nails

- Plates of keratinized cells on dorsal surface of distal phalanx.
- **Consists of 3 parts**
 - Proximal part or root
 - Exposed part or body
 - Free distal border
- Body rests on nail bed which is composed of **stratum basale** and **stratum spinosum**



Thank you

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