



EXERCISE 6

INTEGUMENTARY SYSTEM

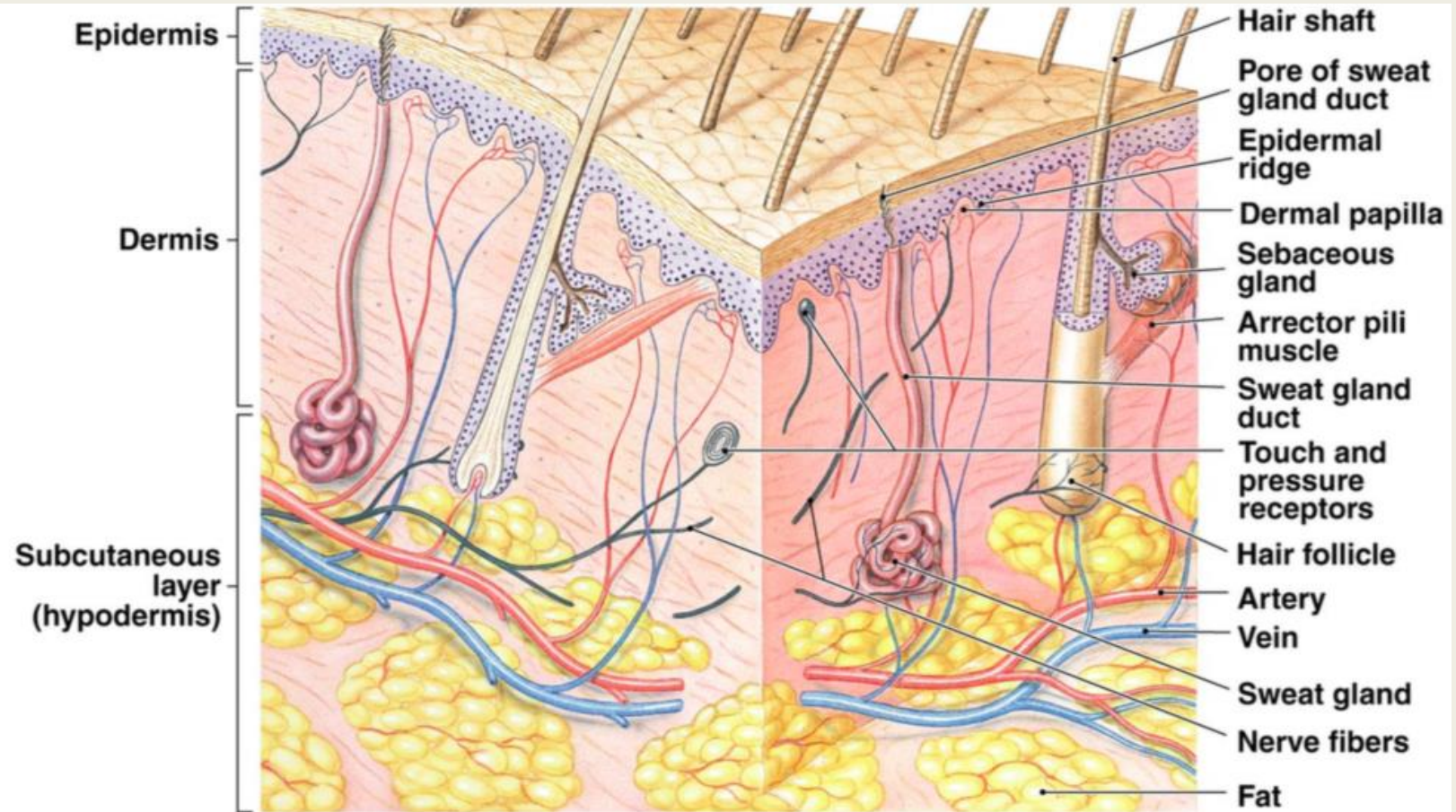
Bio 134 - Animal Histology
Prof. Kimberly Beltran-Benjamin



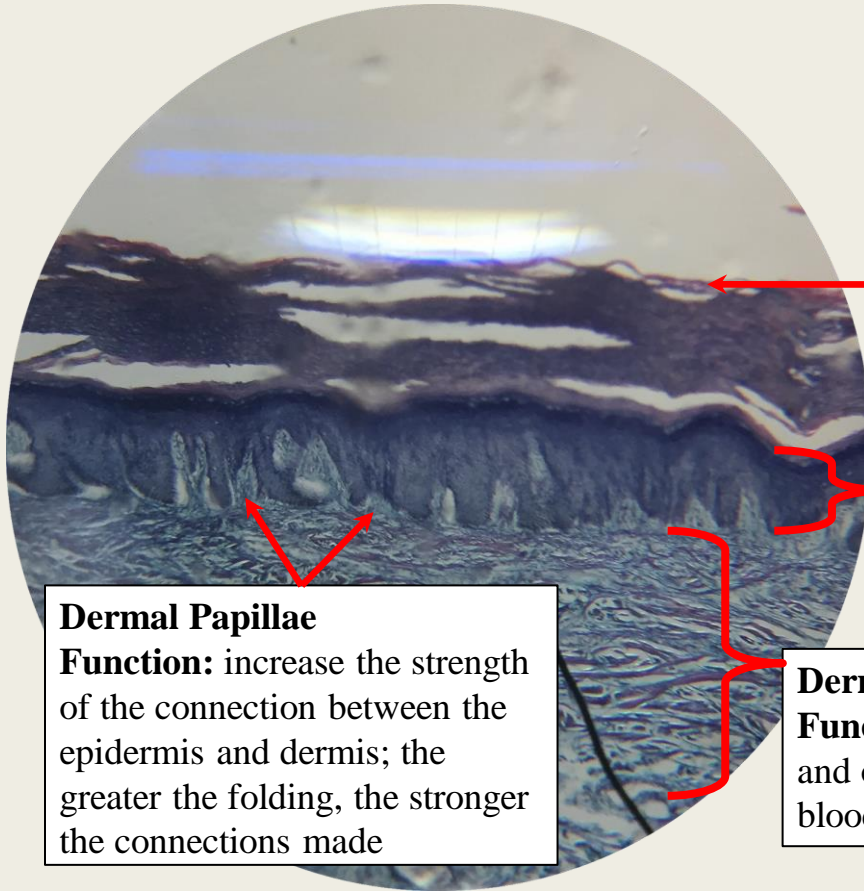
Integumentary System

- The **skin** is the body's largest organ (about 7% of body weight).
 - Cutaneous membrane (skin) is divided into two distinct layers: epidermis & dermis (also included are accessory structures)
 - Subcutaneous layer (hypodermis)
- It serves many important functions, including:
 - Protecting the body against trauma
 - Regulating body temperature
 - Maintaining water and electrolyte balance
 - Sensing painful and pleasant stimuli
 - Participating in [vitamin D synthesis](#)

Skin Layers and Accessory Structures



Layers of Thick Skin



Palm (l.s.)

General Function: Marked by creases and covered by ridges called palm prints and **fingerprints**, which function to improve **tactile** sensitivity and grip.

Location: Hand

Specimen: Human

Special Features: Thick skin; with additional layer called stratum lucidum

Keratin

Function: adhere cells to each other and to form a protective layer on the outside of the skin

Epidermis

Function: For protection; first line of defense against pathogens

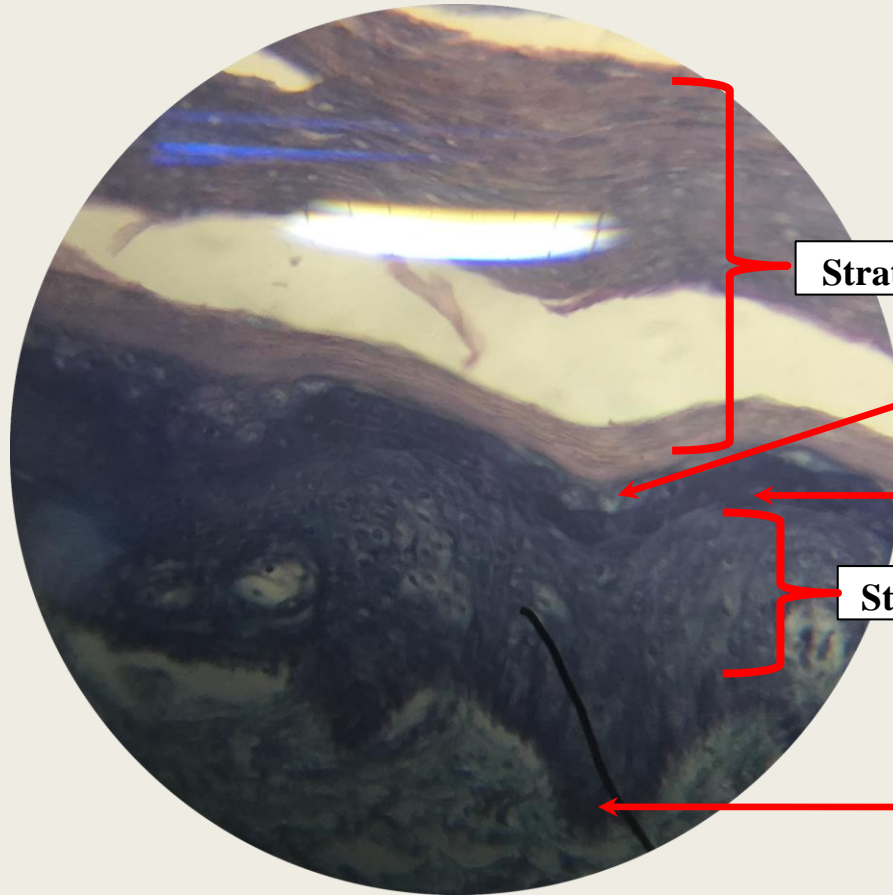
Dermal Papillae

Function: increase the strength of the connection between the epidermis and dermis; the greater the folding, the stronger the connections made

Dermis

Function: contains nerve endings, sweat glands and oil (sebaceous) glands, hair follicles, and blood vessels.

Epidermis of Thick Skin



Palm (l.s.)

General Function: Marked by creases and covered by ridges called palm prints and **fingerprints**, which function to improve **tactile** sensitivity and grip.

Location: Hand

Specimen: Human

Special Features: Thick skin; with additional layer called stratum lucidum

Stratum Corneum

Stratum Lucidum

Stratum Granulosum

Stratum Spinosum

Stratum Basale

Other Name: Stratum
Germinativum

Epidermis

Palm (l.s.)

Palm (l.s.)

General Function: Marked by creases and covered by ridges called palm prints and fingerprints, which function to improve tactile sensitivity and grip.

Location: Hand

Specimen: Human

Special Features: With accessory structures such as receptors, glands, etc.

Pacinian Corpuscle

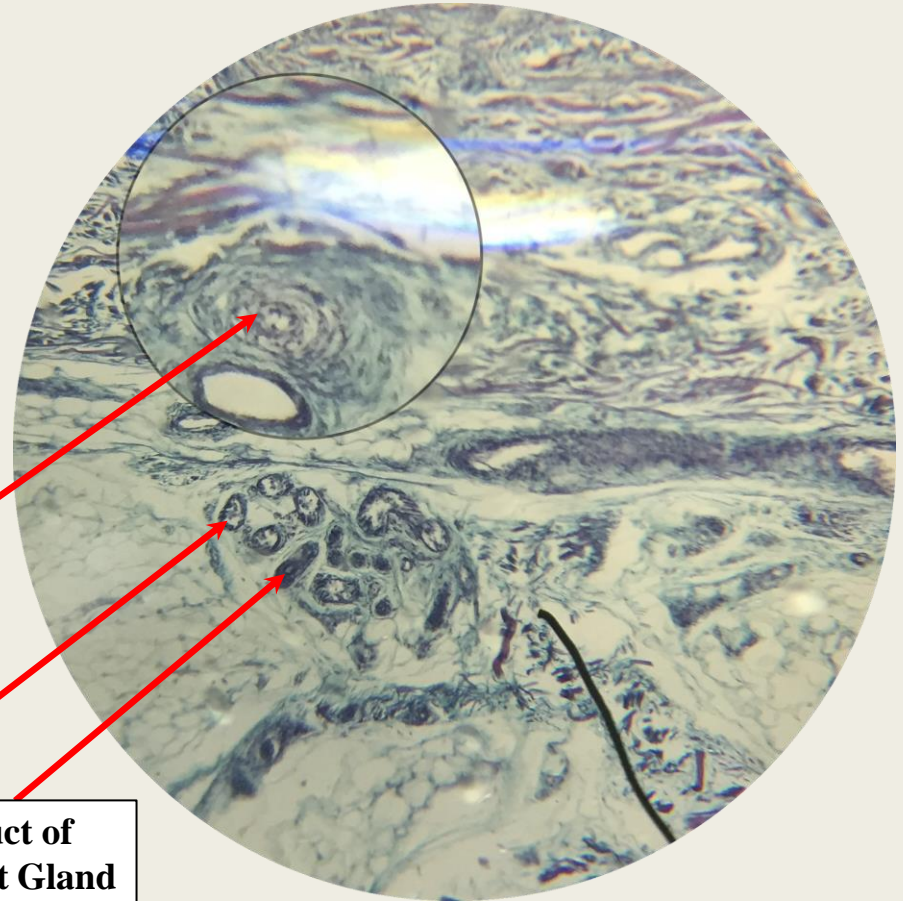
Other Name: Lamellar Corpuscle

Function: nerve endings in the skin responsible for sensitivity to vibration and pressure.

Secretory Unit of Sweat Gland

Function: Secretes sweat

**Duct of
Sweat Gland**



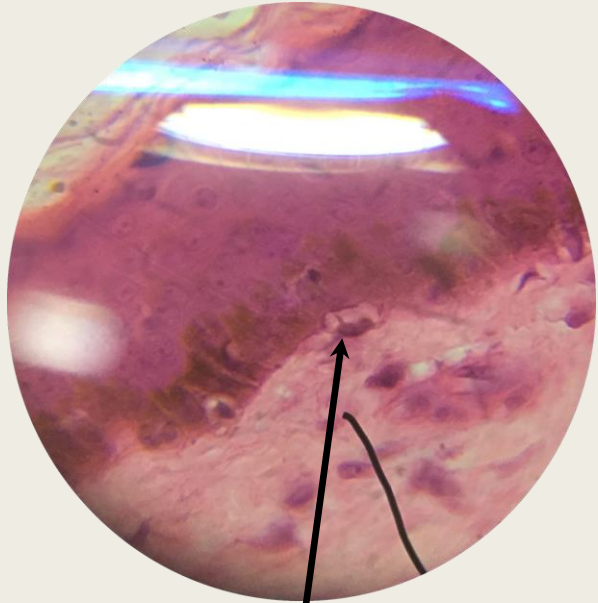
Human Brown Skin (l.s.)

Human Brown Skin

General Function: Protection, Sensation, Thermoregulation

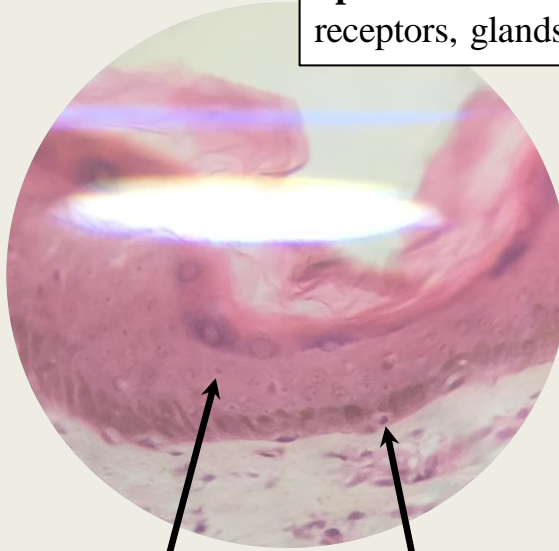
Specimen: Human

Special Features: With accessory structures such as receptors, glands, etc.



Merkel's Disc

Function: slow-adapting, unencapsulated nerve endings that respond to light touch

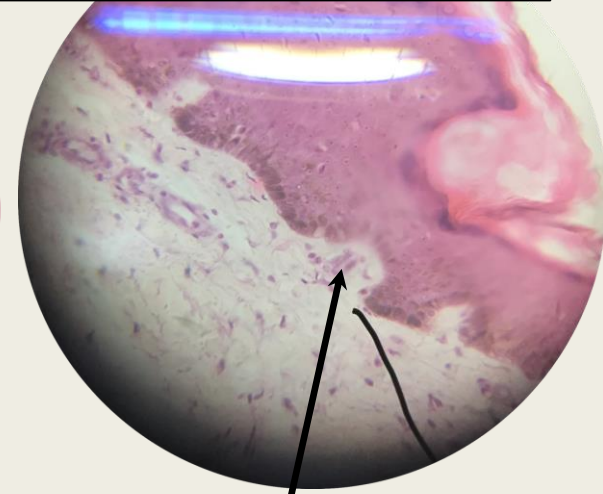


Keratinocyte

Function: produces keratin

Melanocyte

Function: produces melanin



Meissner's Corpuscle

Function: nerve ending in the skin that is responsible for sensitivity to light touch

Skin Pigmentation

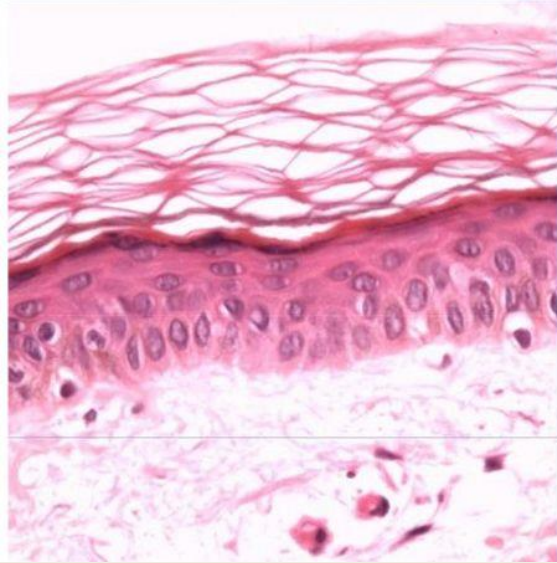
Overall skin colour depends on:

1. Carotene pigments in subcutaneous fat (adipose tissue) (**orange-yellow color**).
2. Amount of blood and how much oxygen its carrying - hemoglobin (**red color**).
3. Amount of a pigment called melanin that there is in the epidermis (**brown color**).

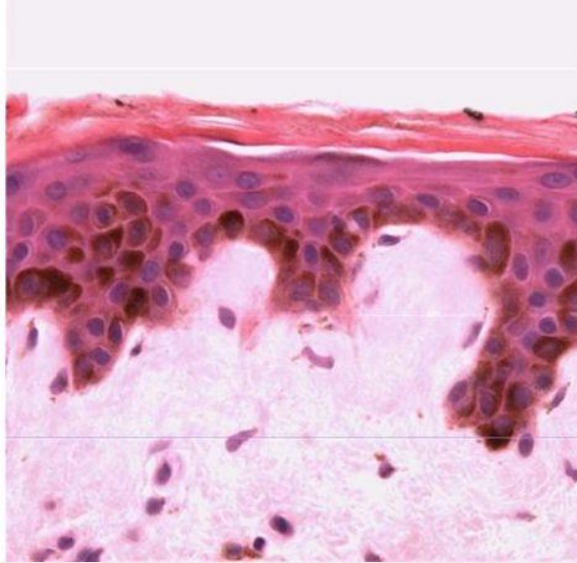
Note: Melanocyte number is the same in all races.

In different races, the number of melanocytes is **THE SAME**. In light skinned people, the melanin is concentrated deep in the epidermis, particularly in the stratum basale layer. Differences in skin colour depend on how much melanin is produced, the size of the melanosomes, and the degree to which they aggregate. The amount of melanin made can be increased by increasing exposure to UV light. However, albinos cannot make this pigment.

Comparison of Brown and White Skin



White Skin



Brown Skin

Source: <http://slideplayer.com/slide/8376151/>

Human Brown Skin

General Function: Protection, Sensation, Thermoregulation

Specimen: Human

Special Features: With accessory structures such as receptors, glands, etc.

Dark skin has increased production of melanosomes and melanin → More transfer of melanin to keratinocytes; Slower rate of degradation of melanosomes

Layers of Thin Skin

Epidermis

Epithelium: Stratified Squamous
Keratinized Epithelium

Arrector Pili

Function: Contraction causes the
hairs to stand on end

Dermis

CT: Dense Irregular
Connective Tissue

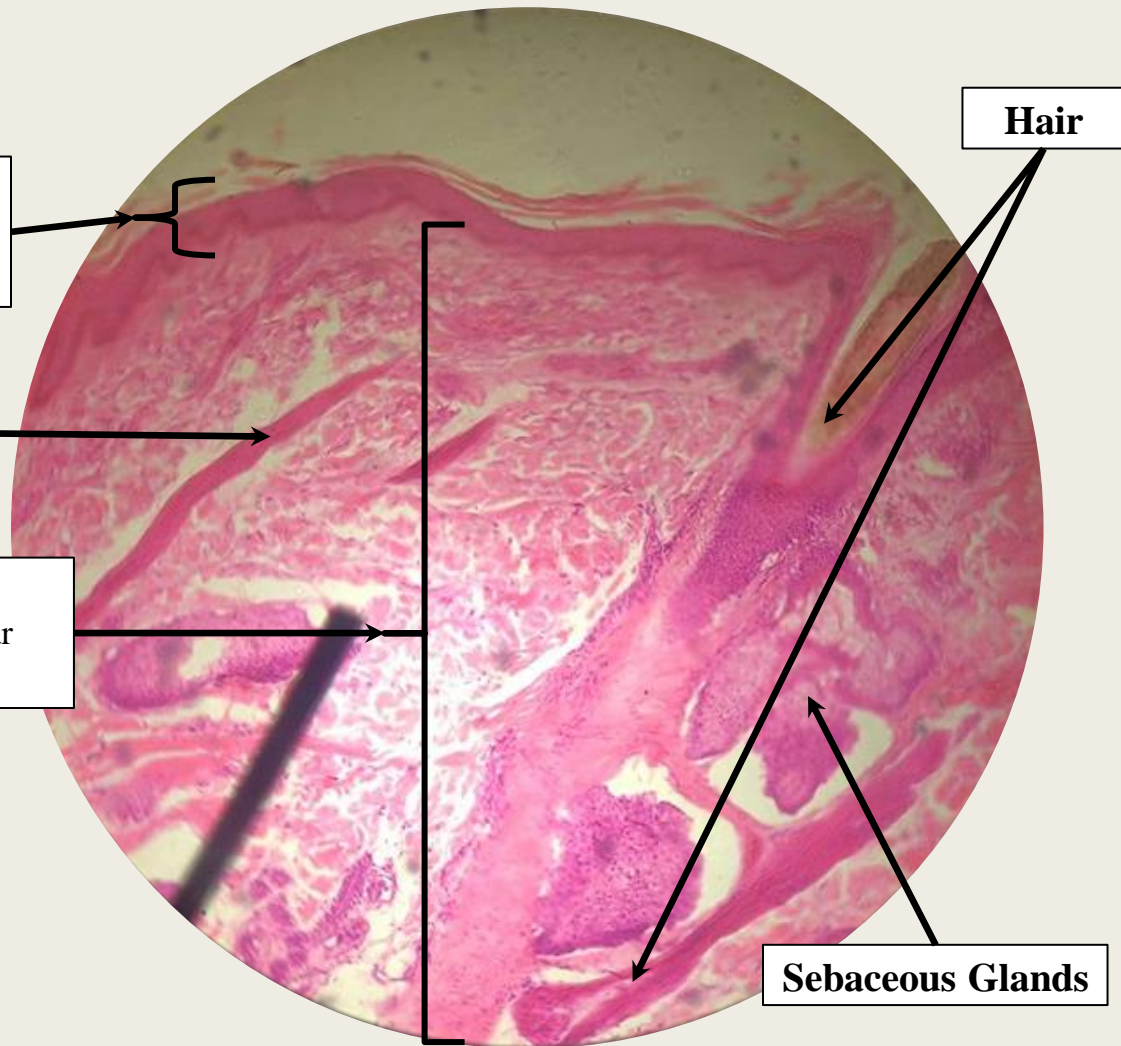
Scalp (l.s.)

Function: Protection,
Sensation, Thermoregulation

Location: Integumentary
System

Specimen: Human

Special Feature: Keratinized



Epidermis of Thin Skin

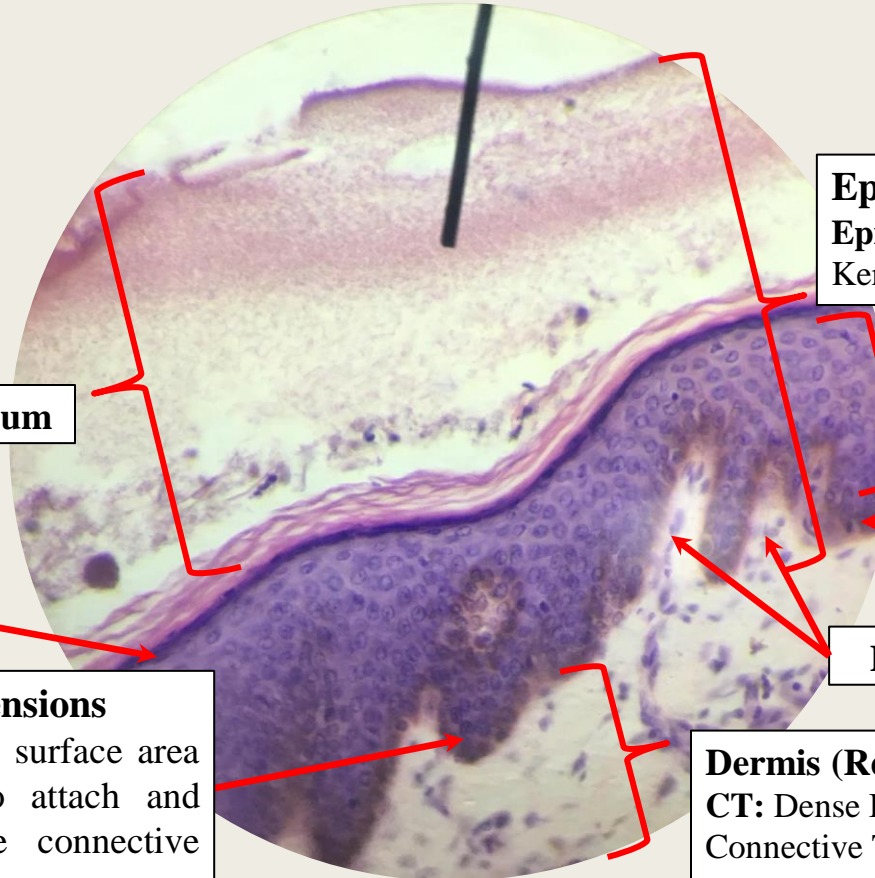
Scalp (l.s.)

Function: Protection, Sensation, Thermoregulation

Location: Integumentary System

Specimen: Human

Special Feature: Keratinized



Stratum Corneum

Epidermis

Epithelium: Stratified Squamous Keratinized Epithelium

Stratum Spinosum

Stratum Basale

Dermal Papillae

Stratum Granulosum

Dermis (Reticular Layer)

CT: Dense Irregular Connective Tissue

Rete Pegs/ Epithelial Extensions

Function: provide increased surface area for the epithelial tissue to attach and receive nutrients from the connective tissue

Sweat Glands

Scalp (l.s. & c.s.)

Function: Protection, Sensation,
Thermoregulation

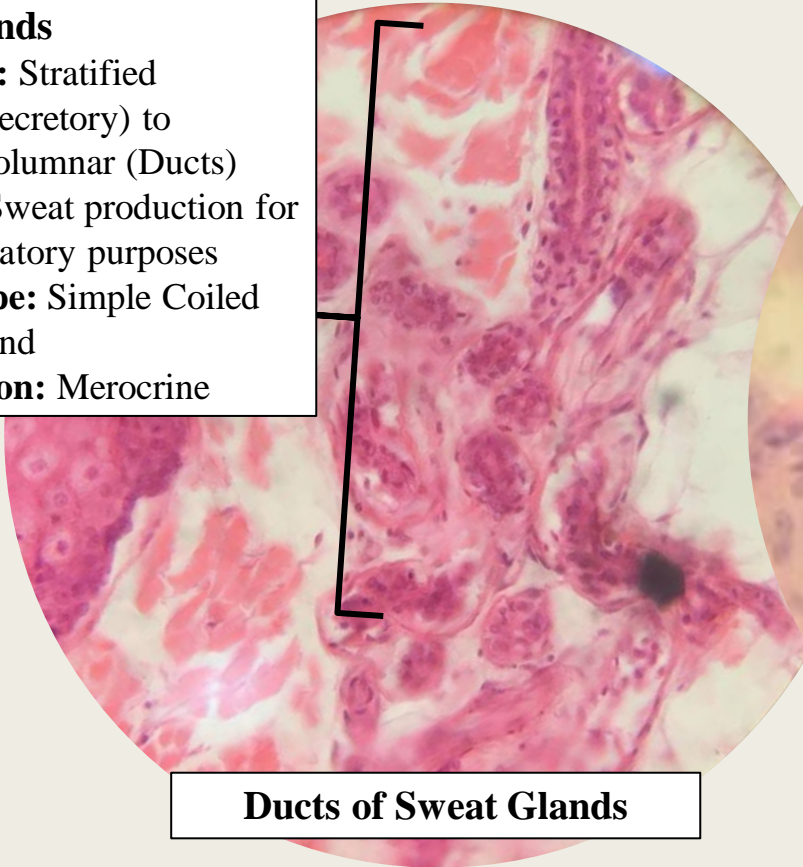
Sweat Glands

Epithelium: Stratified
Cuboidal (Secretory) to
Stratified Columnar (Ducts)

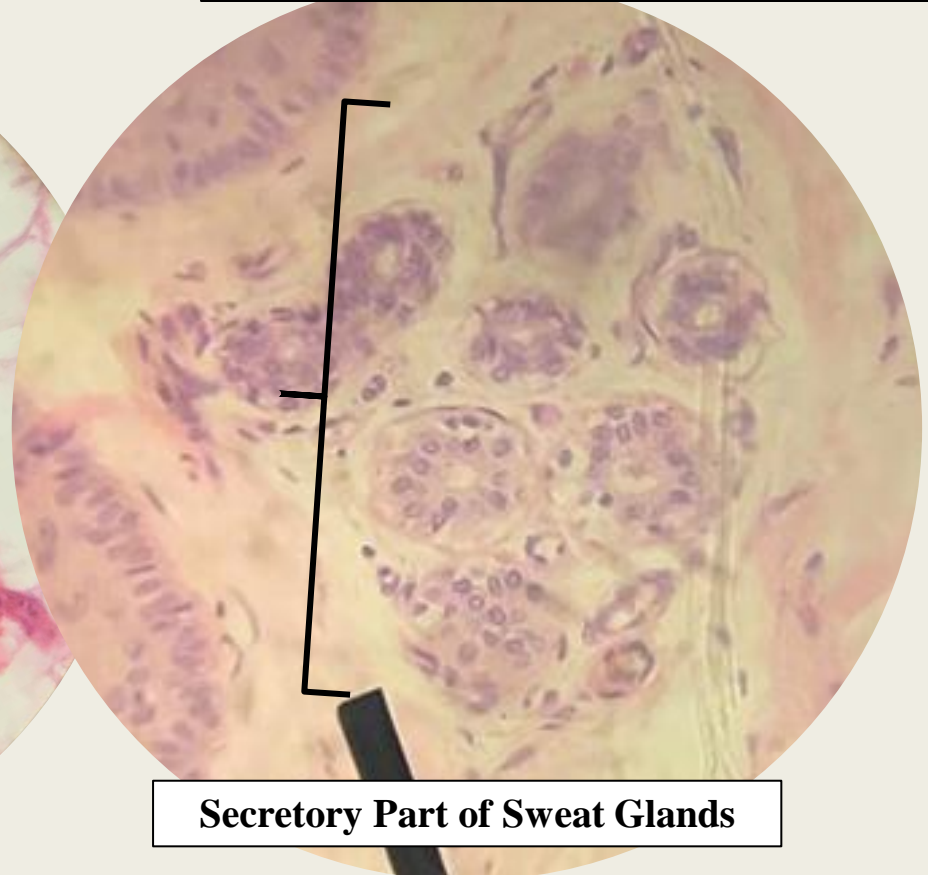
Function: Sweat production for
thermoregulatory purposes

Gland Shape: Simple Coiled
Tubular Gland

Classification: Merocrine

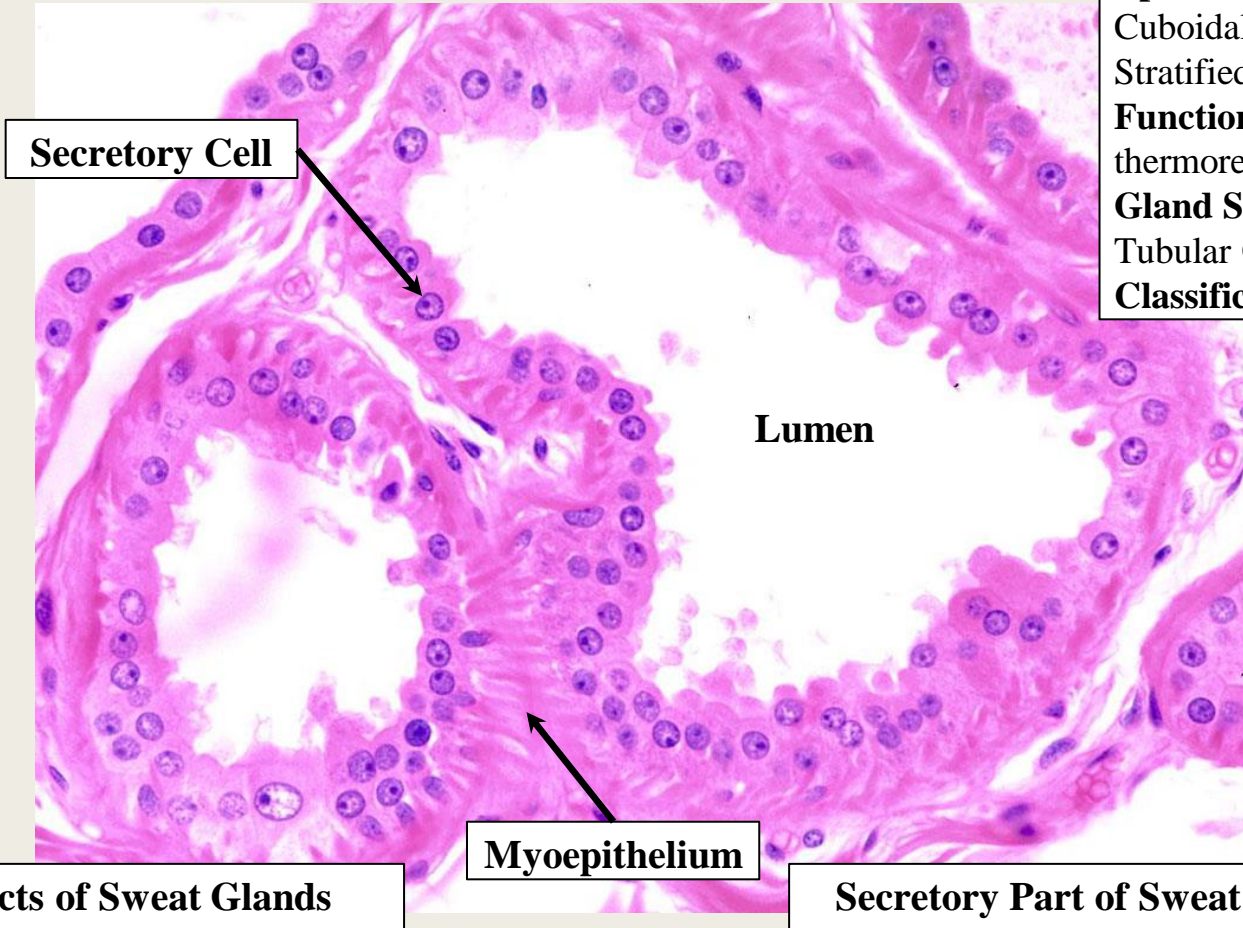


Ducts of Sweat Glands



Secretory Part of Sweat Glands

Sweat Glands



Secretory Cell

Lumen

Myoepithelium

Ducts of Sweat Glands

Secretory Part of Sweat Glands

Sweat Glands

Epithelium: Stratified
Cuboidal (Secretory) to
Stratified Columnar (Ducts)

Function: Sweat production for
thermoregulatory purposes

Gland Shape: Simple Coiled
Tubular Gland

Classification: Apocrine

Source:

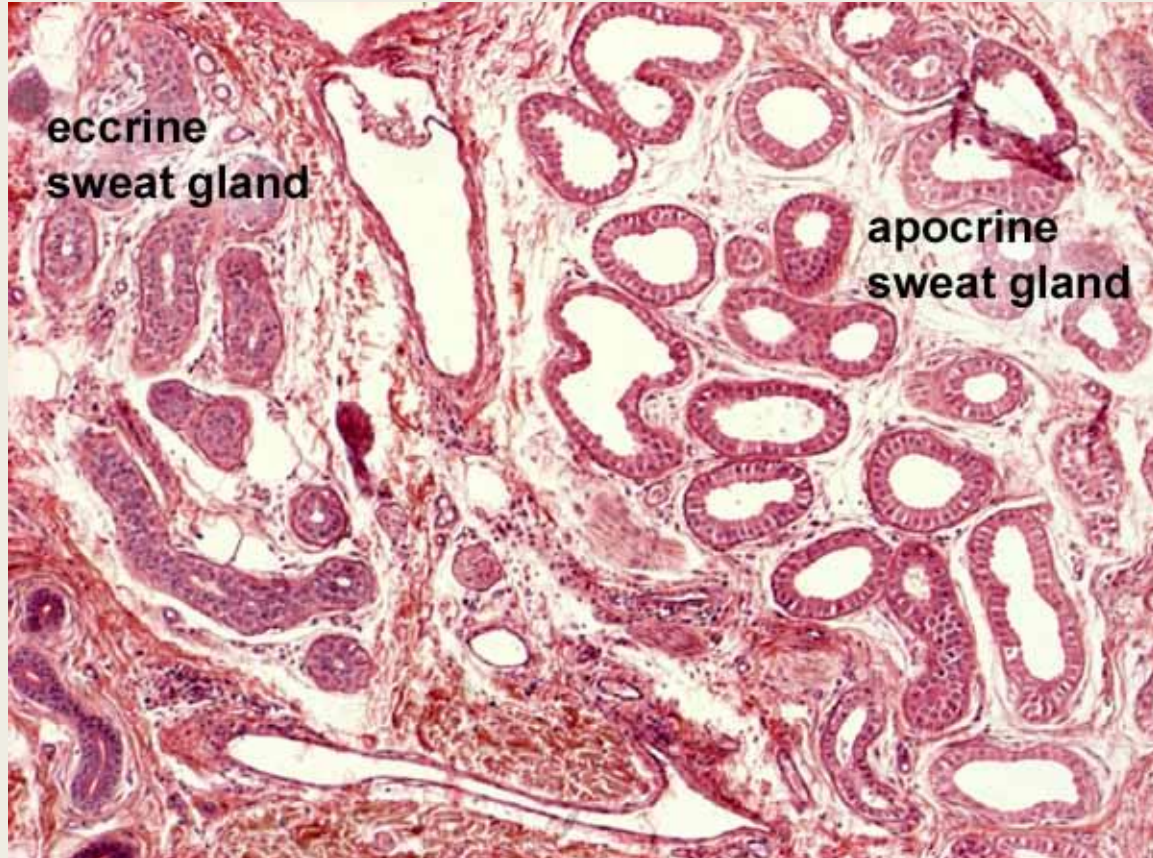
http://medcell.med.yale.edu/histology/skin_lab/apocrine_sweat_glands.php

Sweat Glands

Table 1. Difference Between Apocrine and Eccrine Sweat Glands

	APOCRINE	ECCRINE/MEROCRINE
LOCATION OF OPENING	Via hair follicles	Directly at the skin's surface
SWEAT COMPOSITION	Water + Salts and Waste + Fatty Acids + Proteins Body Odor is caused by BACTERIA not the sweat itself	Water + Salts
LOCATIONS FOUND	Anal Region, Genital Region, Armpits	All other parts not mentioned in apocrine sweat glands Most abundant: Palms, Soles and Forehead

Sweat Glands



Sebaceous Glands

Scalp (c.s. & l.s.)

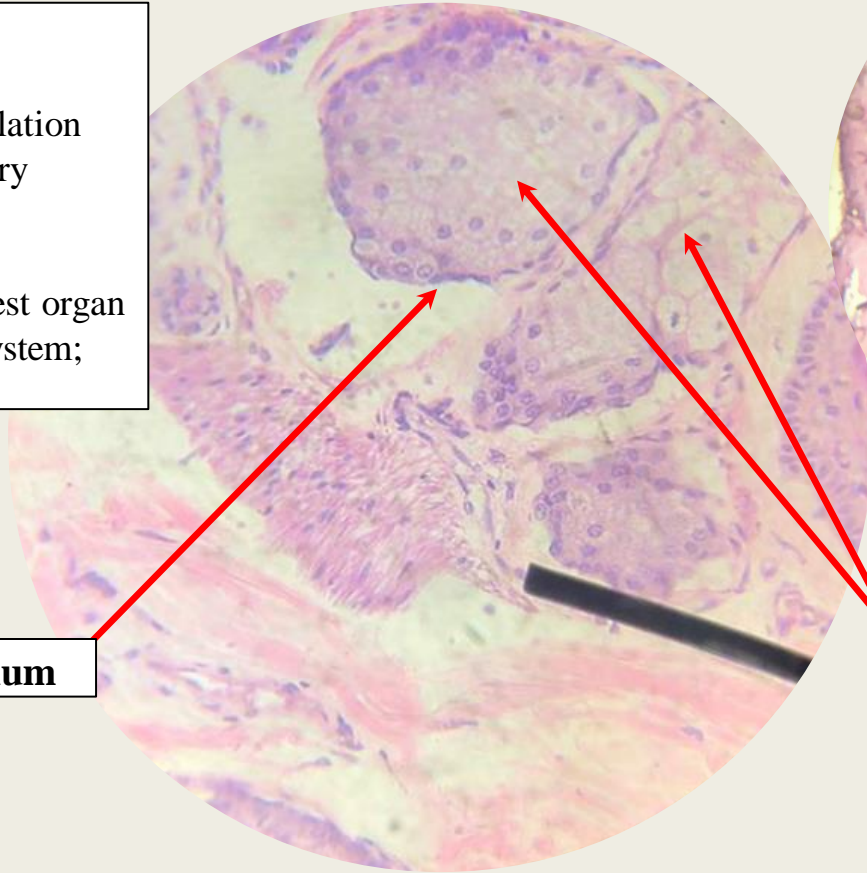
Function: Protection, Sensation, Thermoregulation

Location: Integumentary System

Specimen: Human

Special Feature: Largest organ of the integumentary system; Keratinized

Myoepithelium



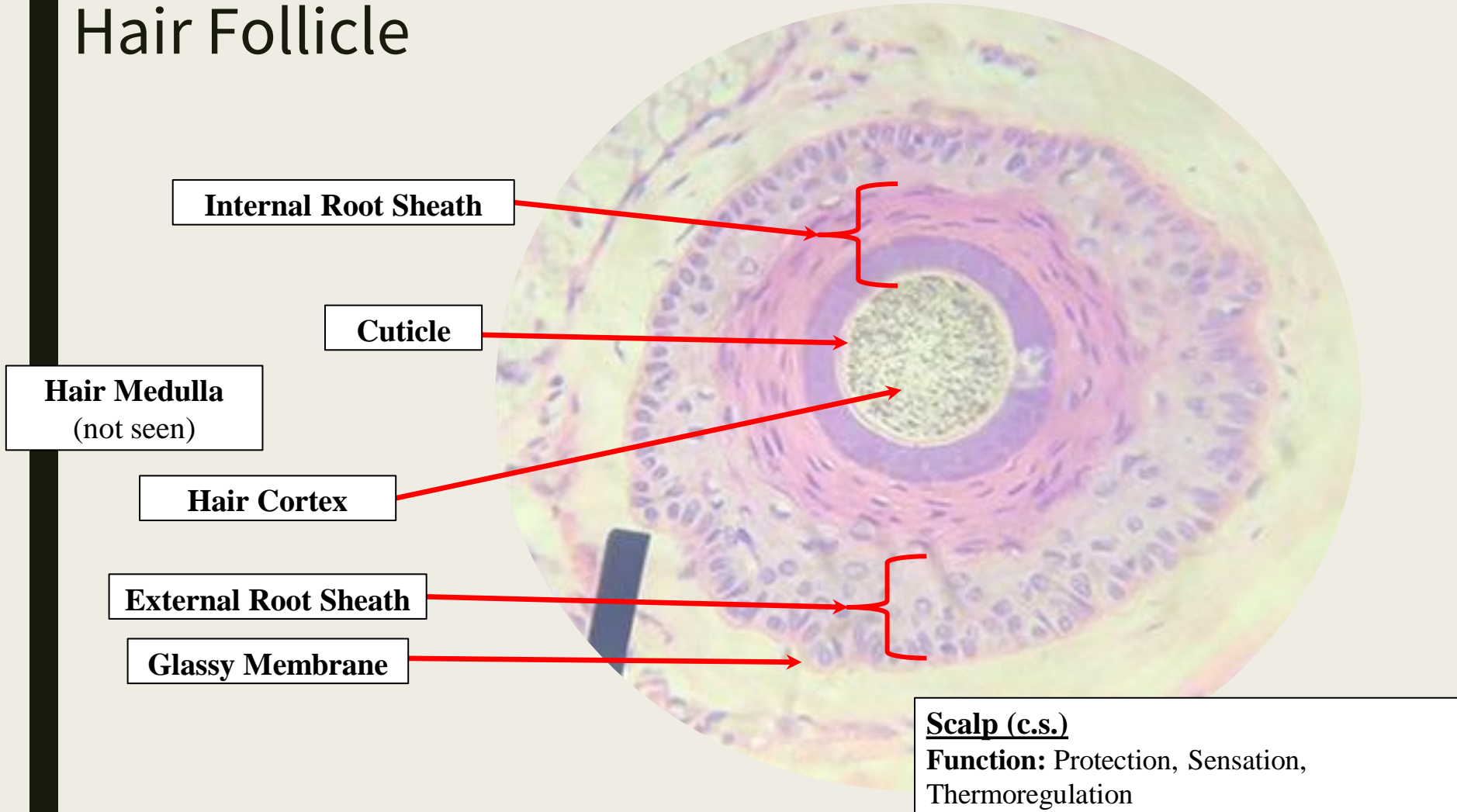
Sebaceous Glands

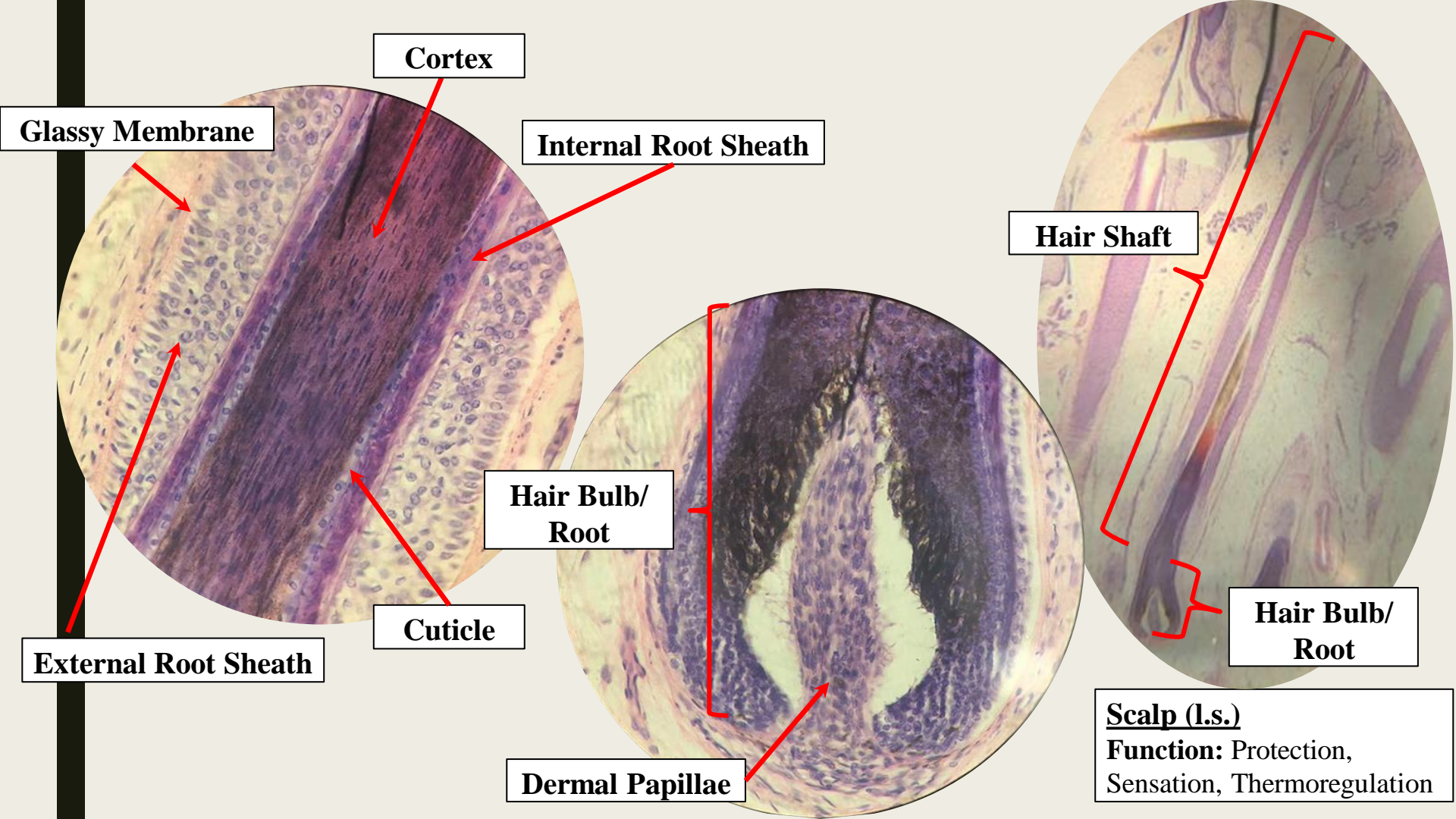
Other Name: Oil Glands

Function: Produces and secretes oil or sebum

Special Feature: Always found beside a hair shaft

Hair Follicle





Cortex

Glassy Membrane

Internal Root Sheath

Hair Shaft

**Hair Bulb/
Root**

Cuticle

**Hair Bulb/
Root**

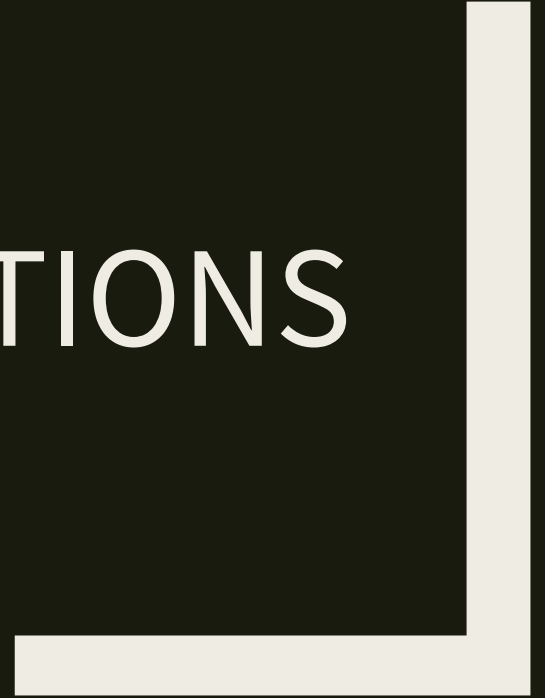
External Root Sheath

Dermal Papillae

Scalp (l.s.)

Function: Protection,
Sensation, Thermoregulation

GUIDE QUESTIONS



1. What do the following structure represent under the EM? Give their importance.

A. “Spiny” Projections in the Stratum Spinosum

Their spiny appearance is due to **shrinking of the microfilaments between desmosomes** that occurs when stained with Hematoxylin and Eosin stain.

Keratinization begins in this layer. The keratinocytes are active in synthesizing keratin which in turn forms tonofibrils. Tonofibrils form desmosomes which allow to form connections between keratinocyte.

1. What do the following structure represent under the EM? Give their importance.

B. Granules in the Cells of Stratum Granulosum

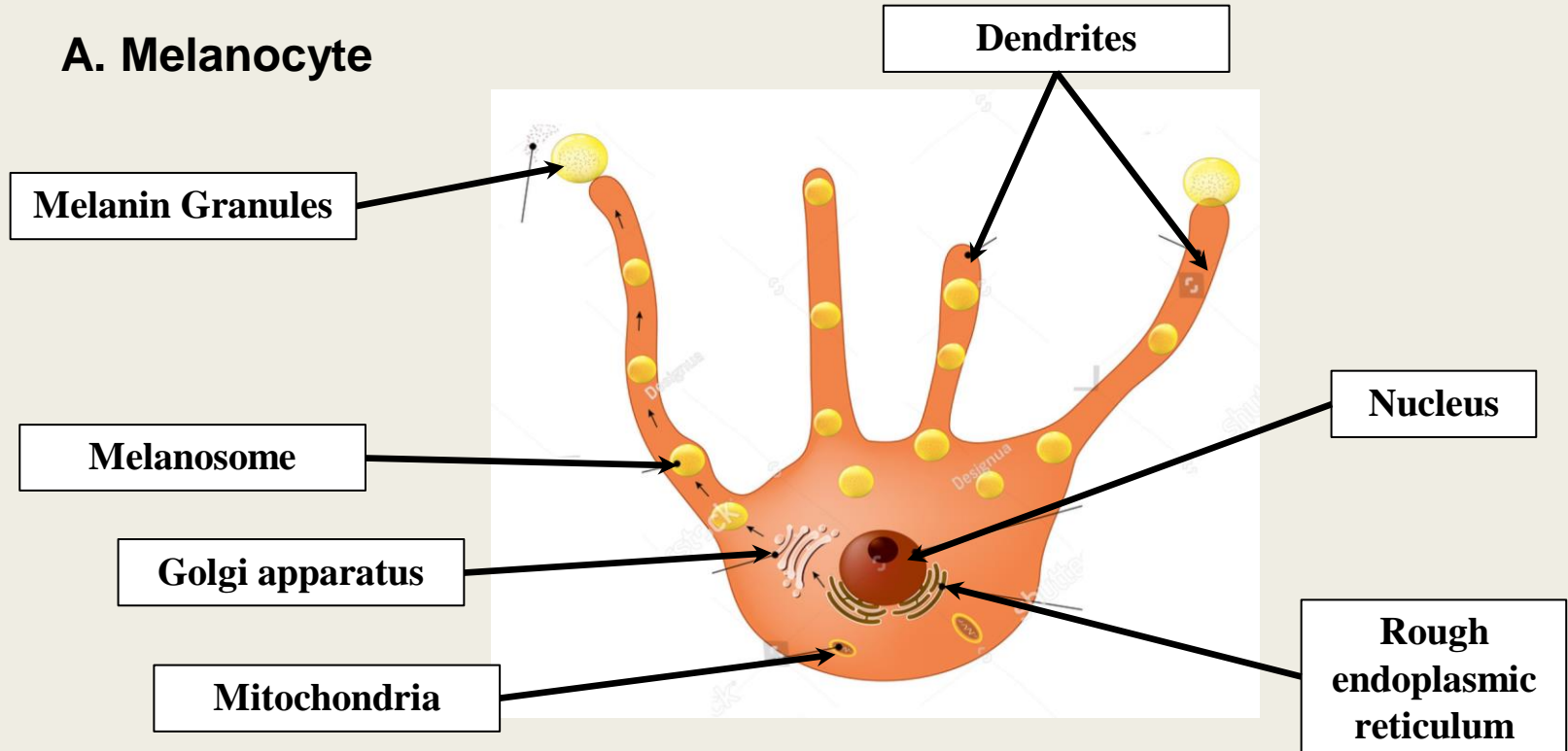
These granules contain **keratohyalin granules**, which are filled with histidine- and cysteine-rich proteins that appear to bind the keratin filaments together.

2. Describe the process of melanin synthesis.

Melanin synthesis occurs in vesicles formed by the Golgi body and consists of 4 stages. In the Stage I vesicle, tyrosinase precursors are synthesized on ribosomes of the endoplasmic reticulum and accumulate in vesicles formed by the Golgi body. In the Stage II vesicle, the vesicle contains intermediate filaments which melanin is deposited on. In the stage III vesicle, concentration of melanin increases, obscuring the filaments. In the Stage IV vesicle, no filaments are visible, giving rise to a mature melanin granule.

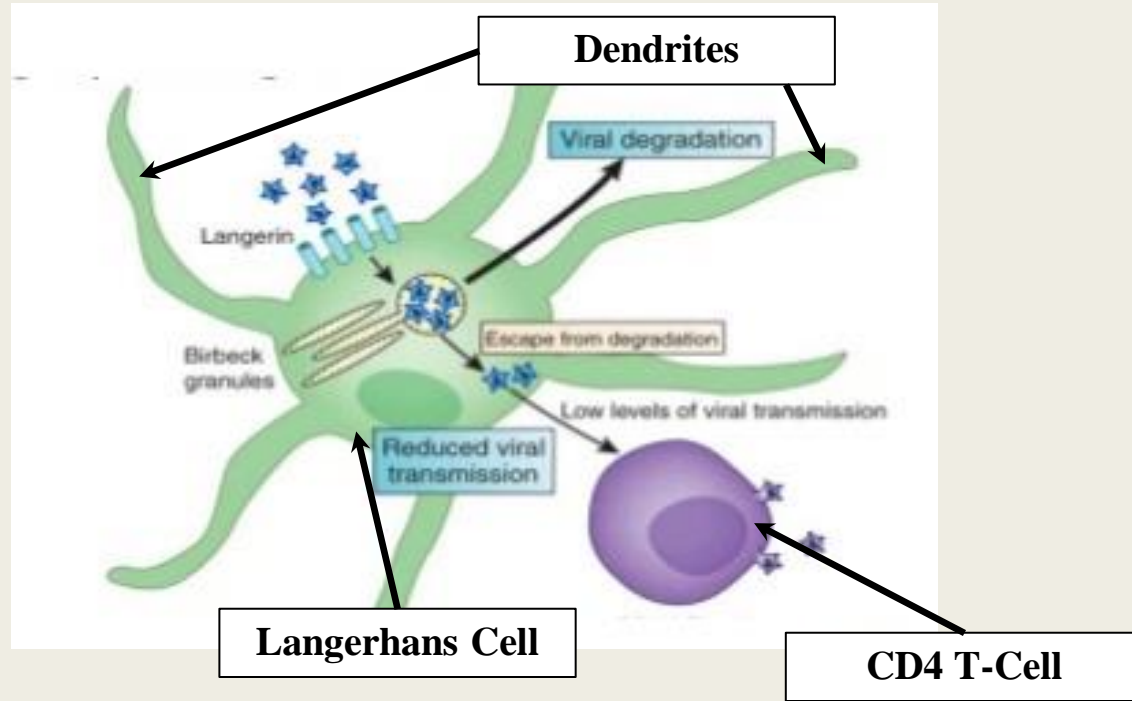
3. Draw and label the following specialized cells and structures:

A. Melanocyte



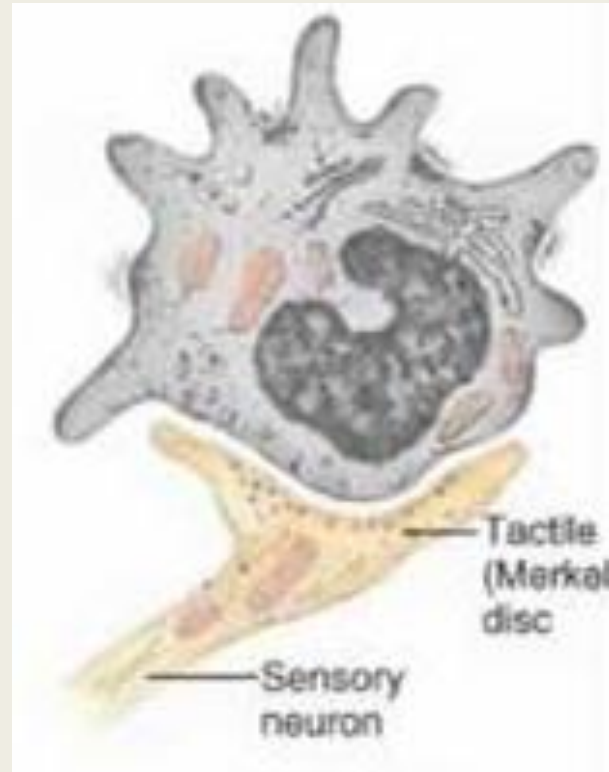
3. Draw and label the following specialized cells and structures:

B. Langerhans Cell



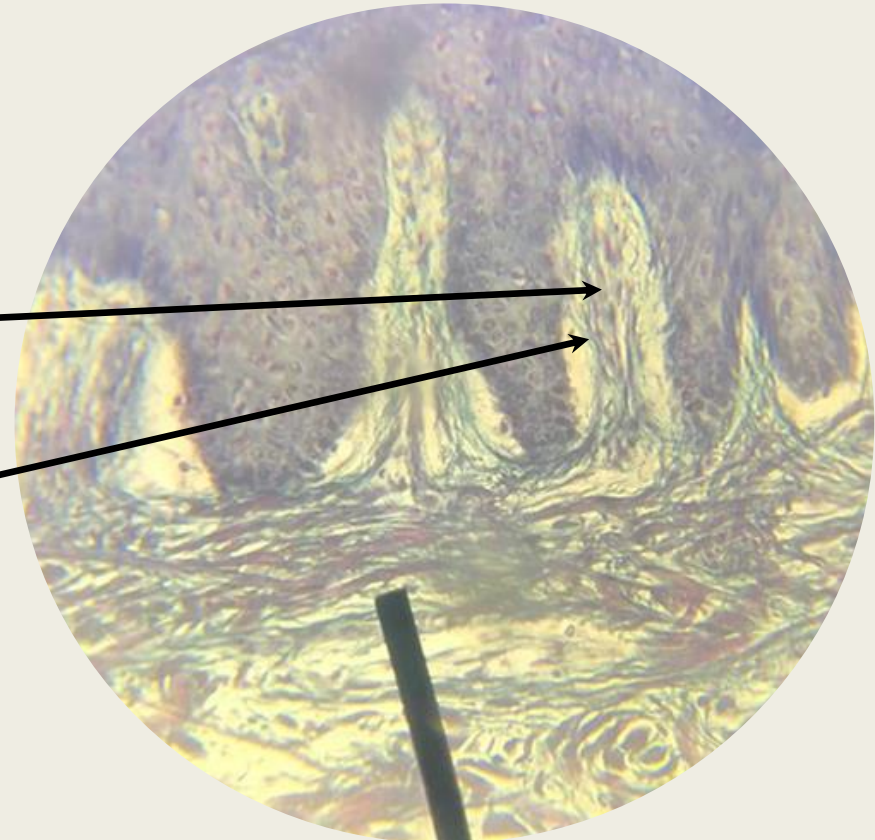
3. Draw and label the following specialized cells and structures:

C. Merkel's Cell



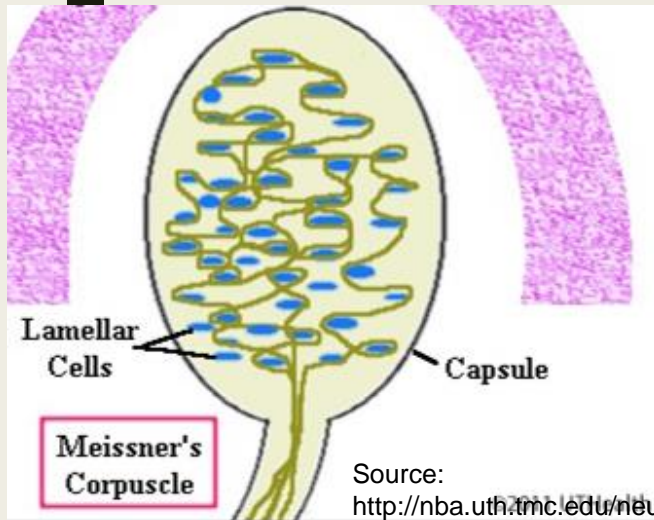
3. Draw and label the following specialized cells and structures:

D. Meissner's Corpuscle



Lamellar Cells

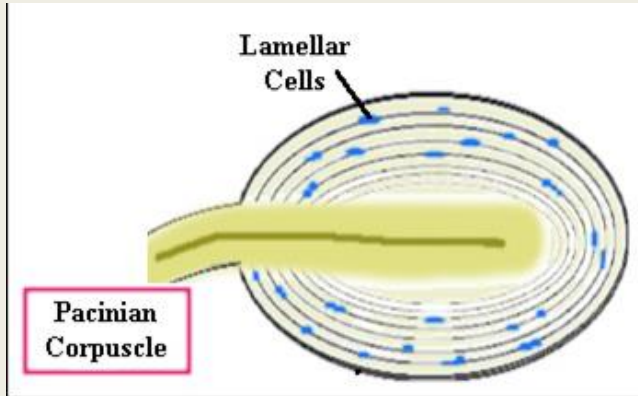
Capsule



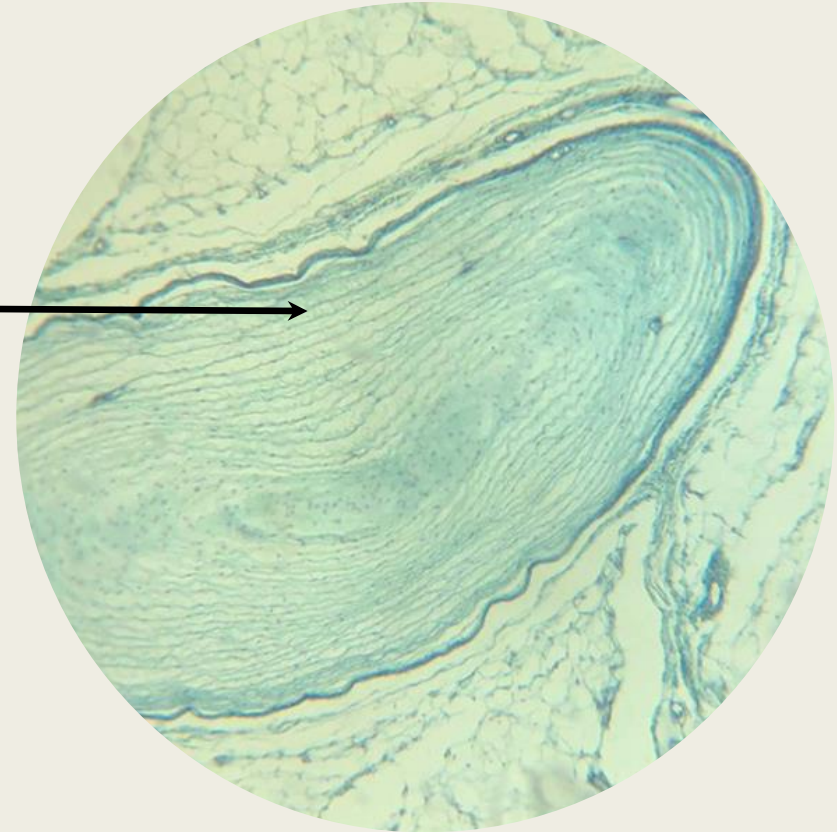
Source: http://nba.uth.tmc.edu/neuroanatomy/L4/Lab04p15_index.html

3. Draw and label the following specialized cells and structures:

E. Pacinian Corpuscles



Lamellar Cells





EXERCISE 6

INTEGUMENTARY SYSTEM

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Bio 134 - Animal Histology
Prof. Kimberly Beltran-Benjamin