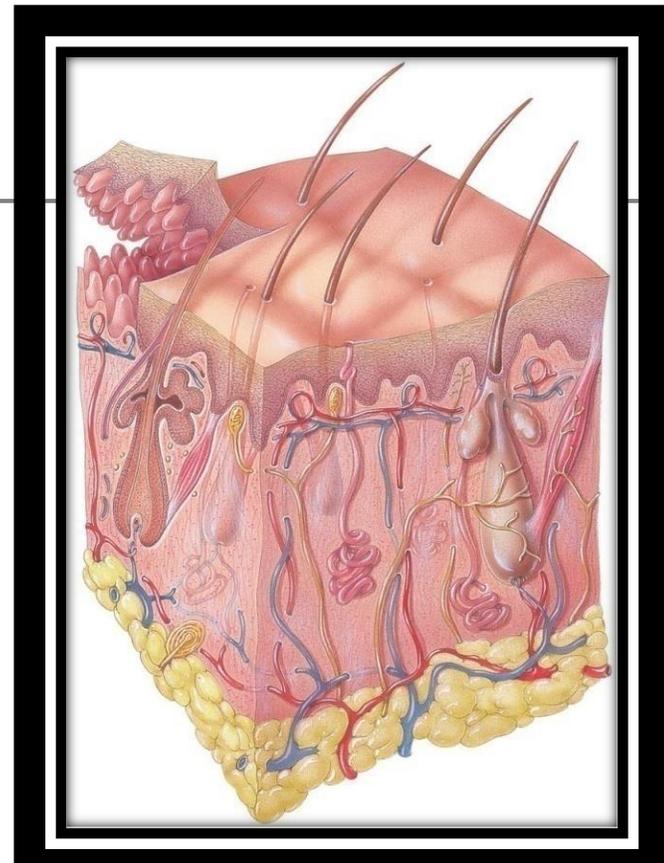


# The Integumentary System

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(2021)



- The **integumentary system** is formed of the **skin** and its **accessory structures**. These include:

a. **Hair**

b. **Arrector pili muscle** → Sympathetic same level same side

c. **Sebaceous and sweat glands**

d. **Nails**

- Functions of the skin:

1. **Regulation of body temperature**

2. Blood reservoir

3. Protection مستودع في دة

4. Cutaneous sensations احاسيس الجلد

5. Excretion and absorption

6. Synthesis of vitamin D SUN

# Structure of the Skin

- The skin (cutaneous membrane) covers the body and is the largest organ of the body by surface area and weight. Weight is about 16% of body weight. It's thinnest on the eyelids, thickest on the heels.
- The skin is formed of two major layers:
  1. Outer layer called the **epidermis**.
  2. Inner layer called the **dermis**.
- Beneath the dermis is a **subcutaneous layer** (also called the **hypodermis**) which attaches the skin to the underlying tissues and organs.

Function

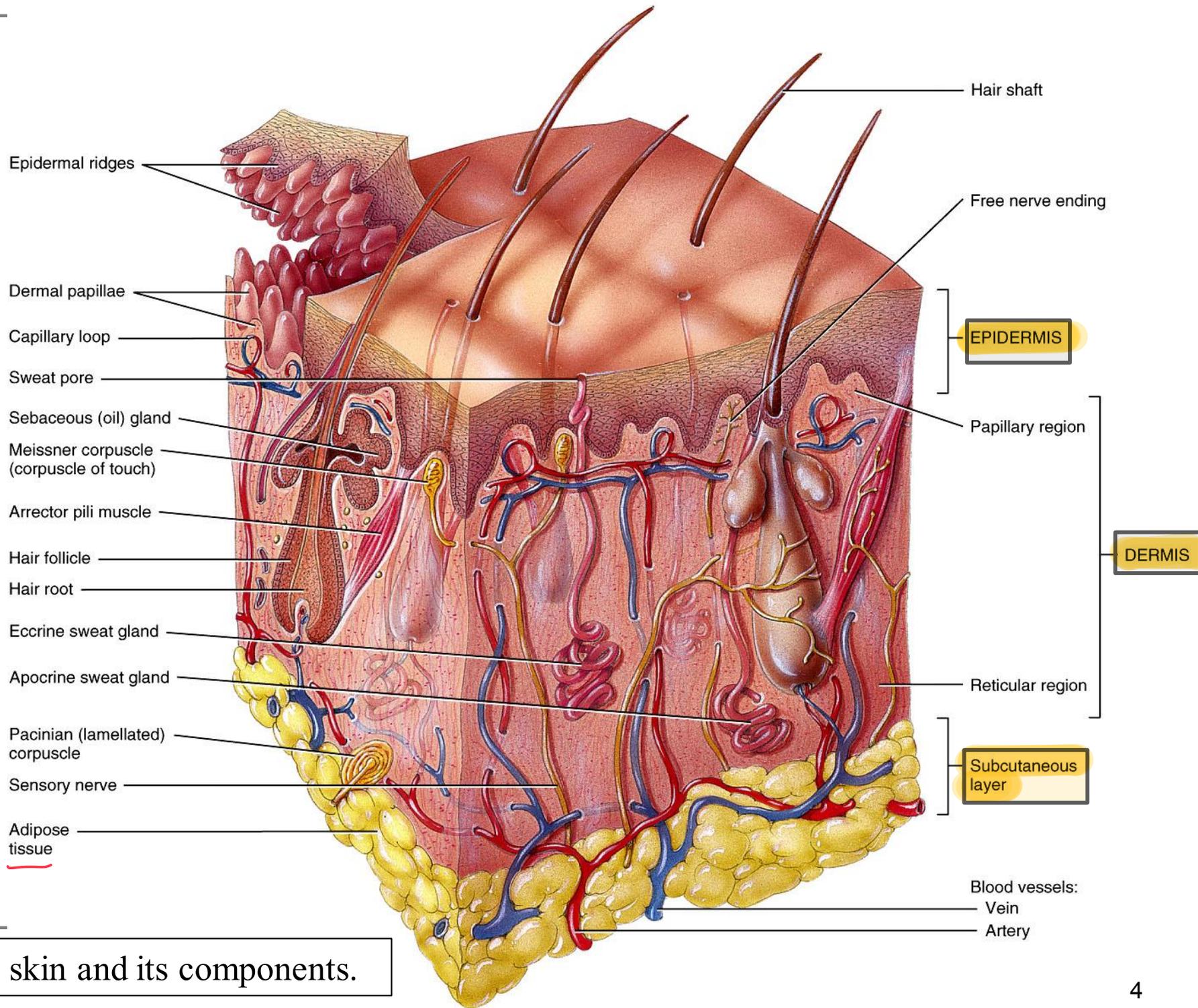
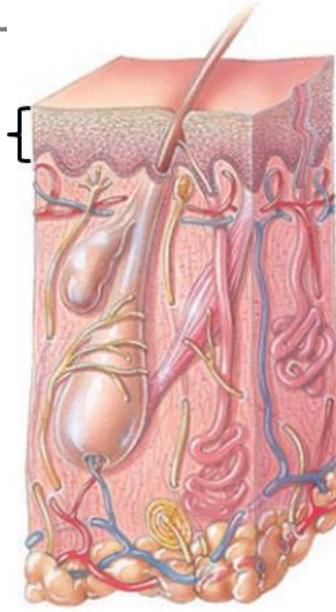


Fig.1: The skin and its components.

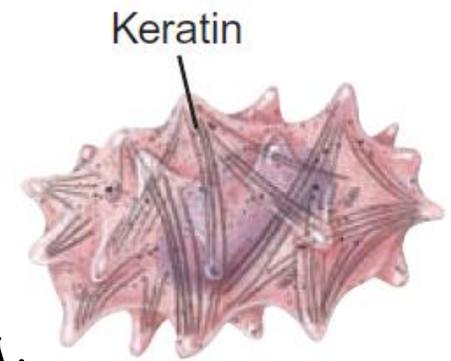
# The Epidermis

→ Skin

- The epidermis is composed of stratified squamous keratinized epithelium.
- It contains four major types of cells:
  - Keratinocytes
  - melanocytes
  - langerhans
  - mekel



1) Keratinocytes (90% of the cells) they form the layers of the epidermis and produce keratin which is a tough fibrous protein that provides protection.



2) Melanocytes: which produce the pigment melanin that protects from damage by ultraviolet radiation.

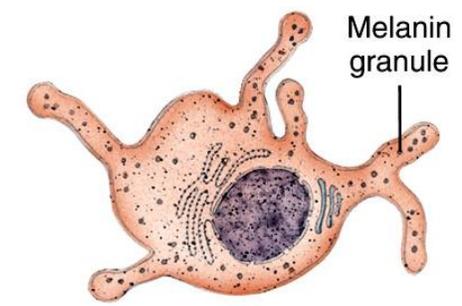


Fig.2: The epidermis and its cells.

16. Which cell type produces a pigment that affords the skin some protection against ultraviolet radiation?

A. keratinocytes

B. melanocytes

C. dendrocytes

D. merkel cells

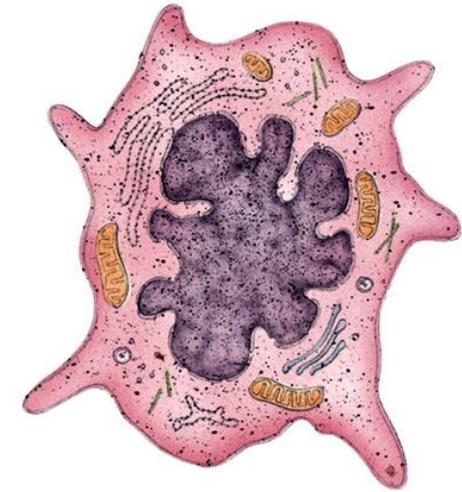
Answer is B:

52. What is the most common protein in the epidermis?

- A. elastin
- B. keratin
- C. melanin
- D. cholesterol

Answer is B: Most epidermal cells are keratinocytes that produce the fibrous protein keratin.

3) **Langerhans cells:** involved in immune responses.



4) **Merkel cells:** which function in the sensation of touch along with the adjacent tactile discs (derived from a neuron).

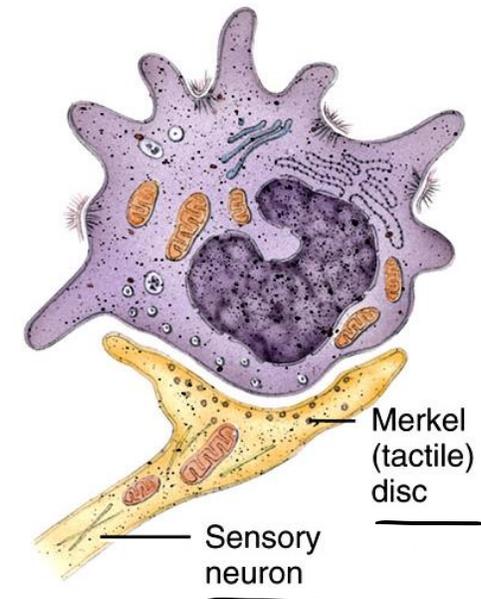


Fig.2: The epidermis and its cells (continued).

12. Choose the incorrect statement below.

A. Keratinocytes produce keratin

B. Merkel cells are associated with a sensory nerve ending.

C. Melanocytes produce melanin

D. All of the above is correct

Answer is D:

# Layers of the Epidermis

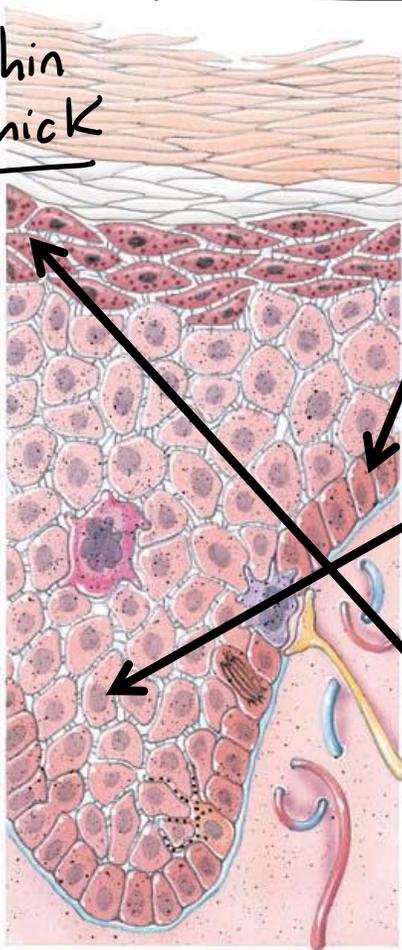
- stratum basale
- stratum spinosum
- stratum granulosum
- stratum lucidum
- stratum corneum

- The epidermis is formed of four layers (thin skin) or five layers (thick skin).

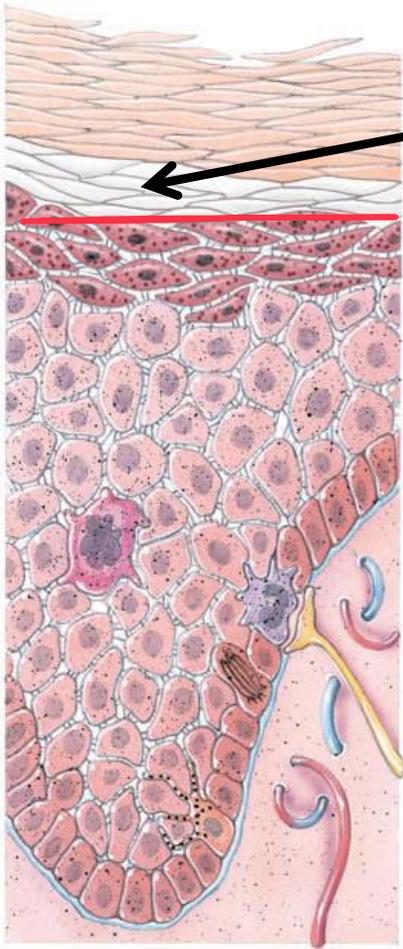
طبقات

merkel cells + cell bodies from melanocytes

4 thin  
5 thick



- 1) Stratum basale (deepest layer), where continuous cell division occurs to produce all the other layers.
- 2) Stratum spinosum, 8-10 layers of keratinocytes.
- 3) Stratum granulosum, which contains granules that could be keratohyalin or lamellar granules.

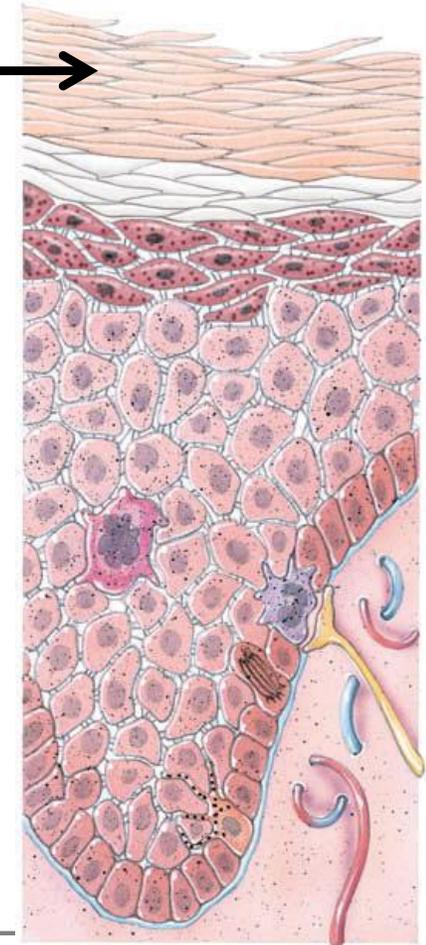


4) **Stratum lucidum** is present only in **thick skin** (the skin of the fingertips, palms, and soles).

باطن

stratum lucidum  
الوحيدة من جود  
thin

5) **Stratum corneum (The Keratin layer)**: composed of many sublayers of flat, dead keratinocytes called **corneocytes** or **squames**. These are nothing more than cell membranes filled with keratin. They are continuously shed and are replaced by cells from deeper strata.



طبقات

17. Which layer of the integument is the most superficial layer?

A. the hypodermis

B. stratum ~~granulosum~~ *basale*

C. stratum corneum

D. reticular dermal layer

Answer is C: Stratum corneum is the outermost dead layer of the epidermis.

60. One of the following statements about the stratum corneum is correct. Which one?

- A. cells in this layer undergo cell division to replace the skin.
- B. it consists of dead cells.
- C. it contains collagen, elastin and reticular fibres.
- D. the layer has sensory receptors known as Merkel discs.

Answer is B:

## Notes about the layers:

- Merkel cells and the cell bodies of melanocytes are found within the stratum basale. The branches of melanocytes extend between adjacent keratinocytes to provide them with melanin pigment.

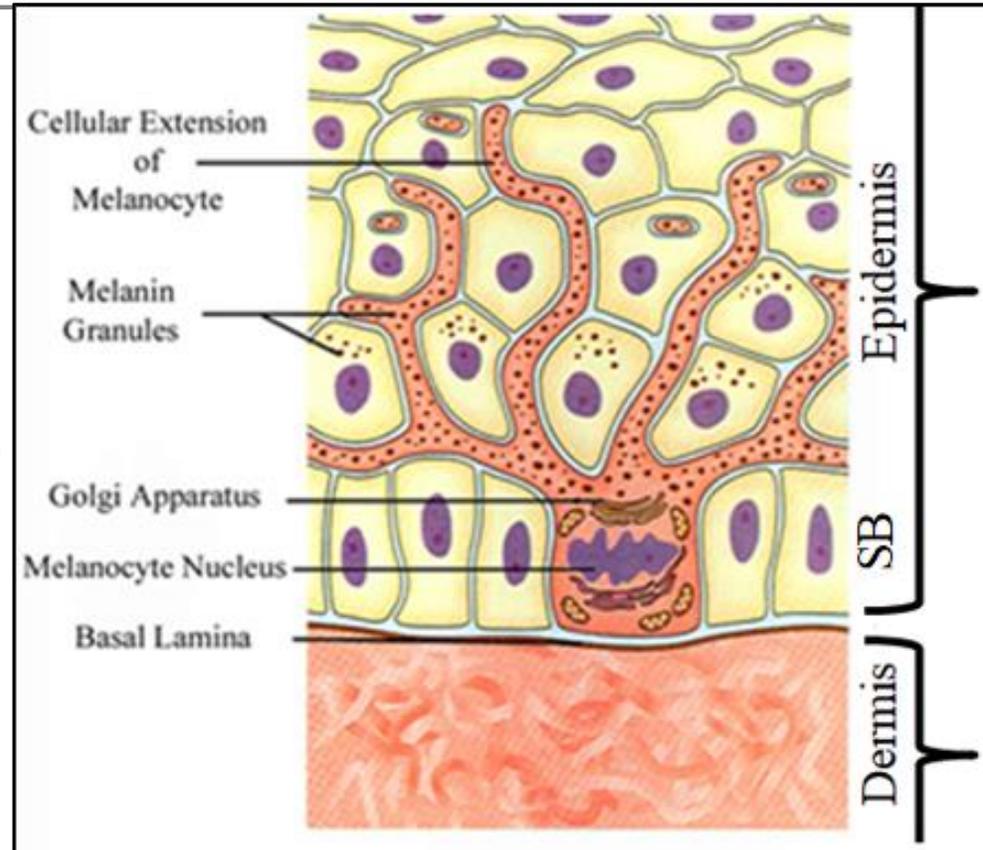


Fig.3: Position of melanocytes.

- The lamellar granules of the stratum granulosum bind with the cell membrane and release a lipid-rich secretion that fills spaces between cells to prevent water loss.
- Keratin in the cells bind to desmosomes to help in the adhesion of the cells to each other.

# The Dermis

- The dermis is a layer of connective tissue that provides structural and nutritional support for the epidermis.
  1. outer papillary region.
  2. inner reticular region.
- Formed of two regions:
  1. Outer papillary region consists of loose (areolar) connective tissue containing:
    - Dermal papillae – tissue of the dermis that projects between the epidermal ridges (which are epidermal tissue passing down into the dermis). This increases the area of contact between the epidermis and dermis.
    - Capillary loops.
    - Corpuscles of touch and free nerve endings.

شعيرات

Capillary loops.

جسيمات

Fig.4: Papillary region of the dermis.

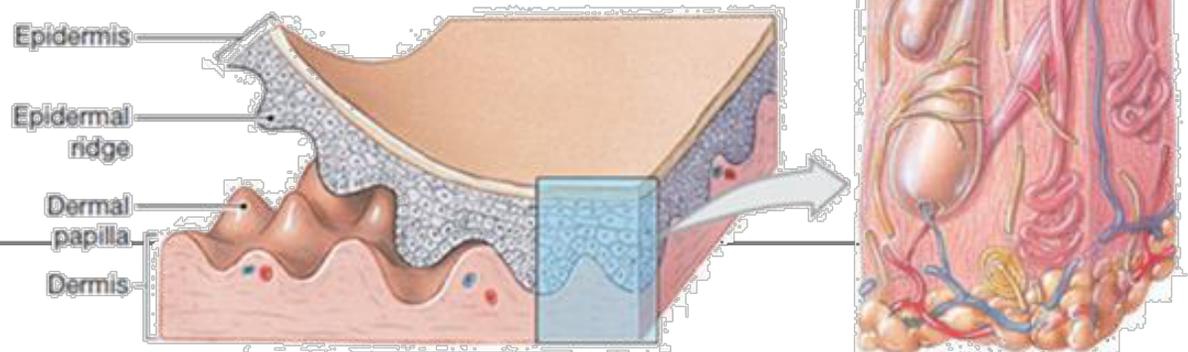




Fig.5: Fingerprint.

- The overlap between the dermis and the epidermis is reflected on the surface of the skin by a pattern of elevations and depressions that forms the fingerprints (and footprints). Their function is to increase firmness of grip by increasing friction.

الاحتراس

ثبات

2. The deeper **reticular region** consists of dense collagenous irregular connective tissue containing:

dermis of skin →

متم  
رکزوا

- Adipose cells
- Hair follicles بصيلات
- Nerves
- Sebaceous (oil) glands, and sweat glands

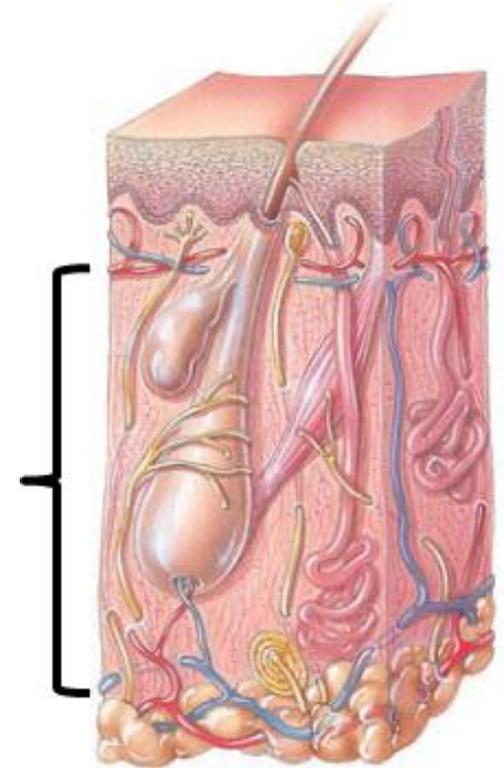


Fig.6: Reticular region of the dermis.

Which of dermis layers has dens collagenous regular connective tissue

➡ none of the above

لانو ال reticular region بتتكون من

irregular

34. Which of the following lists layers of the integument in the order from most superficial first, to deep?

A. epidermis, hypodermis, dermis

B. epidermis, papillary dermal layer, reticular dermal layer.

C. dermis, stratum <sup>basale</sup>~~germinativum~~, stratum corneum

D. stratum corneum, stratum ~~germinativum~~<sub>basale</sub>, epidermis.

Answer is B: The integument consists of the epidermis and dermis. The dermis consists of the papillary dermal layer and the reticular dermal layer, which is deeper.

# The Subcutaneous Tissue

تحت الجلد

- This layer (and sometimes the dermis) contains **lamellated (pacinian) corpuscles** which detect external pressure applied to the skin. It also contains various amounts of fatty tissue.

①

②

## ■ Functions:

- Attaches the skin to the underlying tissues and organs
- Acts as an insulator
- Serves as an energy storage site
- Absorbs shocks (as in palms and soles)

عازل

بواطن



Fig.7: Subcutaneous tissue.

# Accessory Structures of the Skin

## Hair (Pili)

- Hair is composed of columns of keratinized cells bonded together by extracellular proteins. It's present throughout the body, except in certain areas like the palms and soles.
- **Functions of hair:**
  - Protection (Hair on head protects scalp, eyelashes and eyebrows protect eye).
  - Reduction of heat loss.
  - Sensation of light touch.

# Parts of the hair

- **The shaft**: the superficial part of the hair that extends beyond the surface of the skin.
- **The Root**: the deeper part of the hair that reaches down into the dermis. It's surrounded by the hair follicle which is a downward extension of the epidermis.
- The shaft and root of the hair are formed of 3 concentric layers:
  - 1) **The medulla**: The innermost layer  
الداخلية
  - 2) **The cortex**: The middle layer  
متحدة المركز
  - 3) **The cuticle**: The outermost layer. Formed of highly keratinized dead cells arranged like shingles on house roofs.  
بشرة

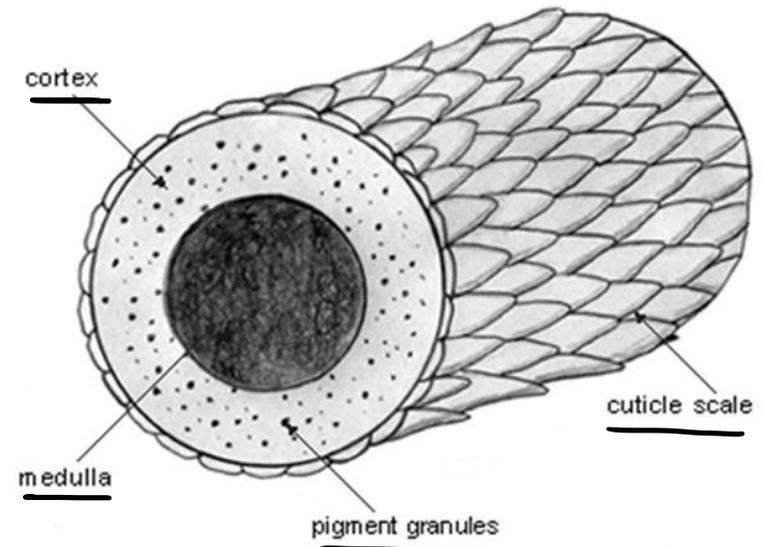
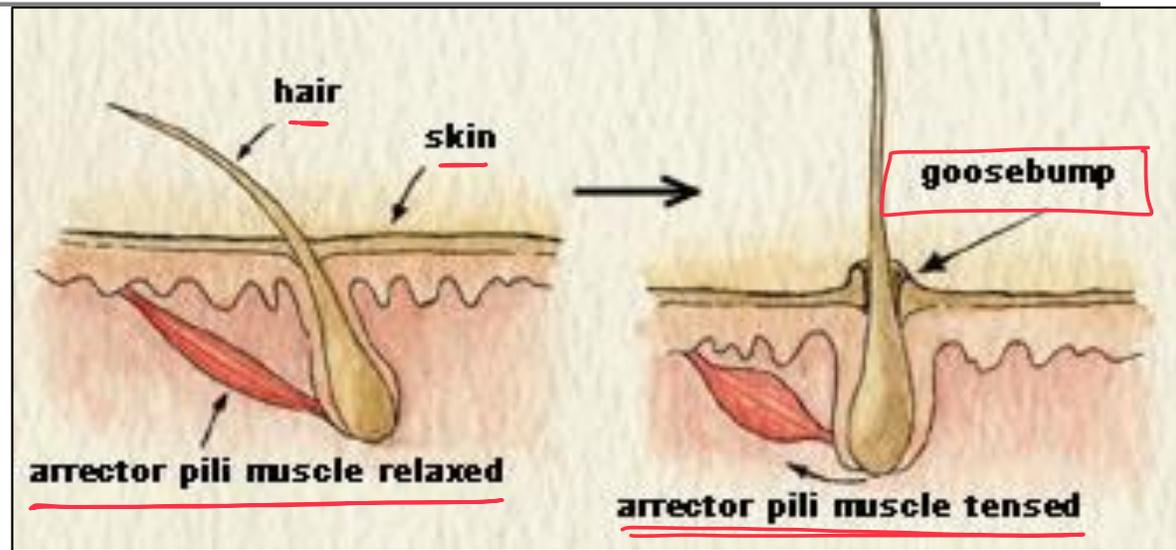


Fig.8: Layers of hair.

Fig.11: Action of the arrector pili muscle.



- The arrector pili muscle is a bundle of smooth muscle cells that extends from the superficial part of the dermis to the dermal sheath of the hair follicle. Under stressful conditions, the muscle contracts pulling the hair making the shaft perpendicular to the surface and bulging the skin around the hair producing 'goosebumps'.

تنفخ (oil)

عسودي

- The sebaceous gland is located in the angle between the arrector pili muscle and the hair. It opens into the hair follicle. The secretion of this gland (sebum) prevents dehydration and inhibits growth of certain bacteria.

Function:

# Sweat Glands (accessory structures)

Feature	Eccrine	Apocrine
Location	All over the body, specially palms and soles	Axilla, groin, and bearded facial regions of adult males
Shape	Coiled	Coiled
Secretion	Watery	More viscous (bacteria acts on this secretion to produce body odor) (sweat)
Method of secretion	Merocrine	Merocrine
Opens	On the surface of the skin	Mostly into the hair follicle
Control	Nervous	Hormonal
Onset of action	From birth	At puberty
Functions	Helps cool the body. Elimination of waste products	Stimulated during emotional stress

اسم الغدة

لا تصني  
method of secretion

الجلد

فخذ

الحيات

ملعقونات

لزج

بلوغ

32. Another name for oil glands in the skin is:

A. sebaceous glands

B. eccrine glands

C. merocrine glands

D. apocrine glands

Answer is A: The other three choices are all sweat glands.

25. One of the following is **NOT** a type of sweat gland. Which one?

- A. eccrine gland
- B. merocrine gland
- C. endocrine gland
- D. apocrine gland

Answer is C: Endocrine is a general term for glands that produce hormones. Merocrine is another name for eccrine.

29. Which layer of the skin is the most superficial?

A. epidermis

B. dermis

C. papillary dermal layer

D. stratum ~~germinativum~~ *basale*

*basale* Answer is A: Epidermis refers to the outermost layer of the skin. While stratum ~~germinativum~~ is part of the epidermis, it is the deepest part.

من خصائص ال eccrine ؟

1-opens into the hair follicle

2-control (hormonal)

3-onset of action at puberty

4-method of secretion (merocrine)

5- none of the above

الجواب رقم 4