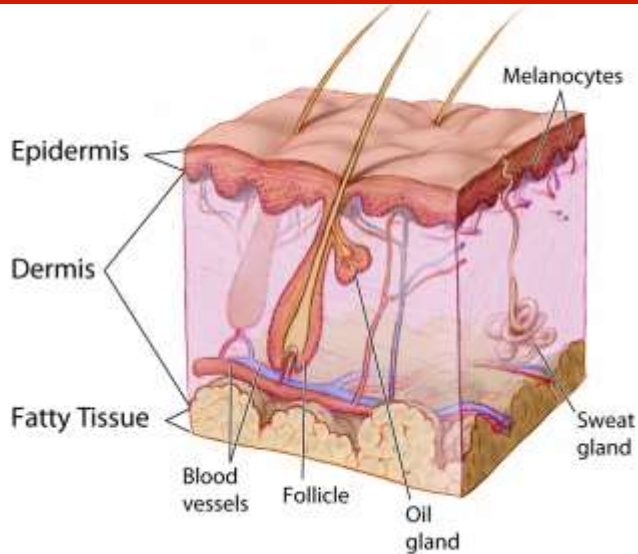


432 Teams

Dermatology



Structure and Function of the Skin

Color Code: Original, *Team's note*, *Important*, *Doctor's note*, Not important, **Old teamwork**



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Objectives

- **To be familiar with the different structures of the skin.**
- **To have basic knowledge of anatomy and function of the skin.**
- **To be familiar with different tools to investigate skin disorders.**
- **The relation between anatomy and diseases.**
- **To have a general idea about different therapeutic options used in dermatology practice.**

Lecture outline

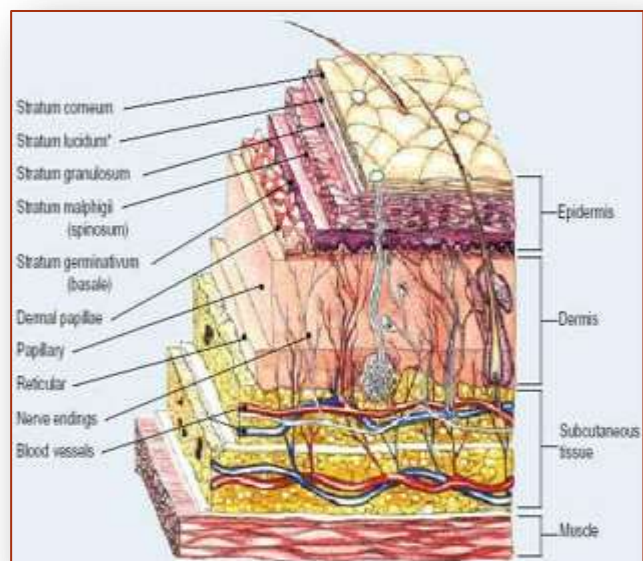
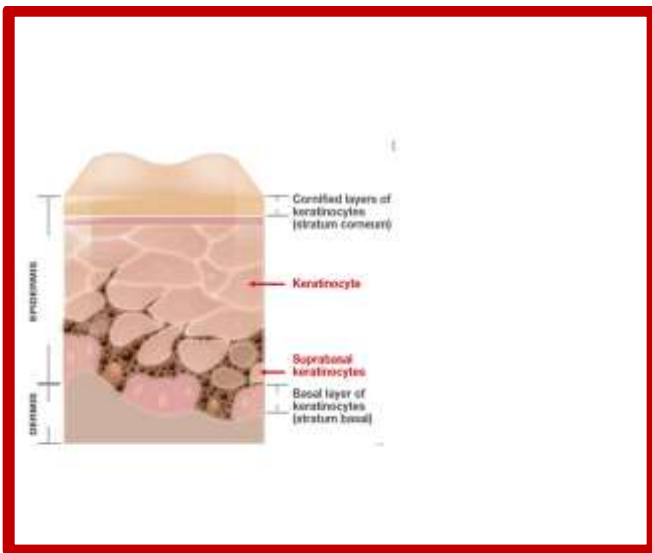
- Function , Structure of the skin.
 - Approach to dermatology patient.
 - Descriptive terms and morphology of skin lesions.
 - Reaction patterns.
 - Topical therapy and others.
-

Introduction to Dermatology

- The skin is a complex, dynamic organ.
- It is the largest organ of the body and weighs about 15% of the body
- It consists of many cell types called **Keratinocytes** (building block)
- Specialized structures like the Basement Membrane.
- It serves multiple functions that are crucial to health and survival.

-It is divided into epidermis (ectoderm), dermis (mesoderm), subcutaneous fat and skin appendages (ectoderm and mesoderm).

-Dermal-Epidermal junction is called basement membrane, the weakest part in the skin and the usual site of blisters.



Video: <https://www.youtube.com/watch?v=z5VnOS9Ke3g>

FUNCTION:

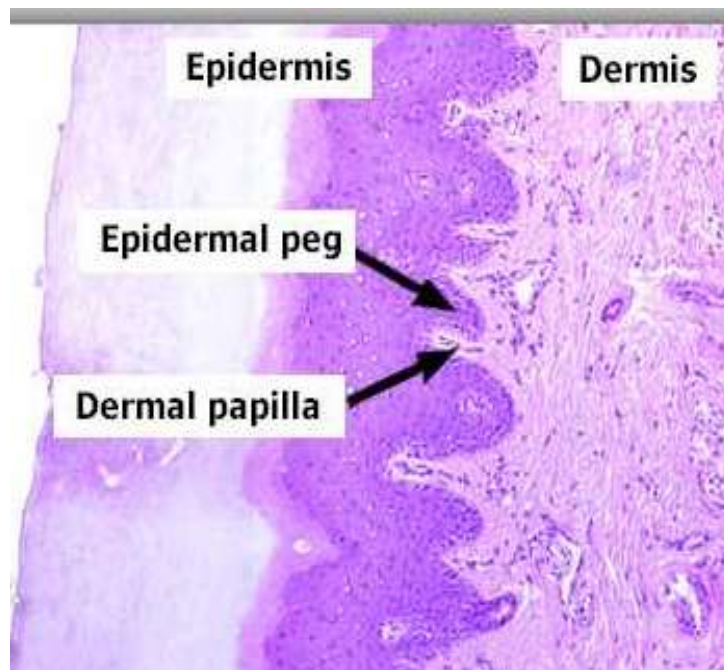
- Barrier to harmful exogenous substance & pathogens
- Prevents loss of water & proteins
- Sensory organ protects against physical injury
- Regulates body temperature
- Important component of immune system
- Vit .D production by absorbing UVB
- Has psychological and cosmetic importance such as hair, nails
- There is a condition called skin failure this can cause heart failure and death

Skin Structure:

The skin consists of:

- 1-Epidermis 4 layers
- 2-Basement membrane between epidermis and dermis (thin 4 layers)
- 3-Dermis 2 layers
- 4-Subcutaneous tissue
- 5-Skin appendages

The epidermal peg is important to increase the surface area and anchor the dermis to the epidermis



Epidermis

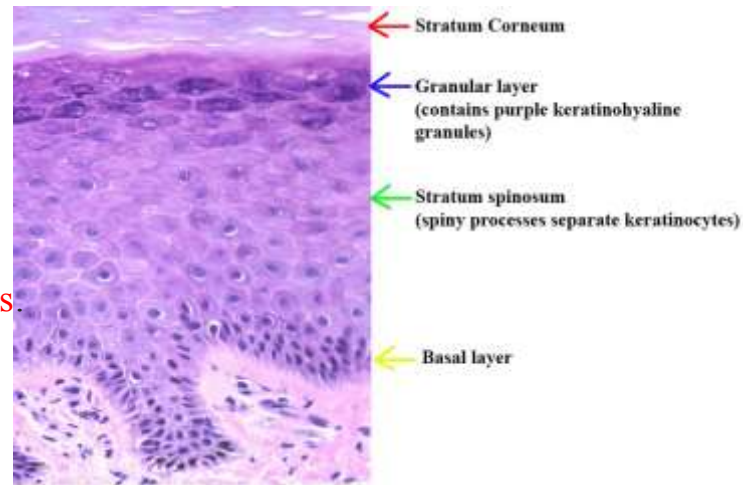
Epidermis: Consist of several zones.

1-Basal layer (stratum basale): **columnar** dividing cells.

2-Spinous layer (stratum spinosum): **Polyhedral(cuboidal)** cells attached by **desmosomes**.

3-Granular layer (stratum granulosum): flat cells containing **keratohyaline granules**.

4-Cornified layer (stratum corneum): dead cell with no organells

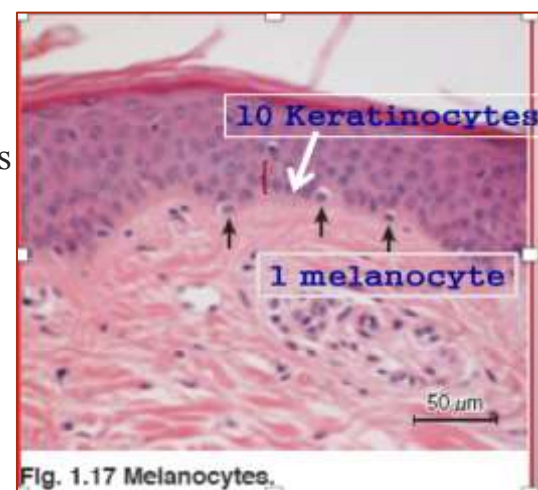


- The epidermis consists of many cells 95% are Keratinocytes, and other prominent cells are melanocytes, Langerhans cells, and merkel's cells.
- The epidermis doesn't have blood vessels it obtains its nutrients from the blood vessel of dermis diffusing through the dermoepidermal junction (papillary layer of dermis).
- Very important layer for the protection of the skin against chemical agents and pathogens

1-Basal cell layer: (Stratum basale)

It is a **single layer**. Rest on the basement membrane; divides continuously and move upwards. Melanocytes are dendritic cells lying between basal cells in a **ratio of 1:10**.

They synthesize melanin **stored in melanosomes**.



Melanosomes are transferred to adjacent cells by means of Dendrites thus forming the **epidermal melanin Unit** (each melanocyte will give 36 keratinocytes and the presences if the equeal distribution contributes to the homogeneity of the skin)

The size of Melaosomes and Packaging differentiate white from dark skin.

The **number of melanocytes are equal in white and dark skin**

Melanocytes are also found in :

- the iris
- inner
- ear meninges
- mucus membranes
- hair , and nail

2-Spinous cell layer:

Adhere to each other by **Desmosomes** (complex Modification of the cell membrane).

Desmosomes appear like spines hence the designation Stratum Spinosum.

Langerhan cells are antigen presenting present in Abundance.

(they are found in all skin layers unlike the melanocytes which is only confined to the basal epidermal layer)

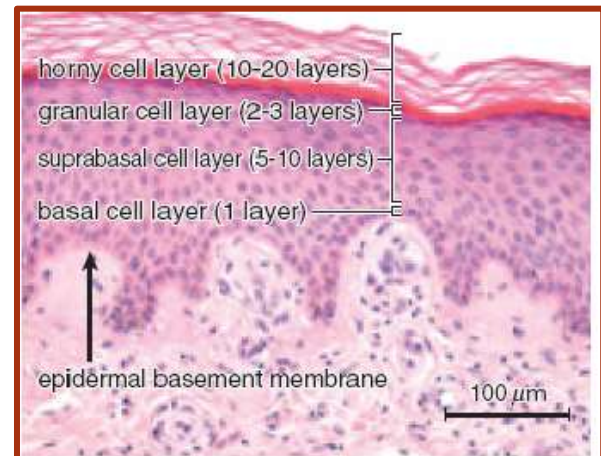
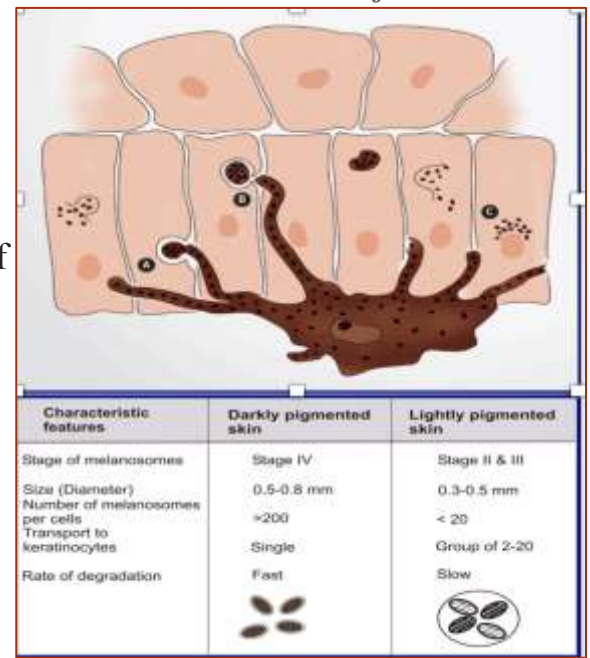


Fig. 1.4 The four layers of the epidermis

3-Granular cell layer (stratum granulosum)

- Diamond shaped flat cells.
- Cytoplasm is filled with **Keratohyaline granules**.
- Thickness of this layer is proportional to the thickness of the stratum corneum layer.
- In the thin skin it is 1-3 cell layers and in the thick skin like palms and soles its 10 layers .

-This is helpful to know where the biopsy was taken from remember the thinnest skin layer is the lid and the thickest is that of the palms and soles

4-Cornified layer (Stratum corneum) :

- The cells in this layer have no nucleus.
- It is 25 cell layers.
- Cell have thick envelope that resist chemicals.
- Provides protection against chemical and pathogens.
- It has a basket weave pattern

5-Stratum lucidum: lucidum means clear, empty

- Is found in thick skin below Stratum Corneum.
- Between the granular layer and stratum corneum
- It is a lucid zone (an empty zone , when you process a sample of skin with formalin this layer dissolves).
- When the skin is thick the pattern becomes compressed instead of basket weave and you will also see the stratum lucidum feature



Fig. 2.2-1 Normal skin (hematoxylin and eosin staining).

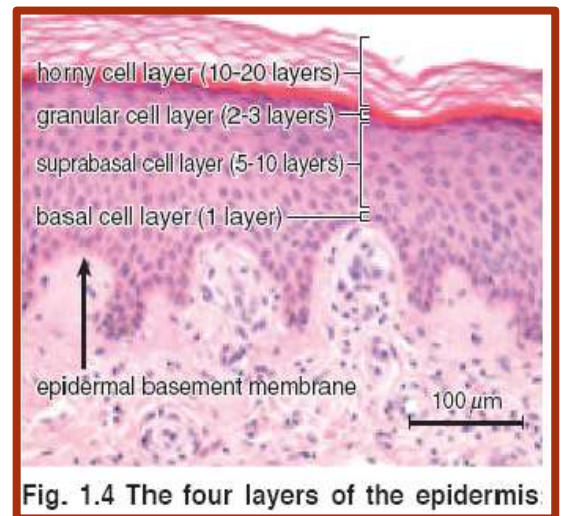
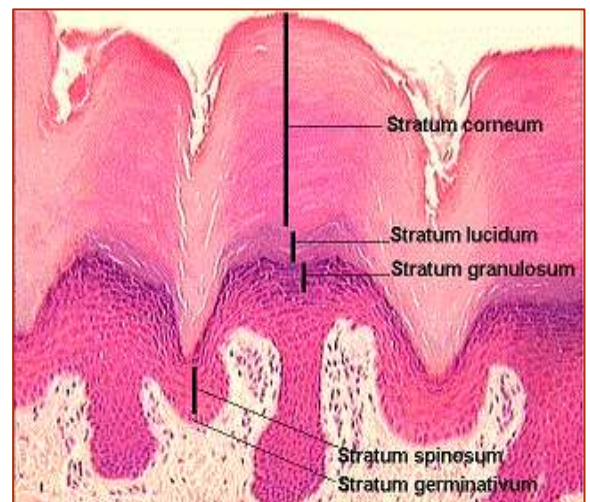


Fig. 1.4 The four layers of the epidermis



Basement membrane

-It is a pink undulated homogenous area Between the epidermis and dermis.

-It consist of number of proteins (such as Luminin, which is attacked is some bullos disease)

-It is the site of attack injury in blistering Diseases.

When blisters get traumatized they will erode or ulcerate

-Has 2 layers, lamina lucida and lamina densa.

-Keratinocytes attach to basement membrane via hemidesmosomes



Basement Membrane formed by:

-Plasma membrane of basal cells and hemidesmosomes.

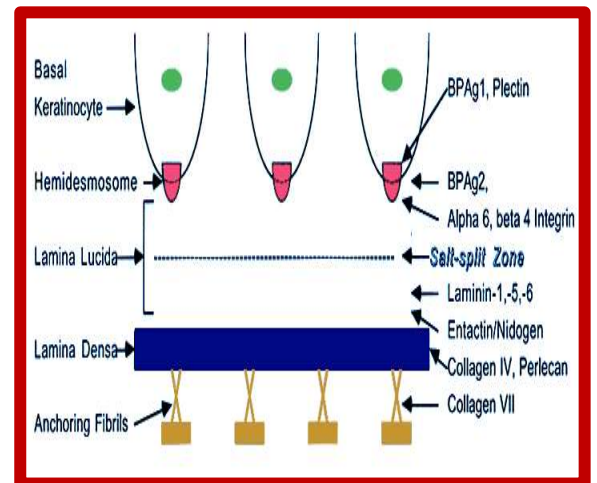
-Thin clear amorphous space (Lamina Lucida).

Its rich in proteins and antigens

-An electron dense area (Lamina densa).

-Anchoring fibrils that anchors the epidermis to dermis.

- If any of the layers in the basement membrane loses its integrity , blisters will develop



Dermis

Dermis is divided into:

- 1- Papillary dermis
- 2- Reticular dermis

Consists of:

1-Collagen fibers:

Provide strength Thin fibers in papillary dermis but thick and coarse in the Reticular dermis.

2- Elastic Fibers:

Provides elasticity protection against shearing forces.

3- Ground substance:

- Binds water and maintains the skin turgor.
- Makes the skin soft and smooth .

In other words it's the Glycosaminoglycans

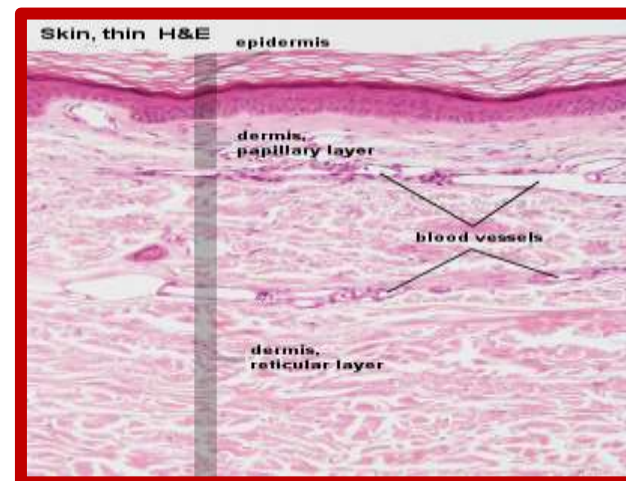
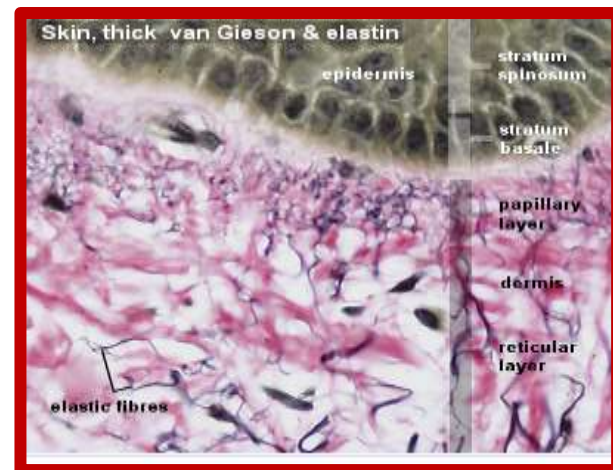
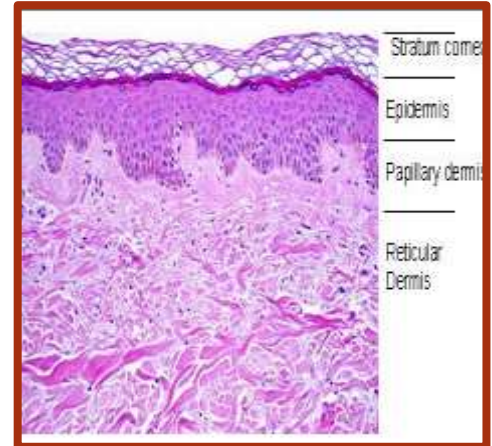
4- Blood vessels

To nourish the overlying epidermis also.

Remember the epidermis is avascular

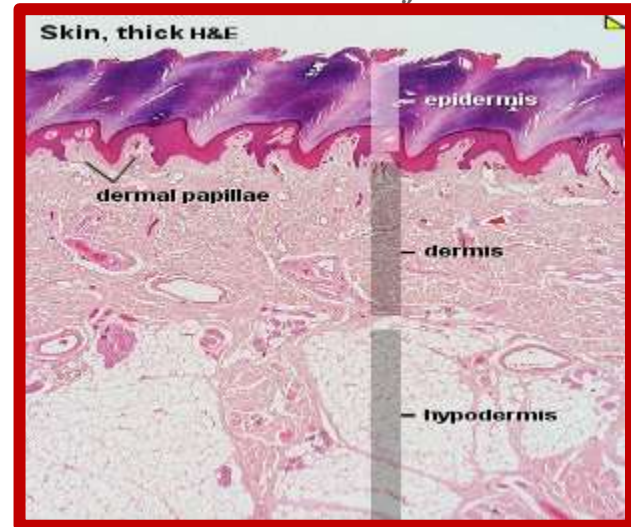
5- Fibroblasts

To produce the above elements..



Function of dermis:

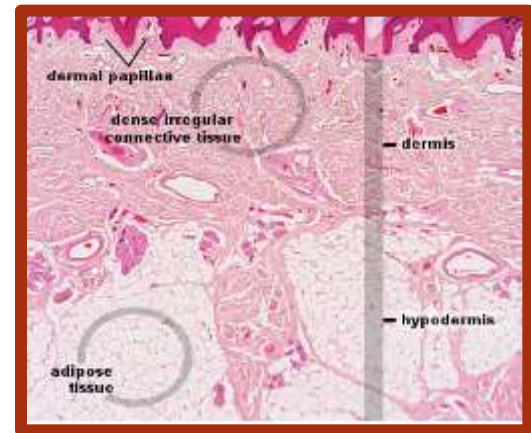
- It provides nourishment to the epidermis and interact With it during wound repair.
- It gives the skin its strength, elasticity, and softness



Subcutaneous Fat

Subcutaneous Fat:

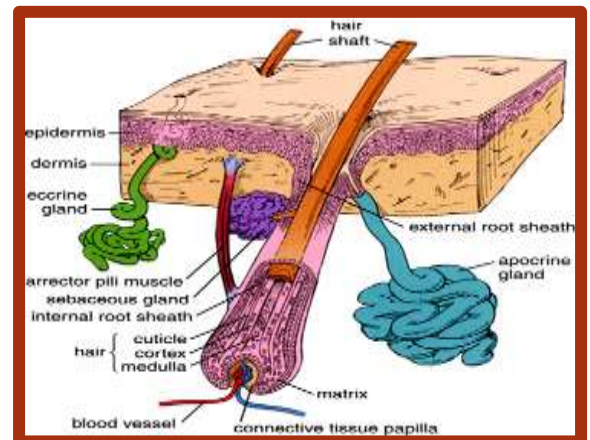
- Composed of lipocytes.
- Lipocytes are either lobular (which contains the fat cell) or septal (which carries the vessels and nerves)
- Subcutaneous fat helps in protection , insulation and acts as a cushion
- In some disease where subcutaneous fat is lost, we feel the skin is hard.



Skin Appendages

Skin Appendages include:

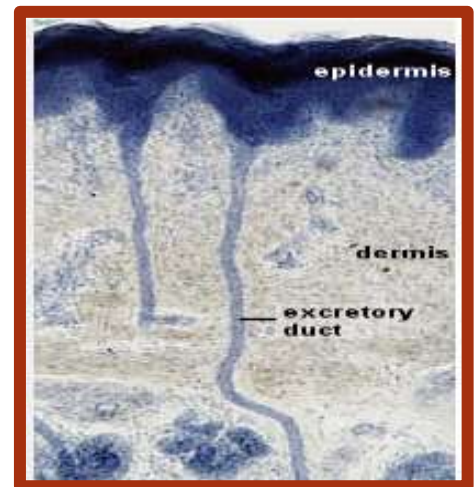
- Eccrine / Apocrine sweat glands.
- Sebaceous glands.
- Hair Follicles.
- Nails.



Eccrine sweat glands:

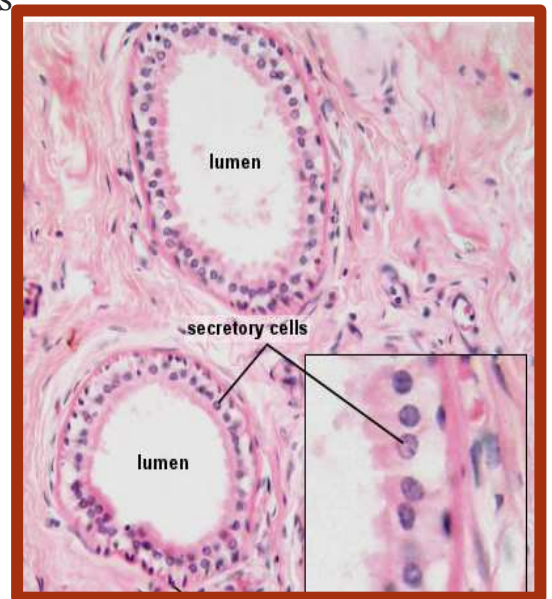
- Tubular structures **open freely on the skin;** not attached to hair follicles.
- Under the influence of **cholinergic stimuli.**

Eccrine sweat glands, present everywhere **except** the vermillion border, nail beds, labia minora, glans penis
Abundant in palms and soles



Apocrine sweat glands:

- Secrete viscous material that give musky odor When acted upon by bacteria .
such as in hidradenitis suppurativa
- Present in the axillae, anogenital area, modified glands in the external ear canal, the eye lids (**moll's glands these in association with the meibomian glands are important to prevent the tear from evaporating**), and areolae.
- Under **adrenergic stimuli.**



Sebaceous glands:

- Attached to hair follicles (**when the canal opening clogs you develop acne**) or open freely.
- Present in the scalp, forehead, face, upper chest **except** palms and soles.
- In the areola as Montgomery tubercles.
- In the eye lids as meibomian glands.
- Ectopic glands (**in places where there is no hair**) in the mucous membran are **called Fordyce spots.**
They are symptomless and benign treatment reassure the patient
- Sebaceous glands are under the control of **androgens.**



Hair Follicles:

The hair follicles with it's attached sebaceous gland
From the **Pilosebaceous unit**.

- Hair phases :
- Anagen → active growth of hair . It lasts for 2 years but in some 6 years
- Catagen → resting non growing hair lasts for 3 weeks
- Telogen → dead hair that is bound to fall . cant stay in the head no matter what
- Hair grows at 1cm/month

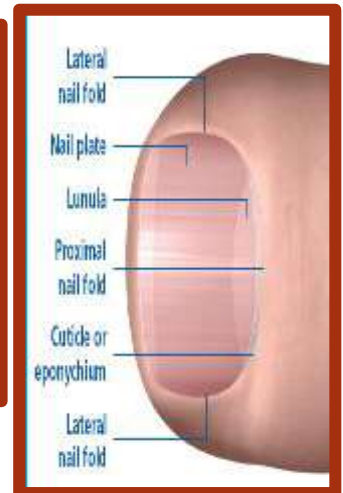


Nails:

- The nail plate is formed of hard keratin.
- Proximal nail fold morphology can be altered in Connective tissue disease.

Its important for having a healthy nail

- The Lunula is the visible part of the matrix.
- The matrix covers the midportion of the distal phalanx.
- Fingernails grow 3mm/ month.
- Toenails grow 1mm/ month. → that is why it takes a lot of time to treat fungal infection in the toes



- In people with work involving a lot of water contact their lateral nail fold will develop an infection i.e Paronychia

-Nails can be affected in systemic and skin diseases

-the doctor said it's really important to know

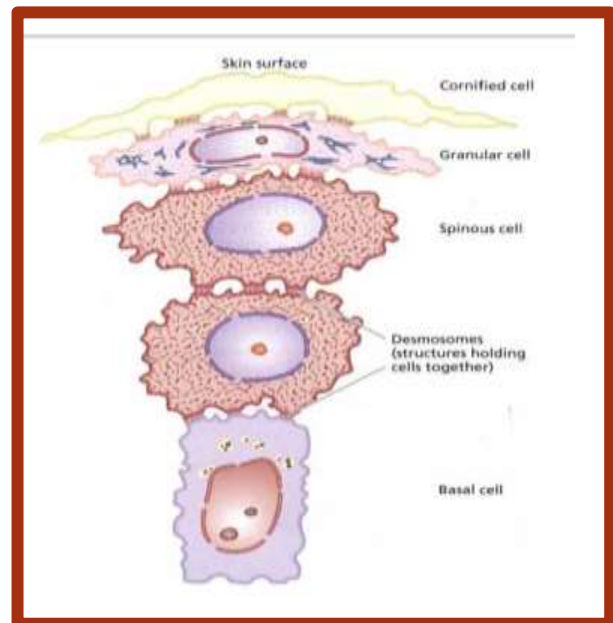
NAIL DISORDERS

- 1- ABSENT PART: Anonychia congenita
- 2- NAIL PITTING: Psoriasis
- 3- CUTICLE INVASION: Lichen planus
- 4- PIGMENTATION & RIDGING: Monilla
- 5- DISTAL ONYCHOLYSIS: Tinea
- 6- SPOON NAILS: Iron deficiency Anemia
- 7- DISCOLORED & INVERTED EDGES: Ectodermal Dysplasia
- 8- CLUBBING: Hypoxia, Malignancy or Toxins
- 9- BITTEN NAILS (SHORT): Anxiety
- 10- SPLINTER HAEMORRHAGE: Bac. Endocarditis
- 11- YELLOW: Bronchiectasis, Lymphoma & Edema
- 12- HALF & HALF: Hepatic Necrosis
- 13- RIDGING: Rheumatoid arthritis
- 14- LONGITUDNAL BROWN LINES: Addisons's, Breast cancer & Melanoma
- 15- WHITE NAILS: Anemia
- 16- RED NAILS: SLE, Polycythemia
- 17- HORIZONTAL WHITE & PINK BANDS: Nephrotic Syndrome
- 18- BRITTLE NAILS: Hypothyroidism



Cornification (Keratinization)

- The terminal differentiation of keratinocytes into dead horny cell (corneocyte)
- The total process takes approximately **2 months**.
- It involves the formation of **keratin polypeptides**.
- Abnormalities in this process secondary to abnormal immune response such as in psoriasis leads to roughness and scaling of the skin. **Instead of shedding every 2 months its every 3 days**



summary

The functions of the skin are briefly summarized in the following table.

Skin structure	Function
Keratinocytes – stratum corneum	Prevents the skin against external environment. Barrier for shearing forces acting on the skin Prevents the absorption of water from outside, and loss of water and electrolytes from the skin
Melanocytes	Protects against the damage by ultraviolet light
Langerhans cells	Acts as the first line of immunological defense for the skin
Collagen tissue	Prevents the body against mechanical forces
Elastic tissue	Provides the elastic recoil to the skin
Ground substance (glucosaminoglycans)	Remarkable capacity to absorb water, gives fullness to the skin Protects the body against compressive forces
Nerves	Provide sensations to and from the skin
Blood vessels	Nutritional and help in maintaining body temperature
Sweat glands	Helps in maintaining body temperature, in keeping the skin moist, and excretion of waste products such as urea
Sebaceous glands	Moisturizes the hair and skin, fungistatic and bacteriostatic
Apocrine glands	Responsible for body odor
Nails	Helps in fine movements such as grasping of objects
Hair	Improves body image, scalp hair protects against ultraviolet damage
Subcutaneous fat	Insulates the body from cold, reserve source of food, and cushions the body from blunt trauma

Questions

1. The number of layer in epidermis:

- A. 2.
- B. 3.
- C. 4.
- D. 6.
- E. 8.

2. Which of the epidermal cell layers provides protection against chemical and pathogens?

- A. Stratum corneum.
- B. Stratum granulosum
- C. Stratum spinosum.
- D. Stratum basale.

3. The main cell type in the epidermis is:

- A. Keratinocytes.
- B. Melanocytes.
- C. Langerhans cells.
- D. A and B

4. Thick skin differs from thin skin in:

- A. No different.
- B. Thick spinous layer.
- C. Thick basal layer.
- D. Thick stratum cornium

ANS :

1-C 2-A 3-A 4-D

GOOD LUCK