



433 Teams

DERMATOLOGY

Lecture (4)

Structure of skin

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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.

Functions of Skin:

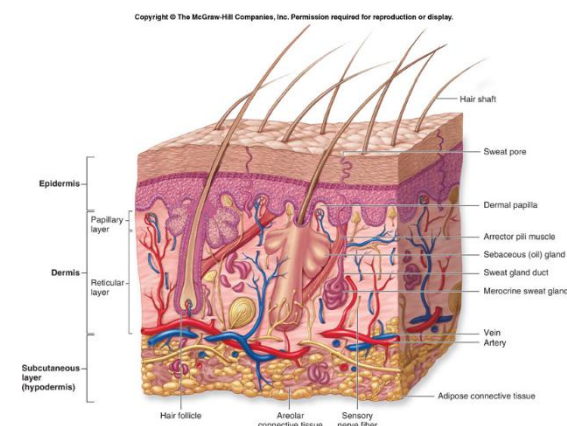
- Prevent infections via innate and adaptive immunity
- Maintain a barrier
- Repair injury
- Provide circulation
- Communicate
- Provide nutrition
- Regulate temperature
- Attract attention

Pathologies affecting functions of skin:

- Infections
- Autoimmunity
- Cancers
- Dehydration
- Eczema
- Ulcers
- Infarction
- Vasculitis
- Sensory neuropathy
- Pruritus
- Vitiligo
- Alopecia
- Hyperthermia
- Vitamin D deficiency

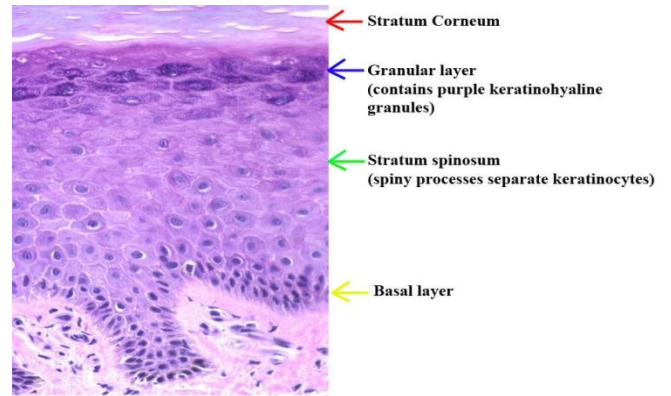
The Skin as an organ:

- General structure and embryological origins
- Epidermis (ectoderm)
- Dermal- Epidermal junction is called **basement membrane**, **Weakest part in the skin usual site of blisters**
- Dermis (mesoderm)
- Subcutaneous fat and skin appendages (ectoderm and mesoderm)
- Palms, soles, genitalia and scalp skin have slightly different structure



Epidermis:

- **Keratinocytes:** 95% of the cells in epidermis. Division of these cells only occur in the basal layer where 10% of them are stem cells.
- The normal transit time of a differentiating keratinocyte from basal layer to the outer surface of the stratum corneum is 28 days. **(in psoriasis it is much shorter)**.
- 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



Subdivided into 4 layers:

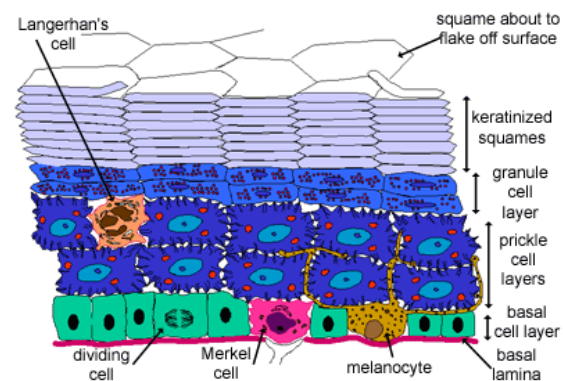
- Cornified or horny layer: the outer **non-nucleated** barrier layer.
- Granular layer.
- Spinous or prickle cell layer comprise the bulk of keratinocytes.
- Basal layer with **stem cell** dividing keratinocytes and melanocytes.

Basal Layer (Stratum basale):

- Keratinocytes express keratin 5 and 14 in this layer. Other keratinocytes express keratin 1 and 10.
- It takes 28 days to transit cells from this layer to stratum corneum.

Cornification (keratinization)

- It is the cytoplasmic events that occur in the cytoplasm of epidermal keratinocytes during their terminal differentiation into dead horny cell (corneocyte)
- The total process takes approximately **2 months**
- It involves the formation of keratin polypeptides.
- Abnormalities in this process leads to **roughness and scaling of the skin** like PSORIASIS (In psoriasis it takes 3 days which will result in a lot of scales)



Merkel cells:

- Merkel cells are found in this layer in touch sensitive areas like fingertips and lips. These cells have dense granules and contain large quantities of catecholamines. Merkel cell carcinoma is an aggressive malignant tumor.

Melanocytes:

- Melanocytes are cells responsible for skin pigment and provide protection from UV light. They are mainly seen in this layer.
- Melanocyte to keratinocyte ratio is different in different parts of the body.
- In the face: 1 to 5
- In the lower back 1 to 20
- Melanocytes can also be found in the hair bulb, eye and brain.

Spinous Cell Layer (Stratum Spinous):

- In the spinous layer they are connected to each other by **desmosomes** and gap junctions.
- Bone marrow derived Langerhans cells which are antigen presenting cells (MHC II) are found in this layer. And they can be identified through birbeck granules. Abnormal proliferation of these cells is seen in Langerhans cell histiocytosis
- Langerhans cells are also found in the epidermis (all of its layers, unlike the melanocytes which is available only in the basal layer).
-

Granular Cell Layer (Stratum granulosum):

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

Stratum lucidum:

- This layer dissolved with formalin processing

Cornified layer (Stratum corneum):

- 25 cell layer.
- Cells have no nucleus.
- This part of skin is exfoliated
- Provide protection against chemicals and pathogens

Basement Membrane :

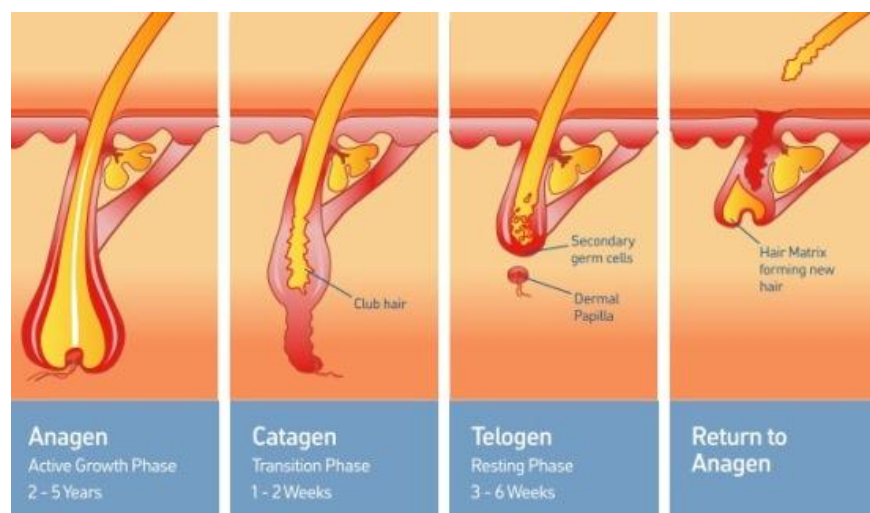
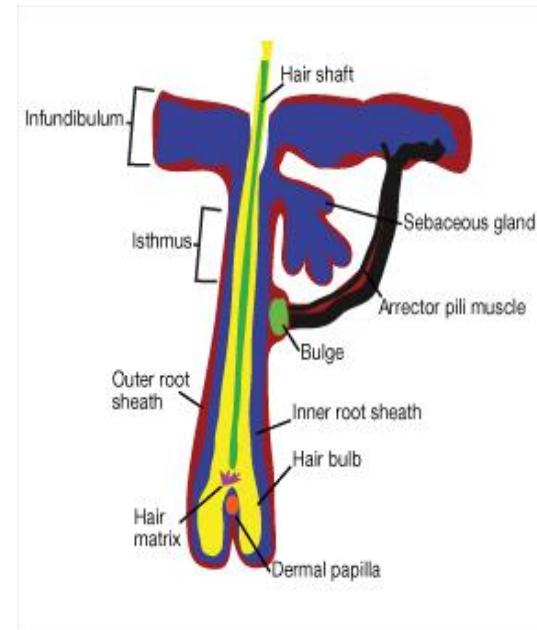
- Between epidermis and dermis
- Consists of two layers
 - Lamina Lucida
 - Lamia dense
- Contains important proteins and proteinous structures which are important in **bullous** and **autoimmune** diseases
 - Laminin
 - Desmosomes: adheres keratinocytes to basement membrane
 - Anchoring filaments: connects lamina lucida to lamina densa
 - Anchoring fibrils: connects lamina densa to papillary dermis

Dermis:

- Upper layer is called papillary dermis, the lower part is called reticular dermis.
- Mucopolysacchride gel held together by collagen and elastin fibrous matrix.
- The cells in the dermis include: fibroblasts (produce collagen), macrophages, dermal dendritic cells and mast cells (immune functions).
- Also has blood vessels, nerves, lymphatics and muscles
- It provides nourishment to the epidermis and interact with it during wound repair , gives the skin strength (Collagen fibers), elasticity(Elastic fibers), and softness(Ground substance)

The Skin Appendages:

- Pilosebaceous unit
 - Hair follicle(hair shaft, hair bulb and bulge) + sebaceous gland + arrector pili muscle
 - Phases of the hair follicle:
 - Phase where the hair is dividing and elegendating -> Anagen (growth phase 1cm/month, lasts for 2 years but in Indians it lasts for 6 years)
 - Middle phase Catagen (lasts for 3 weeks)
 - When the hair falls (dead hair follicle) -> Telogen (3 Months)
 - Some people have something called Telogen effluvium where the period of Talogen exceeds 3 months
 - 3 types of hair: terminal coarse hair, vellus hair, and androgen dependent hair on beard, axilla and groin areas.

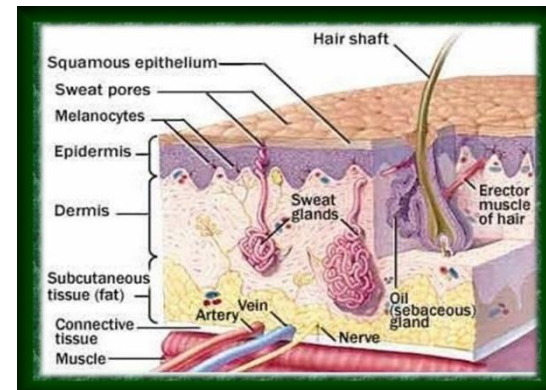


Eccrine sweat glands

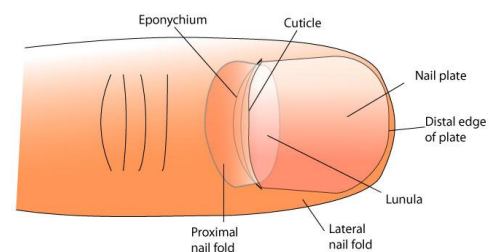
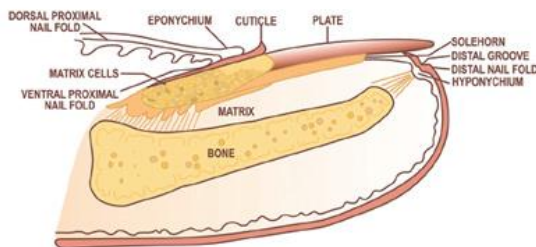
- Opens freely on the skin
- **CHOLINERGIC**
- Found everywhere, except
 - Vermilion border
 - Nail beds
 - Labia minora
 - Glans penis
- Most numerous on the sole of the foot and least abundant on the back.

Apocrine sweat glands

- **ADRENERGIC**
- Present only in
 - Axillae
 - Anogenital area
 - Modified glands in the external ear canal
 - The eye lids and areolae
- **Periglandular acetylcholine is the major stimulant of sweat secretion.**



Nails:



Top view of the nail unit

- Highly modified skin appendage.
- Grows out of nail matrix.
- The lunula is the visible part of the matrix.
- Protected by the cuticle.
- The nail plate is formed of hard keratin.
- Consists of nail plate, proximal nail fold, nail matrix, nail bed, and hyponychium.
- **Fingernails grow at 3 mm** per month and need 6 months to be replaced after avulsion.
- **Toenails grow at 1 mm** per month and need 12-18 months to be replaced.

Skin type

TYPE I:	Pale white skin, blond/red hair	Always burns, does not tan
TYPE II	fair skin	burns easily
TYPE III	dark white skin	burns, then tans
TYPE IV	light brown skin	tans easily with minimum burns
TYPE V	medium brown skin	tans darkly with rarely burns
TYPE VI	dark brown skin	tans darkly, never burns

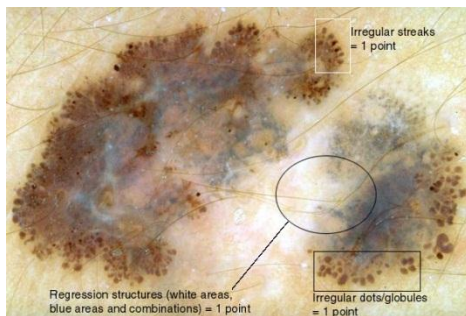
Investigations:



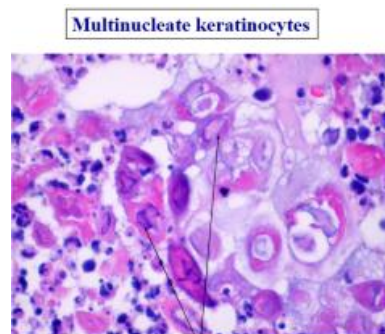
Wood's lamp



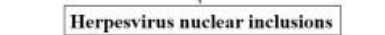
Dermoscopy



KOH

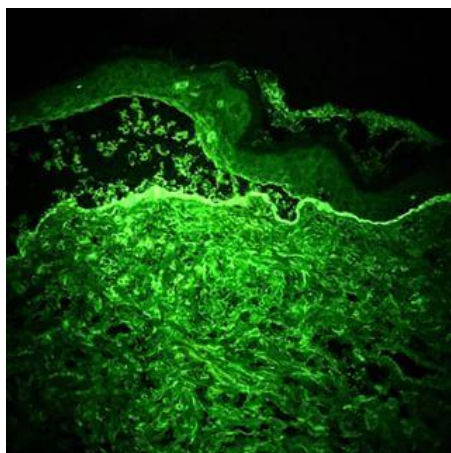


Multinucleate keratinocytes

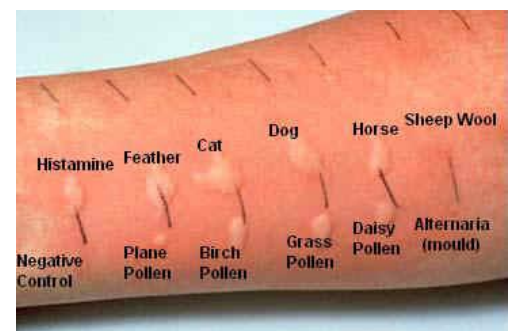


Herpesvirus nuclear inclusions

Tzanck smear (herpes)



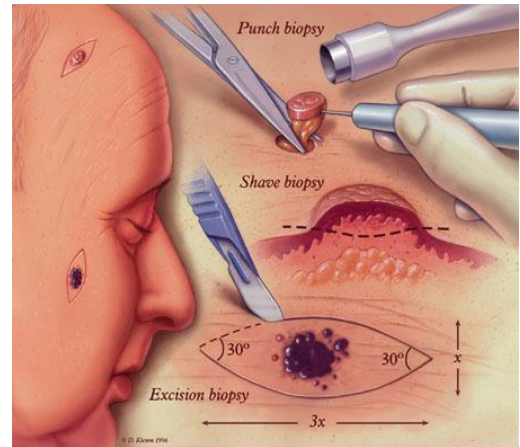
Direct Immunofluorescence



Prick test



Patch testing (type 4 hypersensitivity)



Skin Biopsy



Skin biopsy (curettage)

Done By:

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