433 Teams

DERMATOLOGY

Lecture (1)

Structures and functions of the skin.

(basic anatomy and physiology)

derm433team@gmail.com

جامعة الملك سعود
King Saud University

Objectives

- To know the normal skin structure.
- To be able to take proper history.
- To be able to describe lesions by using proper dermatological terminology.
- To be able to formulate a differential diagnosis.
- To be able to diagnose and treat common skin disorders.
- To be familiar with dermatologic emergencies

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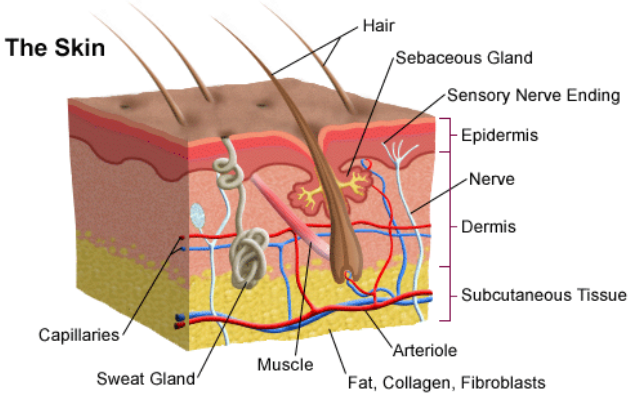
Introduction

- The skin is a complex, dynamic organ.
- The skin is the largest organ of the human body (1.75 m2), and the weight about 15% of the body
- It consists of many cell types called Keratinocytes and Specialized structures like "the Basement Membrane"
- Dermal- Epidermal junction is called basement membrane, the weakest part in the skin and the usual site of blisters.
- It serves multiple functions that are crucial to health and survival.
- It is divided into epidermis (ectoderm), basement membrane, dermis (mesoderm), subcutaneous fat and skin appendages (ectoderm and mesoderm).



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
- Vitamin D production by absorbing UVB
- Has psychological and cosmetic importance such as hair, nails

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Epidermis

Epidermal peg (وتد) → Anchors it to the dermis

- The epidermis consists of several layers and many cells 95% are Keratinocytes, and other prominent cells are melanocytes, Langerhans cells, and markels cells.
- The epidermis doesn't have blood vessels it obtains its nutrients from the blood vessel of dermis.

1- Basal Cell Layer: (it's a one single cell layer)

- Rest on the basement membrane; divides continuously and move upwards.

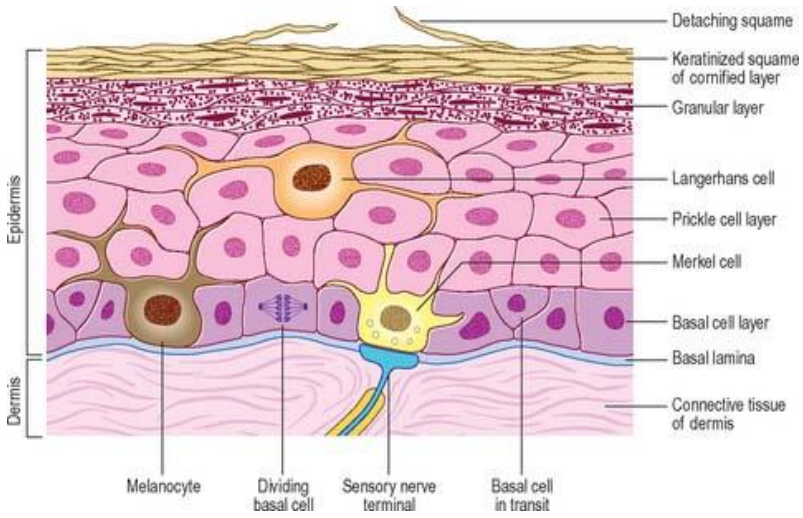
❖ Melanocytes:

- Melanocytes are dendritic cells lying between basal cells in a ratio of 1:10 and in sun over exposed skin areas (e.g. Face) the ratio increases up to 1:5
- They synthesize melanin stored in melanosomes.
- Melanosomes are distributed to the adjacent keratinocyte evenly, each one gets 36 melanosomes (1:36) thus forming the **Epidermal Melanin Unit**
- The number of melanocytes are equal in white and dark skin. They differ in: **1-** Melanosomes melanin content, the less the lighter. **2-** Dispersed melanosomes give darker color, while tiny clumped cells give lighter color.
- There are 2 types of melanin: 1- Eumelanin gives black or blond hair color. 2- Pheomelanin gives red hair color.
- Skin color depends on melanin and other pigments like carotene and hemoglobin and it is photoabsorbant.

2- Spinous Cell Layer:

- polyhedral cells attached by desmosomes, Desmosomes appear like spines hence the designation Stratum Spinosum.

- Langerhans cells are antigen presenting present in abundance, its function is to defend your body and it moves in a vertical movement.
- Markel Cells → sensory cells



3- Granular Cell Layer:

- Diamond shaped cells, filled with Keratohyaline granules.
- Thickness of this layer is proportional to the thickness of the stratum cornium layer. In thin skin (e.g. around the eye) 1-3layers and 10 layers in thick skin like palms and soles.

4- Stratum corneum (cornified) layer: (Resistant layer)

- It is acellular 25 layers, thick & compact → Thick skin, basket weave → Thin skin.
- The cells are attached to each other with lipids between them. (in younger skin we have a process called Auto-Moisturization, which means that this layer produce lipids and lubricates the skin. Unfortunately, the older we get, the more this process decreases and have drier skin)
- Resistant to chemicals, UVL …etc.

- Stratum lucidum is found in thick skin below Stratum cornium

REMEMBER! This layer is acellular, if nuclei is present it's a pathological condition called → **Parakeratosis**

Spinous layer hypertrophy (many cells) → **Acanthosis**

Hyperkeratosis → very thick stratum corneum, up to 75+ layers.

Physiological parakeratosis → in mucous membrane we don't have stratum corneum, but we have nuclei in the outermost layer aka Physiological parakeratosis.

Basement Membrane

- It is a pink undulated homogenous area between the epidermis and dermis.
- It consists of number of proteins.
- It is the site of attack injury in blistering diseases (epidermis separates from dermis → fluid accumulation → blisters\bullae)
- Formed by:
  - Plasma membrane of basal cells and hemidesmosomes
  - Thin clear amorphous space (lamina lucida) (Lucida means empty, but it's full of proteins that break down during tissue processing hence appears empty)
  - An electron dense area (lamina densa).
  - Anchoring fibrils that anchors the epidermis to dermis.

Dermis

- Upper layer is called papillary dermis, and the lower part is called reticular dermis.
- It provides nourishment to the epidermis and interact with it during wound repair.
- It gives the skin its strength, elasticity, and softness.
- Consists of:

    1- Collagen Fibers: Provides strength. Thin fibers in papillary dermis but thick and coarse in the reticular dermis.
    2- Elastic Fibers: Provides elasticity and protects against shearing forces.
    3- Ground substance→ gives the skin its young look because it absorbs a lot of water, maintains the skin turgor.

- As we get older the less substance ground, collagen fibers, and elastic fibers we have → wrinkles and dry skin.

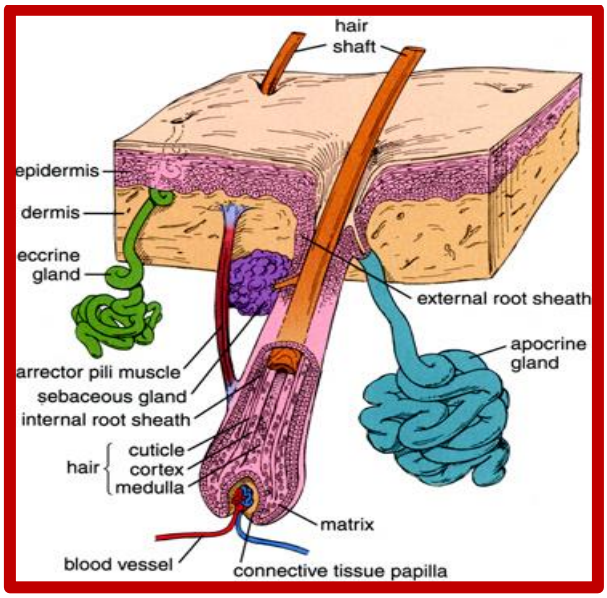
    4- Blood vessels: To nourish the overlying epidermis also.
    5- Fibroblasts: Produce the above elements.

Subcutaneous Tissue

- Composed of lipocytes. Number of cells is stable, as the body weight changes the contents of the cells change accordingly
- Inflammation of the subcutaneous fat is called panniculitis.
    - Lobular panniculitis
    - Septa panniculitis
- Septa is the cause of cellulites; it contains undrained water and lymph and gives the irregular sinus.

Skin Appendages

- Includes: Eccrine/ apocrine sweat glands, sebaceous glands, hair follicles, nails.
- Pilosebaceous unit = hair follicle + sebaceous gland.
- Acne is a disease of Pilosebaceous unit.
- Apocrine and sebaceous glands open in the hair follicle.



➢ Eccrine sweat glands

- Tubular structures open freely on the skin; not attached to hair follicles.
- Under the influence of **cholinergic stimuli.**
- Present everywhere except: The vermilion border, nail beds, labia minora, glans. Abundant in palms and soles.

➢ Apocrine sweat glands

- Secrete viscous material that give musky odor when acted upon by bacteria.
- Present ONLY in the axillae, anogenital area, modified glands in the external ear canal, the eye lids (moll's glands), and areolae.
- Under **adrenergic stimuli.**

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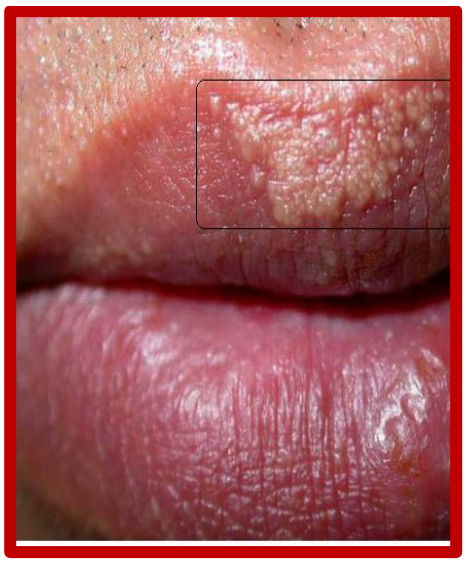
➢ Sebaceous glands

- Attached to hair follicles or open freely.
- Present in oily areas (Scalp, forehead, face, upper chest EXCEPT palms and soles).
- Called "Montgomery tubercles" in AREOLA
- Called "Meibomian glands" in EYELIDS
- Called "fordyce spots" when present in the mucous membrane as Ectopic glands
- Sebaceous glands are hormone responsive (under the control of androgens) and become active at puberty.
- They secrete sebum (squalene, cholesterol esters, wax esters and triglycerides) to moisturize the skin through a process called holocrine secretion through hair follicle opening.



- Sometimes present in abnormal location such as the lips or the mucus membrane on the inside (we don't have hair in that area so the presentation of sebaceous glands is abnormal)

  They appear as yellow particles

➢ Hair follicles

- Pilosebaceous unit = hair follicle + sebaceous gland.
- Hair follicle growth cycle: **ACT**

1- **Anagen:** (2-6 years) active growing phase
2- **Catagen:** (10 days) transitional phase
3- **Telagen:** (3 months) resting, hair shedding phase,

- Usually daily hair shedding is around 50-100 hairs/day.
- Structure of hair:

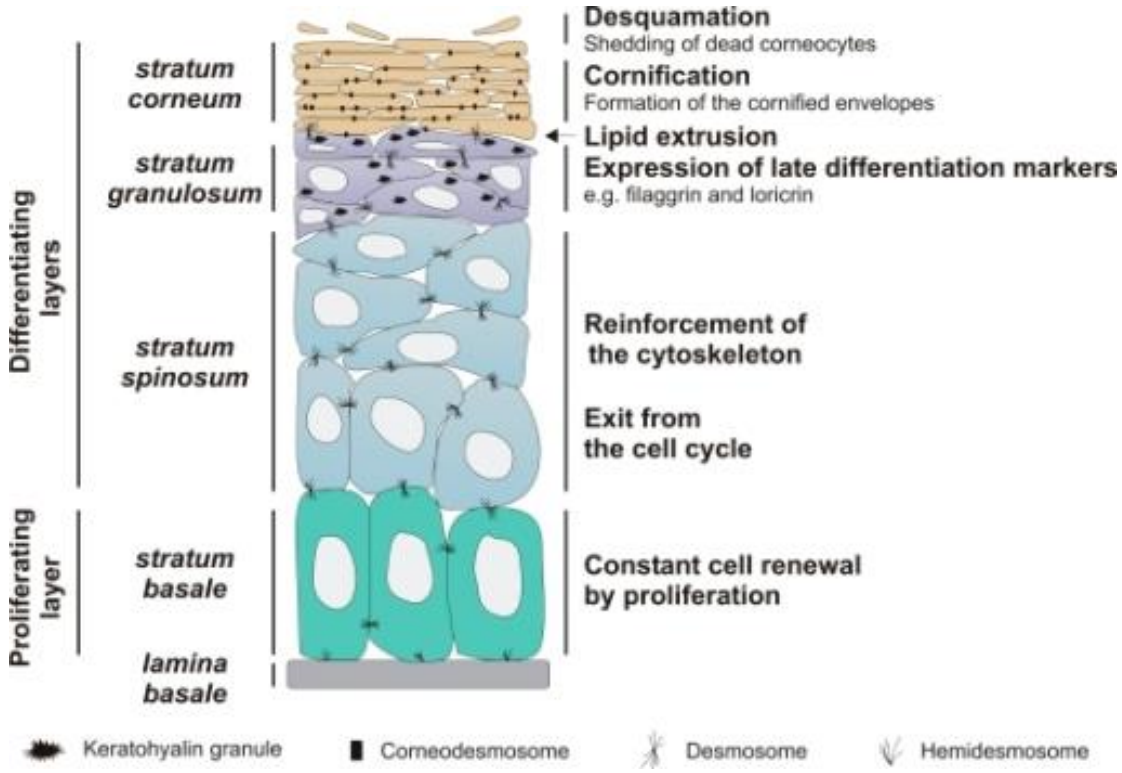
1- **Cortex:** differentiates between animal and human hair**.**
2- **Medulla.**

➢ Nails

- Highly modified skin appendage.
- Consists of nail plate, proximal nail fold, nail matrix, nail bed, and hyponychium.
- Grows out of nail matrix.
- The matrix covers the mid-portion of the distal phalanx.
- The nail plate is formed of hard keratin.
- THE LUNULA is the visible part of the matrix.
- Proximal nail fold morphology can be altered in connective tissue disease
- Protected by the cuticle.
- 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.
- Proximal nail fold morphology can be altered in connective tissue disease
- Nails tend to grow faster during summer
- Thumb & Pinky finger → Slow growers
- Index & Middle fingers → Fast growers

Cornification (Keratinization)

- The viable cell in the basal cell layer passes upwards and becomes a dead cell.
- The terminal differentiation of keratinocytes into dead horny cell (corneocyte).
- The process takes around 2 months, if the process duration shortens it will causes abnormal scaly skin.



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Done By:

Noura Ababtain