

Lec -3- The Integumentary System

The skin and its appendages together are called **the integumentary system**.

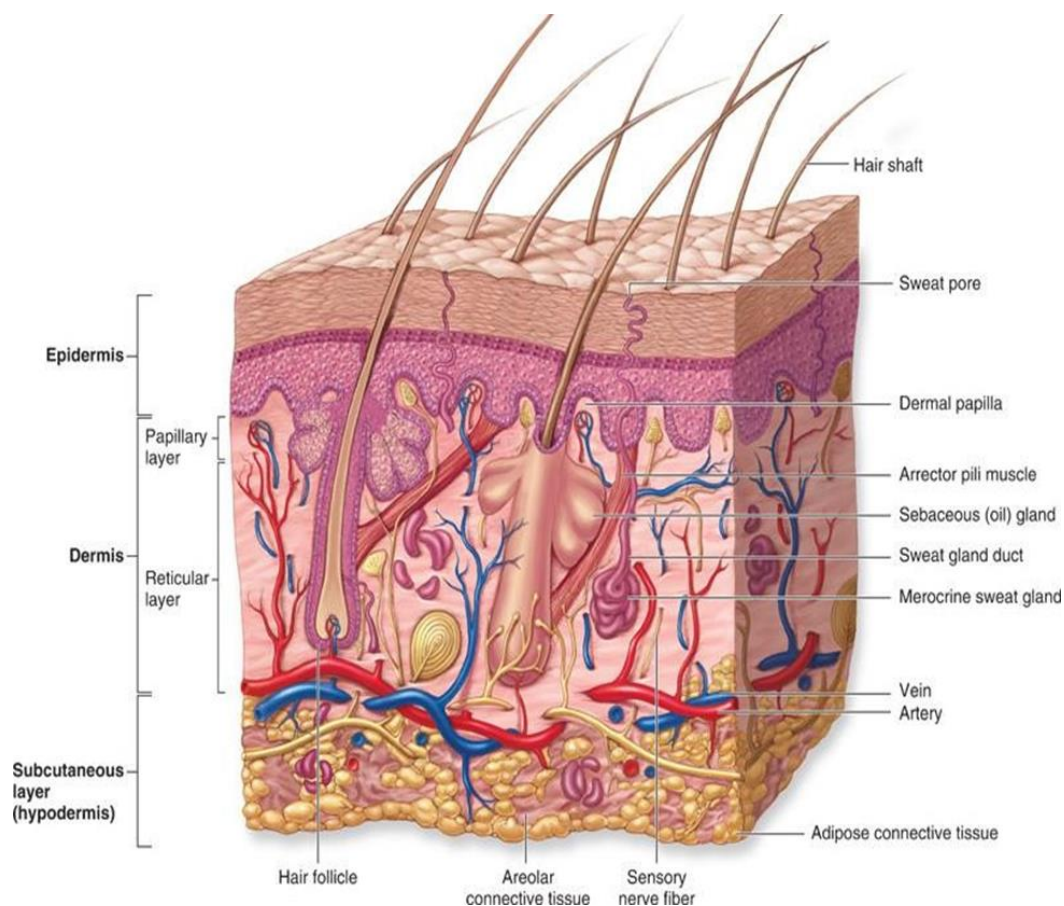
The skin or cutis covers the entire outer surface of the body. Structurally, the skin consists of two layers which differ in function and histological appearance.

The outer layer or epidermis is formed by an epithelium and is of ectodermal origin.

The underlying thicker layer, the dermis, consists of connective tissue and develops from the mesoderm.

Beneath the two layers we find a subcutaneous layer of loose connective tissue, the hypodermis or subcutis, which binds the skin to underlying structures.

Hair, nails and sweat and sebaceous glands are of epithelial origin and collectively called the appendages of the skin.



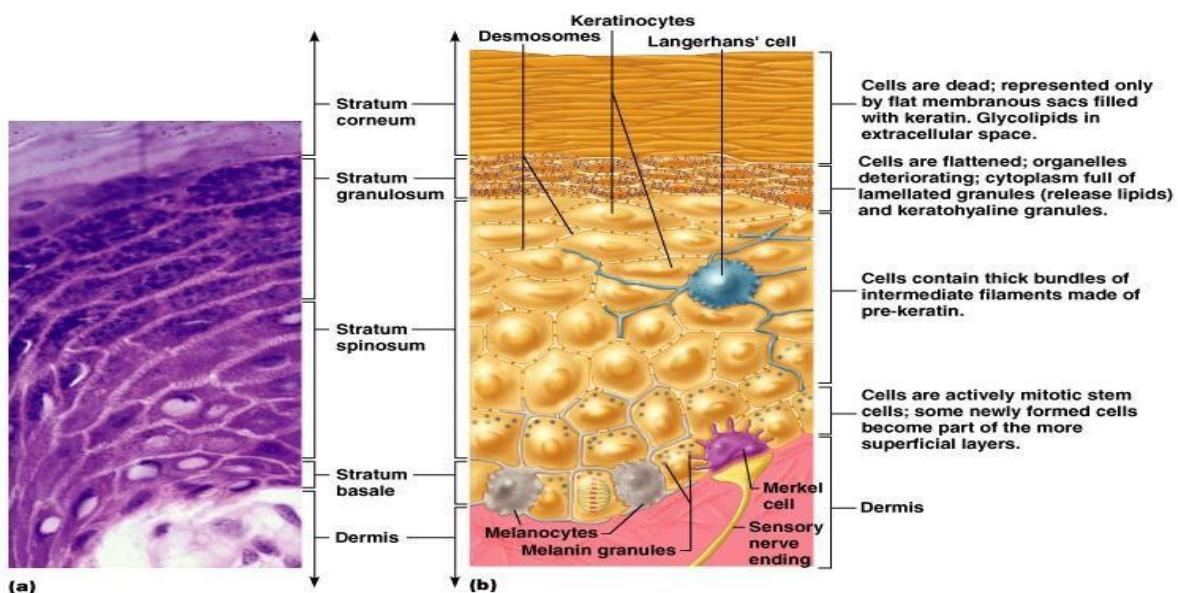
The Functions of integumentary system

1. Protects the internal structures of the body from damage
2. Prevents dehydration
3. Stores fat and produces vitamins and hormones.
4. It also helps to maintain homeostasis within the body by assisting in the regulation of body temperature and water balance.
5. The integumentary system is the body's first line of defense against bacteria, viruses and other microbes.
6. It also helps to provide protection from harmful ultraviolet radiation.
7. The skin is a sensory organ in that it has receptors for detecting heat and cold, touch, pressure and pain.

Skin, thick a good starting point is to identify the main layers (**epidermis, dermis and hypodermis**) of the skin at low magnification.

The three layers forming the skin can be identified in all skin sections.

- The epithelium forming the surface layer, the epidermis, is usually the darkest layer visible.
- Sublayers are visible in the epidermis, the dermis, consists of dense irregular connective tissue. The dermis is much thicker than the epidermis.
- The hypodermis is the lightest layer visible and consists mainly of adipose tissue.



Epidermis

The epidermis is a keratinised stratified squamous epithelium. The main function of the epidermis is to protect the body from harmful influences from the environment and against fluid loss. Five structurally different layers can be identified:

1- Stratum basale (deepest epidermal layer)

- A single layer of stem cells and keratinocytes resting on the basement membrane
- Stem cells divide and give rise to keratinocytes that migrate toward skin surface to replace lost cells
- Also contains a few melanocytes and tactile cells

2- Stratum spinosum

- Several layers of keratinocytes joined together by desmosomes and tight junctions
- Named for appearance of cells after histological preparation (spiny)
- Also contains some dendritic cells

3- Stratum granulosum

- Three to five layers of flat keratinocytes
- Cells contain dark-staining keratohyalin granules

4- Stratum lucidum

- Thin, pale layer found only in thick skin
- Keratinocytes packed with clear protein eleidin

5- Stratum corneum (surface layer)

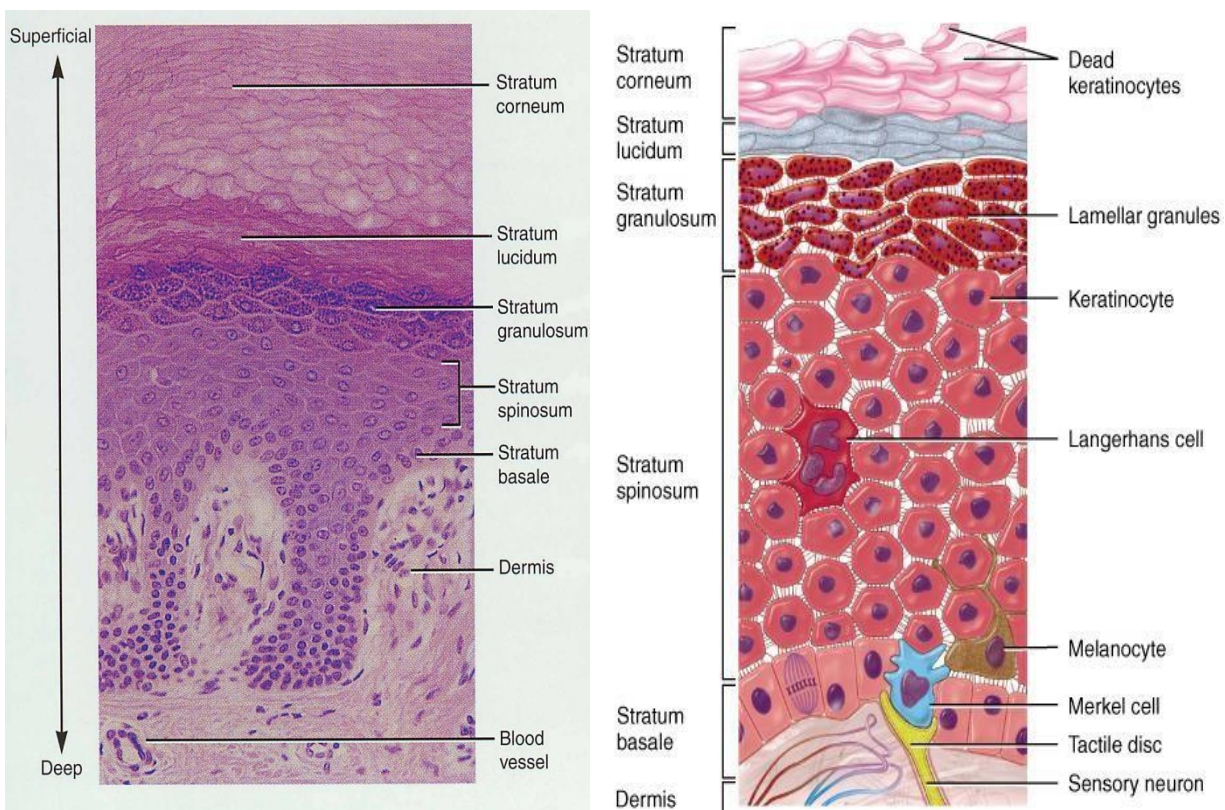
- Several layers (up to 30) of dead, scaly, keratinized cells
- Resists abrasion, penetration, water loss

Other types of cells

1. stem cells :undifferentiated cells found only in deepest layer
2. keratinocytes : most cells in epidermis synthesize keratin

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3. melanocytes : also in deepest layer synthesize pigment melanin Occur only in stratum basale but have branched processes that spread among keratinocytes and distribute melanin
4. Merkel cells (Tactile cells) : Touch receptor cells associated with dermal nerve fibers. Found in basal layer of epidermis
5. Dendritic cells (Langerhans cells): Macrophages originating in bone marrow that guard against pathogens. Found in stratum spinosum and granulosum.



Dermis

- connective tissue layer beneath epidermis
- Composed mainly of collagen
- supplied with blood vessels, sweat glands, sebaceous glands, and nerve endings
- Houses hair follicles and nail roots

- The dermis may be divided into two sublayers:
 - 1- The papillary layer consists of loose, cell-rich connective tissue, which fills the hollows at the deep surface (dermal papillae) of the epidermis.

Capillaries and Collagen fibres appear finer than in the reticular layer.
 - 2- The reticular layer appears denser and contains fewer cells.

Thick collagen fibres often aggregate into bundles and form a network.

The Hypodermis

➤ Hypodermis

- Subcutaneous tissue
- Has more areolar and adipose than dermis has
- Common site of drug injection since it has many blood vessels

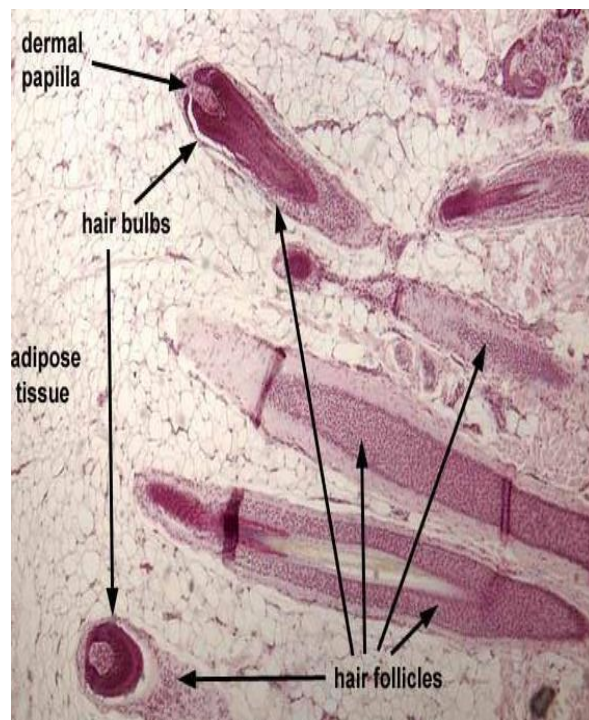
➤ Subcutaneous fat

- Energy reservoir
- Thermal insulation
- Thicker in women
- Thinner in infants, elderly

Appendages of the Skin

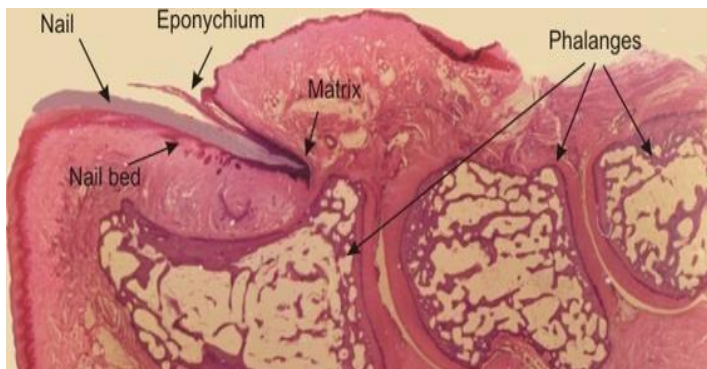
Hair

Are elongated keratinized structures; each hair arises from an epidermal invagination called the hair follicle which has hair bulb. At the base of the hair bulb there is the dermal papilla. The papilla contains capillaries and is covered by cells that form the hair root and develop into the hair shaft. Loss of blood flow or loss of the vitality of the dermal papilla will result in death of the follicle.



Nails

Represent keratinized epithelial cells arranged in plates of hard keratin; located on the distal of each finger and toe, are composed of plates of compacted, highly keratinized epithelial cells that form the nail plate, lying on the epidermis, known as the nail bed.



Glands:

A-Sebaceous Glands: are acinar glands embedded in the dermis over most of the body surface. but the frequency increases in the face, forehead, and scalp. They usually opening into a short duct which usually ends in the upper portion of a hair follicle; in certain regions, such as the lips, it opens directly onto the epidermal surface. The product of this process is sebum, the oily secretion of the sebaceous gland, which is gradually moved to the surface of the skin.

Sebaceous glands are holocrine gland. The primary controlling factor of sebaceous gland secretion in men is testosterone; in women it is a combination of ovarian and adrenal androgens



B-Sweat Glands:

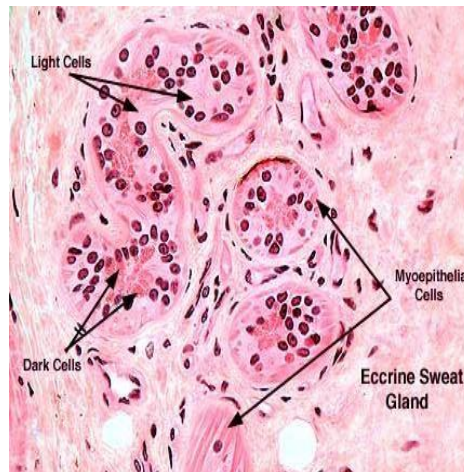
1: Merocrine glands. They are simple, coiled tubular glands whose ducts open at the skin surface. Their ducts do not divide. The secretory part of the gland is embedded in the dermis is surrounded by myoepithelial cells.

Contraction of these cells helps to discharge the secretion.

Two types of cells have been described in the secretory portion of sweat glands:

(A) Dark cells (mucoid cells) the secretion released by dark cells is mucous in nature.

(B) Clear cells do not possess secretory granules; they are involved in transepithelial salt and fluid transport.



2: Apocrine sweat glands: is present in the axillary and anal regions. Apocrine glands are much larger than merocrine sweat glands. They are embedded in the dermis and hypodermis, and their ducts open into hair follicles.

