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Zoology and Botanical Department
Practical Histology

Integumentary system

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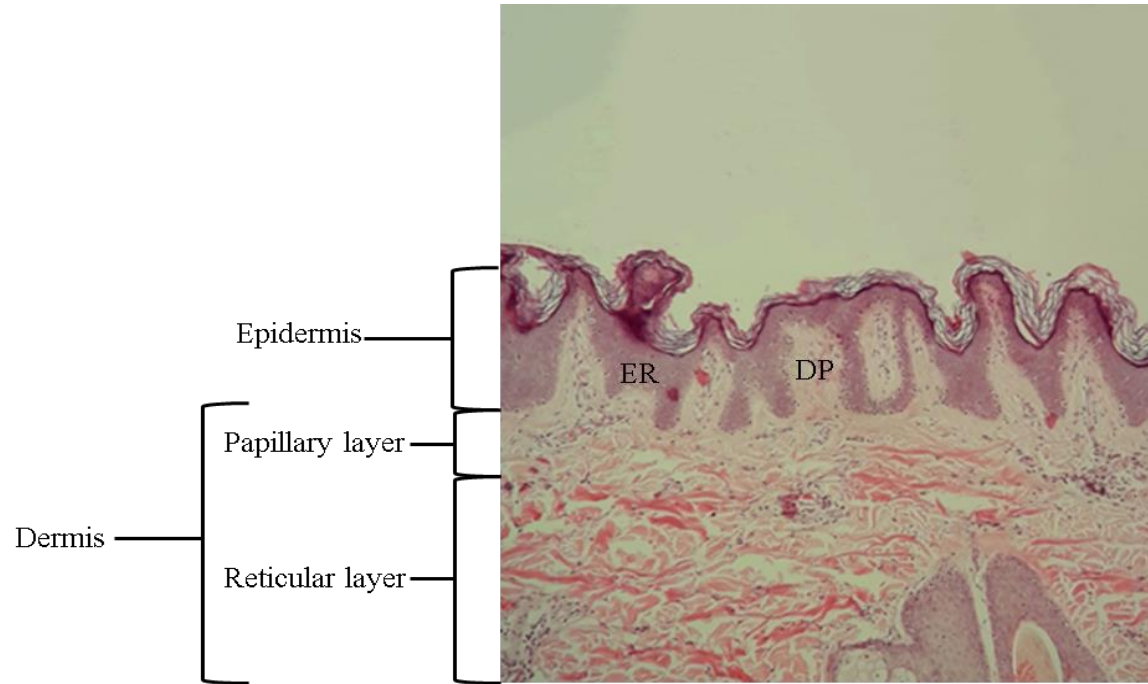


Introduction

- ▶ Skin and its derivatives form the integumentary system. In humans, skin derivatives include nails, hair, and several types of sweat and sebaceous glands. Skin, or integument, consists of two distinct regions
 - ▶ epidermis
 - ▶ dermis
- ▶ Beneath the dermis is hypodermis or subcutaneous layer of loose connective tissue and adipose tissue that forms the superficial fascia seen in gross anatomy
- ▶ The superficial epidermis is lined by keratinized stratified squamous epithelium arranged in several cell types and cell layers
- ▶ Dermis is formed by connective tissue. In addition, dermis contains epidermal derivatives such as hair follicles, sweat glands and sebaceous glands
- ▶ The junction of the dermis with the epidermis is irregular. The superficial layer of the dermis forms numerous projections called dermal papillae, which interdigitate with invaginations of epidermis, called epidermal ridges
- ▶ Dermal papillae forms papillary layer of the dermis. This layer is filled with loose irregular connective tissue fibers, capillaries, blood vessels, fibroblasts, macrophages, and other loose connective tissue cells.
- ▶ The deeper layer of dermis is called the reticular layer. This layer is thicker and is characterized by dense irregular connective tissue fibers (mainly type I collagen), and is less cellular than the papillary layer
- ▶ There is no distinct boundary between the two dermal layers



Skin



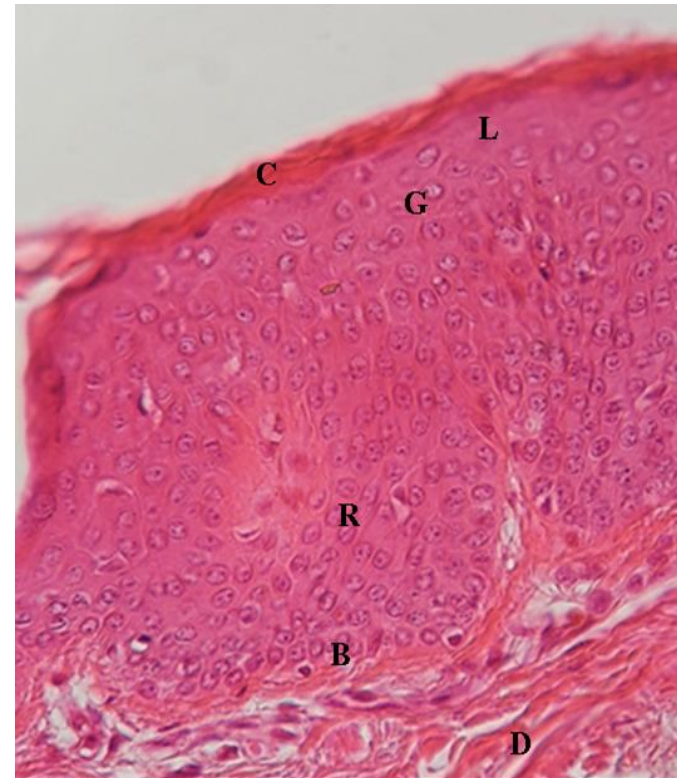
A cross section of skin where the epidermis and dermis are defined. The dermis itself consists of two parts with different characteristics. Epidermis and dermis are locked together by epidermal ridge (ER) and dermal papillae (DP). H&E, 10X. This picture is taken from histological slide in histology laboratory of Isfahan University



Epidermis

- ▶ Epidermis is formed from 4 layers in thin skin and 5 layers in thick skin, including:
- ▶ Stratum basale (stratum germinatum)
- ▶ Stratum spinosum
- ▶ Stratum granulosum
- ▶ Stratum lucidum
- ▶ Stratum corneum

Epidermis. The stratum basale (B) consists of a single layer of cuboidal cells. The stratum spinosum (R) is thick and made of several rows of irregular, multifaceted cells. The stratum granulosum (G) are also have several cell layers that gradually become flat towards the surface. Cells in stratum lucidum (L) are flat and completely compact. The stratum corneum (C) forms the most superficial layer of epidermis. (D) dermis. Basement membrane can be seen between epidermis and dermis H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University



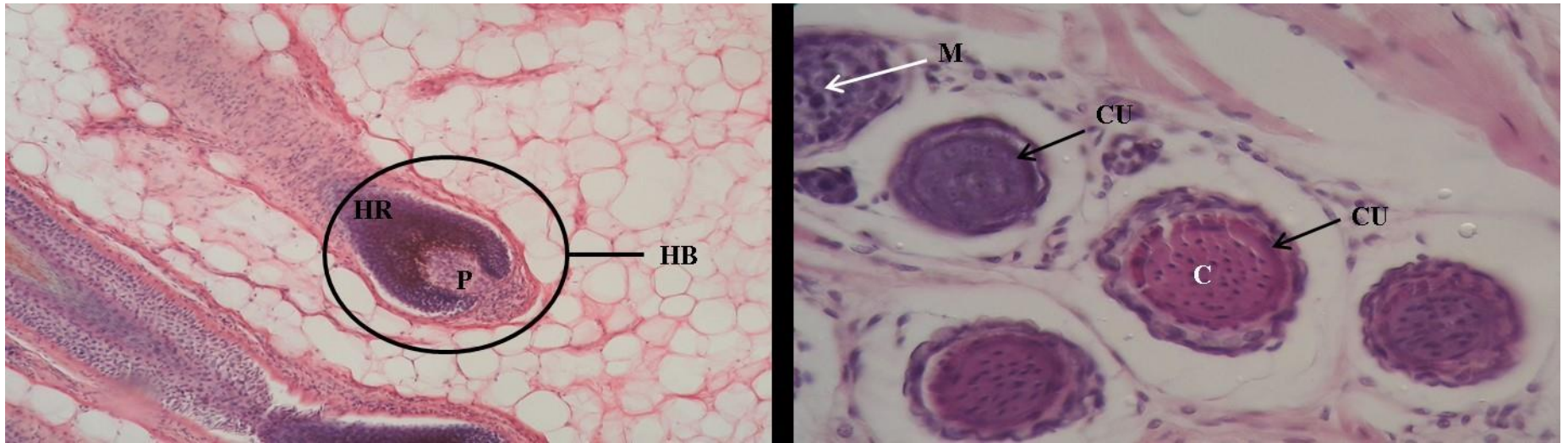


Hair

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- ▶ Each hair is a long keratinized strand derived from the epidermis. Hair is composed of two parts: free stem and a root that is embedded deep in the skin
 - ▶ Epidermal cells that form hair are located in three layers that from inside to outside including:
 - ▶ Medulla- consists of two or three layers of large vacuolated cells
 - ▶ Cortex- the major part of the hair and consists of several layer of keratinized cells
 - ▶ Cuticle- consists of a single layer of transparent and completely keratinized cell in the surface
 - ▶ A tubular structure called hair follicle surrounds the hair root. The expanded terminal portion of the hair follicle observed in longitudinal section is the hair bulb. The base of the hair bulb is indented by the connective tissue to form a dermal papilla
 - ▶ The hair follicle is located in the dermis or hypodermis
 - ▶ Attached to hair follicles are thin strips of smooth muscle called the arrector pilli muscles
 - ▶ Associated also with hair follicles are numerous sebaceous glands



Hair

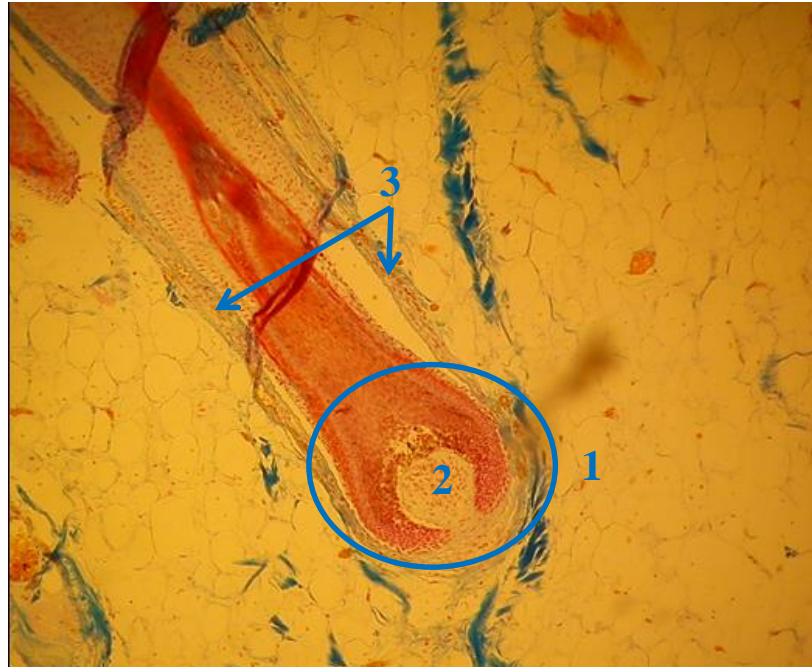


The structure of hair. Right: Cross section of hair follicles in the dermis. Each hair consists of concentric layers of medulla (M), cortex (C) and cuticle (CU). Left: longitudinal section of an hair follicle embedded in hypodermis. The hair follicle develops as hair bulb (HB) at the end. Hair root (HR) is seen as a mass of intermingled cells. The base of the hair follicle has a depression that is filled by connective tissue of dermal papilla (P). H&E, 40X. These pictures are taken from histological slide in histology laboratory of Isfahan University



Errector pili muscle

- ▶ Attached to hair follicles are thin strips of smooth muscle called the arrector pilli muscles

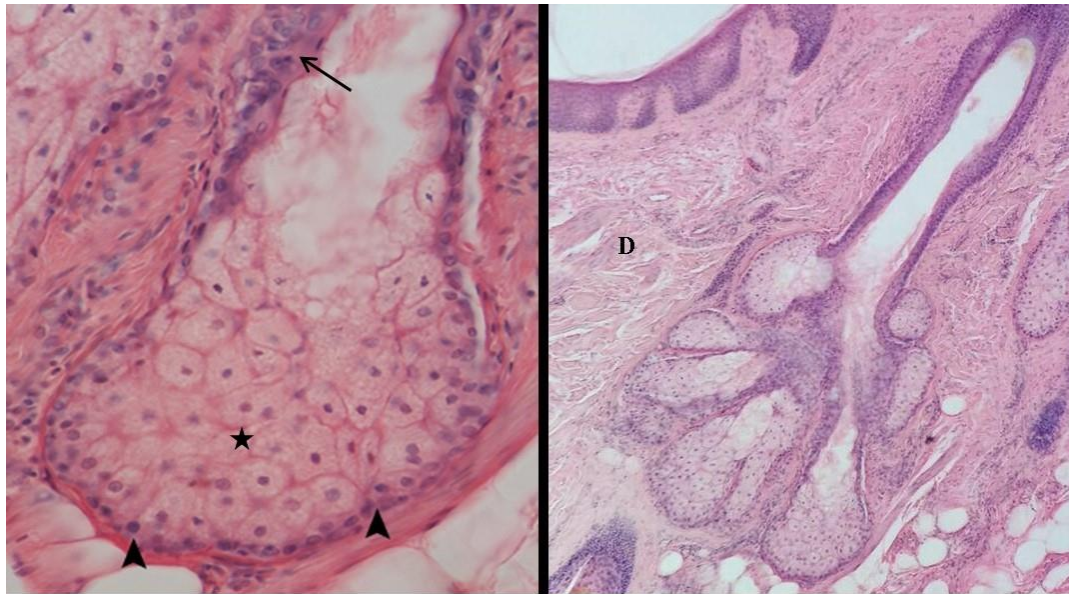


Longitudinal section of hair follicle. 1. hair bulb, 2. dermal papilla, 3. errector pili muscles. H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University



Sebaceous glands

- ▶ Associated also with hair follicles are numerous sebaceous glands
- ▶ These glands are located in the dermis and surrounded by a thin layer of connective tissue
- ▶ They are branched acini glands that produce fat

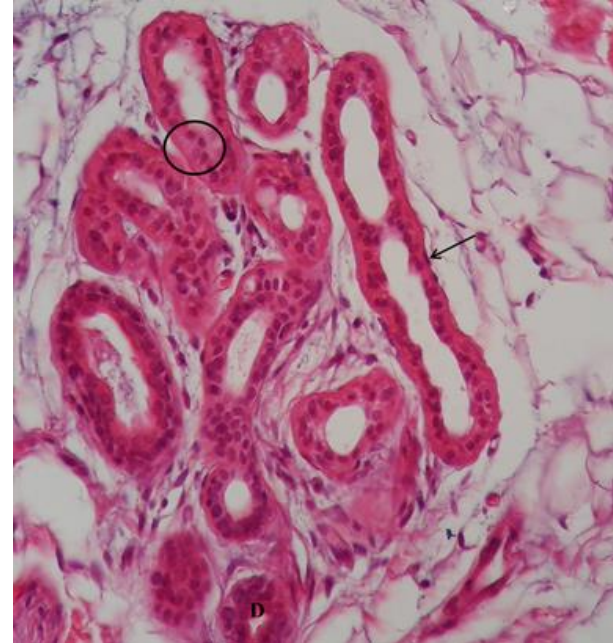


Sebaceous glands. Right: numerous sebaceous glands are depicted in the dermis (D) covers the hair follicle. Left: there is a layer of cuboidal cells (arrowheads) at the base of secretory portion of sebaceous glands. Spherical or multifaceted cells (asterisk) are located on the basal layer and surrounds an alveolus center. The cells become larger towards the center of alveoli. Stratified squamous epithelium lining the sebaceous gland ducts (arrow). H&E, Right:4X, Left: 40X. These pictures are taken from histological slide in histology laboratory of Isfahan University



Sweet (sudoriferous or sudoriparous) glands

- ▶ Sweet glands are simple, tubular glands present in the dermis or hypodermis, although their ducts open in the surface of epidermis
- ▶ In general, sweet gland composed of secretory unit and a duct
- ▶ The secretory units of sweet glands are composed simple cuboidal epithelium of two cell types:
 - ▶ Clear cells that are pale in colour and have a central, spherical nucleus
 - ▶ Dark cells that are abundant and strongly eosinophilic
- ▶ There are also myoepithelial cells. They are contractile cells that located between the secretory cells and their basement membrane
- ▶ Lumen of sweet gland ducts is narrower than its secretory portion and is lined by stratified cuboidal epithelium. Its epithelium is darker than secretory epithelium



Sweet glands. The secretory parts are lined by simple cuboidal epithelium. Two type of clear and dark cells can be recognized in this epithelium (circle). Arrow depicts a myoepithelial cell. The lumen of ducts (D) are narrower than secretory parts and lined by stratified cuboidal epithelium. H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University