

Integumentary System

Integumentary system refers to the study of **integument** and its **derivatives**.

The outermost covering structure of the body is commonly known as **skin** or **integument**. It is profusely supplied with sensory nerve endings which respond to the environmental stimuli. Integument is basically meant for the protection of the body, tissues and organs, though it serves a number of other purposes as well such as excretion, secretion, thermoregulation, respiration, responding to various stimuli, etc.

Integument is a multicellular and multilayered covering principally formed of two layers—

- (i) the outer **epidermis**, and
- (ii) the inner **dermis**.

The basic plan of integument alongwith its derivatives exhibits considerable variations in different groups of vertebrates. The habitat of an animal with regard to its aquatic or terrestrial mode of life plays a very crucial role in determining the character of various variations of integument.

GENERAL STRUCTURE OF INTEGUMENT

Integument in chordates generally consists of two layers *viz.* outer multilayered structure called **epidermis** and the inner **dermis** (Fig. 2.1).

Epidermis

The epidermal portion of integument is **ectodermal** in origin *i.e.*, it is derived from the **ectoderm** of the embryo. Epidermis is **multilayered** *i.e.*, it consists of several layers of cells. Most of these layers are made up of **stratified epithelial cells**. The lowermost layer of epidermis is made up of living **columnar epithelial cells** and this layer is termed as **stratum malpighi** or **stratum germinativum**. The columnar epithelial cells of stratum germinativum have the ability to divide profusely towards its outer side. As these layers of cells move upwards due to constant addition of new layers from stratum germinativum, the columnar epithelial cells become flat, stratified epithelial cells. This happens due to flattening of the cells and keratinization of cytoplasm. Besides, these successive layers become **horny**. The nuclei in the cells gradually disintegrate so that outermost layer (**stratum corneum**) has cells devoid of nuclei and these are completely keratinized and hard, and become non-living. Thus, epidermis has stratum germinativum (living columnar epithelial cells) as its base and stratum corneum (keratinized, non-

living cells without nuclei) as the outermost layer. There are few intermediate layers showing gradual keratinization. Beginning from stratum germinativum, these layers are stratum granulosum and stratum lucidum. Stratum

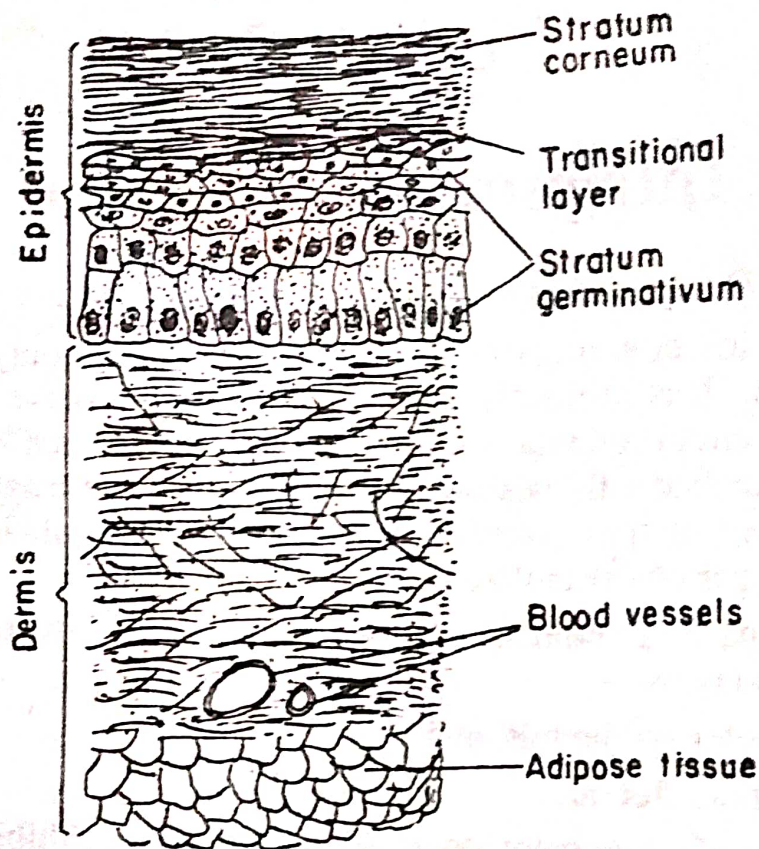


Fig. 2.1. Semidiagrammatic representation of section through a portion of the integument of a typical tetrapod.

granulosum has granules in its cells and is at the threshold point of becoming opaque. Stratum lucidum, on the other hand, is opaque. In these two layers, the keratinization is on the increase. However, it is completed in stratum corneum. In comparison to dermis, epidermis is thin.

Dermis

Dermis is mesodermal in origin *i.e.*, it is derived from the embryonic mesoderm. Dermis is always thicker than epidermis. It is also called as the true skin which is very well developed in mammals.

Dermis usually consists of two layers *viz.*, stratum spongiosum and stratum compactum. Stratum spongiosum is the outer part of dermis and is loose in nature. Stratum compactum is the inner part of dermis and is dense in nature.

In contrast to epidermis, dermis consists largely of connective tissue fibres extending in all directions. These connective tissue fibres form a fairly elastic covering which makes up the greater portion of the skin. Cells are present amongst these fibres but these are not arranged in layers. The connective tissue fibres are white collagen fibres, yellow elastic fibres and smooth muscles. All these fibres are embedded in the connective tissue mass (matrix). In the matrix are also present blood capillaries, nerve fibres, lymph

vessels, pigment cells, sensory cells and nerve endings. Various glands which are ectodermal in origin are also lodged in dermis. It is worthwhile to mention that commercial leather is nothing else but actually highly macerated dermis. In order to prepare leather, the connective tissue fibres of the dermis are thickened so that these become highly tough under the action of tanin, alum, chromium salts and various tanning agents.

In vertebrates, pigment is found in the form of small granules in certain cells of integument specially in groups like cyclostomes, fishes, amphibians and reptiles. These animal groups have the ability to alter the distribution of pigment granules in accordance to the stimuli. In human beings, special pigment bearing cells (**Chromatophores**) are absent. In man, the colour of the skin is based on the presence of pigment granules in the lowest layers of epidermal cells. Barring albino and certain other white animals, the integument of all vertebrates bears pigment granules. **Melanoblasts** are the additional branched pigment cells found at the junction of dermis and epidermis. A few pigment cells may also be present scattered throughout the dermis. In human beings, the colour of skin depends upon three main factors namely basic yellow colour, reddish hue colour due to blood vessels and various shades of colour due to **melanin** pigment. The actual colour depends upon the interaction between the melanin pigment and ultraviolet rays of sun as the formation of pigment is stimulated by mild exposure to the ultraviolet light.