Q 6. Describe integument, its derivatives and functions in mammal.

Ans.

The outermost covering of the vertebrate body is called integument. It consists of skin (cutis) and its derivatives like hair, feathers, scales, glands etc.

The epidermal derivatives are of two types- soft derivatives (e.g. glands, sensory structures etc.) and hard derivatives (e.g. feathers, hair, nails etc.).

The integument covers the entire body including the open area of the eye ball. It acts as protective organ, excretory organ, sensory organ etc. It shows modifications according to the function.

Integument in Mammalia :

The integument is thick, elastic and waterproof. It consists of skin and its derivatives.

I. Skin : The skin is composed of an **outer epidermis** and **inner dermis**.

(a) Epidermis : The **epidermis** is composed of **four layers** of cells, namely stratum corneum, stratum lucidium, stratum granulosum and stratum germinativum.

(i) Stratum corneum - It is outer most layer of epidermis. It is composed of hard, thin, flattened and completely cornified cells. The cornification occurs by transformation of eleidin (= a clear intracellular protein) of stratum lucidium into keratin (= a family of fibrous structural proteins). Keratin is insoluble in water and prevents the passage of water and solutes. It participates in the formation of derivatives of skin like hairs. nails, hoofs etc. This layer is shed periodically.

(ii) Stratum lucidium - This layer is found below the stratum corneum. It consists of transparent and hard end cells. The cells are flat and without nucleus. Usually this layer is found in the friction bearing surfaces like soles and palms.

(iii) Stratum granulosum - This layer is found below the stratum lucidium. It is composed of several layers of granules containing cells. These cells are oval and round. The granules are formed of keratohyalin (= a protein may be involved in keratinization), which is formed by the fragmentation of nuclei of old cells of stratum Malpighi. It is more developed in the soles and palms.

(iv) Stratum germinativum - It is inner most layer of epidermis. It is composed of single row of columnar cells arranged in wavy manner. Cells of this layer obtain nourishment from underlying dermis. These cells multiply mitotically and add new cells on their outer face. All cutaneous glands and horny structures are derived from this layer. The melanin containing cells, called melanophores are found in this layer.

(b) Dermis : The **dermis** lies below epidermis. It is much thicker but much more uniform than the epidermis. It is composed of loose connective tissue with a packed mass of collagen and elastic fibres. The dermis is well supplied with blood vessels and nerve fibres. It forms a tough, vascular, flexible and elastic covering over the entire body to form leather. It may be distinguished into two layers.

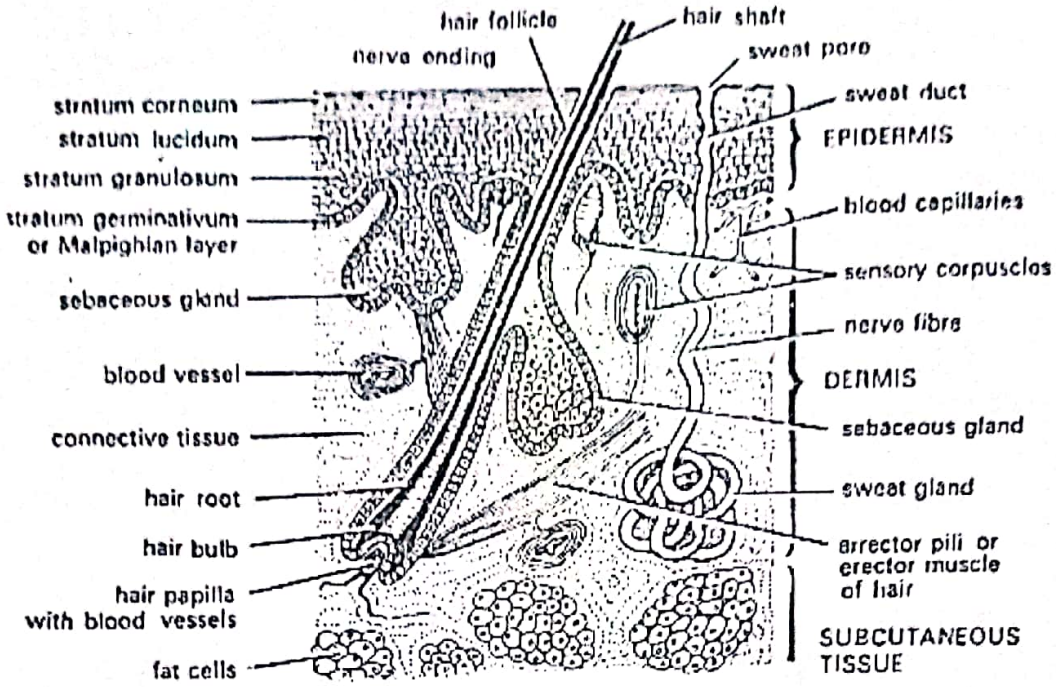

Fig. V.S. of skin of a Mammal.

(i) Papillary layer - This is the upper part of the dermis. The papillary region is composed of loose areolar connective tissue. This is named for its fingerlike projections called papillae that extend towards the epidermis. Papillae are further distinguishable into nutritive papillae and sensory papillae. The nutritive papillae contain blood and lymph capillaries , while sensory papillae contain tactile nerve endings.

(ii) Reticular layer - This is the lower part of the dermis. It is composed of dense irregular connective tissue and masses of adipose tissue. The roots of the hair, sebaceous glands, sweat glands, receptors, nails and blood vessels are also found in this region.

II. Integumentary derivatives in Mammals :

(A) The **epidermal derivatives** of mammalian integument are of two types - **soft epidermal derivatives** (e.g. sebaceous glands and sweat glands) and **hard epidermal derivatives** (e.g. hairs, nails, claws, hooves and horns).

(a) Soft epidermal derivatives:

1. Sebaceous glands : These are found as round multicellular structure near the wall of the hair follicle and open into the upper part of the follicle by a duct. Sebum (= a fatty material) is secreted by these gland to keep the skin as well as hairs water proof and greasy. Vitamin D is also synthesized in the presence of sunlight in these glands.

2. Sweat glands (≅ Sudoriferous glands) : These are unbranched, long, tubular and coiled glands present deeply in dermis. These are formed by tubular invagination of stratum germinativum. The glands remove metabolic wastes of the body in the form of sweat.

3. Mucous glands : These are found in several different parts of the body. Most are multicellular, but goblet cells are single celled gland.

Besides these, several other glands are also found in the skin of mammals which are either modification of these two or of different nature. These are Mammary gland (= modified sweat glands), meibomian glands (= modified sebeceous glands), wax glands, scent glands etc.

1. Mammary glands : These are modified sweat glands. These are well developed and functional only in females. These are formed od alveoli and tubules. These open on the tip of nipples in thoracic or abdominal region. These are apocrine and produce milk.

2. Meibomian glands : These are modified sebaceous glands located on the edges of eye lids. Their oily secretion lubricates cornea.

3. Ceruminous glands : These are modified sweat glands found in the auditory canals of ear. Their fatty secretion is known as cerumen or wax. It lubricates and protects tympanic membrane.

4. Scent glands : These are modified sebaceous glands and are located in the inguinal region.

(b) Hard epidermal derivatives:

1. Hairs : Hairs are thread like elongated structures. Each hair has two parts- hair root and hair shaft. The bulb like swollen part lying within the skin is known as hair root, while the slender part projecting out of the follicle is called, the hair shaft.

2. Nails : Nails are flat structures formed of homogenous keratin. These are scale like thickenings of stratum lucidium at the end of fingers and toes.

3. Claws : A claw is a curved , pointed structure found at the end of a toe or finger in most mammals. A true claw is made of hard protein called keratin. Claws are used to catch and hold prey in carnivorous mammals, e.g. cats and dogs.

4. Hooves : A hoof (Plural hooves) is a tip of a toe of an ungulate mammal (such as sheep, goat.

5. Horns : These are conical epidermal caps developed on solid cores arising from the frontal and parietal bones. These grow continuously and are not shed except in antelopes.

6. Scales : Epidermal scales are present on the tails of rats, mouse, mole, shrew etc.

(B). Dermal derivatives : There has been a corresponding reduction in dermal derivatives. The membrane bones of the skull, the mandible (lower jaw), and the clavicles (collar bones) are the remaining vestiges of dermal plates in the mammals.

1. Pigments : Melanocytes are found mainly in the epidermis, though they occur elsewhere. A number of different pigments are produced in different vertebrate groups, but in mammals only brown melanin and yellow or red phaeomelanin are important.

2. Scales : Only a single living mammal - the armadillo (=) - displays the dermal scales.