INTEGUMENTARY SYSTEM

Introduction : The integumentary system consists of integument, called skin, and the structures developed from the skin are termed as skin derivatives. The skin occurs only in the vertebrates. The study of the structure and functions of the skin and its derivatives is called dermatology (*G.derma* = skin; *logos* = discourse). Skin is the largest organ of the body. Scaled epithelium is found in skin.

2.1 HISTOLOGY OF SKIN

Histologically, the skin is formed of two distinct layers, outer ectodermal epidermis and inner mesodermal dermis (corium or cutis or vera or true skin).

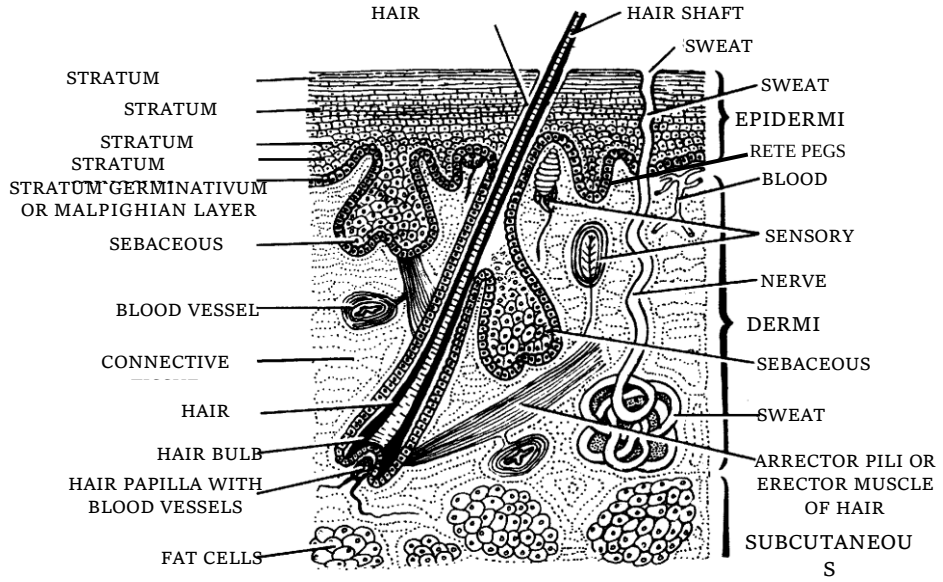


Fig. – V.S. of hairy

(i) **Epidermis :** Epidermis is the outer thin, protective, non-vascular region of the skin. Blood vessels do not pierce epidermis. It develops from the ectoderm of the embryo. It is formed of keratinised, stratified squamous epithelium. The body wall which is regenerative is epidermis of skin. Persons engaged in manual work with hands are likely to develop thick epidermis in palms. The five distinct strata in the whole epidermis, from inner to outer, are stratum germinativum, stratum spinosum, stratum granulosum, stratum lucidum and stratum corneum.

(a) **Layers of Epidermis :**

(1) **Stratum germinativum or Malpighian layer or Stratum cylindricum or Stratum basale :** It is the layer of actively dividing cells. It is a single-layered epithelium of columnar cells. The cells of this layer continue growing and dividing by mitosis throughout life. Stratum germinativum present in the form of ridges and furrous knows as rete pegs.

In this layer, certain branched and pigmented cells are found which are termed as melanocytes. These cells have long processes which are extended far away in the epidermis. In the cytoplasm of melanocytes, certain membrane bound granules are present called the melanosomes in which melanin**,** a black coloured pigment is found and also synthesised. Melanin is formed from tyrosine amino acid and an enzyme dopaoxidase but tyrosinase enzyme catalyses the process of melanin-formation. If the ability to synthesise tyrosinase enzyme is absent in an individual then it leads to albinism. Albinos lack pigmentation. When some parts of the skin lacks pigmentation this disease is called leucoderma. In

vitiligo, the partial or complete loss of melanocytes from patches of skin produces irregular white spots. The stratum basale also contains tactile (Merkel) discs that are sensitive to touch.

Synthesis of melanin is regulated by the melanocyte stimulating hormone (MSH) of pituitary gland and is affected by ultraviolet ray of sunlight. In general, hotter the climate more is the melanin formation. That is why, people inhabiting the equatorial belt, like the negroes, are the darkest. Dense pigmentation is a definite advantage in enduring sun's heat, because the pigment acts as an insulator.

Albinism is a hereditery disease, and is due to a recessive gene which is found on autosomes. In lower vertebrates like amphibians and reptiles, the pigmented cells are found in the dermis and are termed as chromatophores. These cells have the capacity to change the distribution of pigment-granules, so these animals can change their colour. This capacity is termed as metachrosis; and it is absent in mammals. On the basis of pigments, chromatophores are of different types –

(i) **Melanophores :** These contain melanin pigment. It is brownish black in colour.

(ii) **Lipophores :** These contain yellow coloured lipids called chromolipids e.g. carotin

(iii) **Guanophores :** These contain crystals of guanine; which are shining white in colour. So the skin colour arises due to the mixed effect of these three types of chromatophores.

(2) **Stratum spinosum (Prickle-cell layer) :** This is a stratum of six or seven layers of cells. Cells of these layers are polyhedral and tightly held together by means of their interdigitating, finger-like cytoplasmic processes. This stratum provides firmness and rigidity to the epidermis. Stratum spinosum, stratum granulosum and stratum lucidum constitute the transitional region of epidermis.

(3) **Stratum granulosum :** This consists of six or seven cell layers of flattend cells. Their nuclei are denser and cytoplasm contains the basophilic and refractile keratohyalin granules**.** Keratohyalin is precursor of keratin, a protein found in stratum corneum.

(4) **Stratum lucidum :** Cells of two or three layers which form this stratum are considerably flattened. In these, the keratohyalin granules first dissolve and then transform into a substance, eleidin**,** which renders the cells semitransparent, shiny and waterproof. Simultaneously, the nucleus undergoes gradual disintegration. Acting as a "barrier layer" this stratum prevents water and other fluids from diffusing across the epidermis. It is found in place of frictious such as palm and sole.

(5) **Stratum corneum (Horny layer) :** External layer of skin is formed by scaly stratum corneum. Cells are more flattened and scale like. It is made up of striated squamous epithelium, cells contain keratin. Stratum corneum serves as effective barrier against light, heat, bacterial and chemicals. Basically the colour of human skin is yellow or orange due to universal presence of "Carotene pigment" in cell of stratum corneum and subdermal fat cell. A yellowish carotene pigment is precursor of vitamin 'A' is used to synthesized pigment needed for vision. Carotene is found in stratum corneum and fatty areas of dermis and subcutaneous areas. This stratum is thick in soles and palms, but relatively thinner in other parts of body. In human soles and palms, the skin surface exhibits regular patterns of furrows (sulci cutis) and ridges (cristae cutis) used to make finger, hand and foot-prints. The surface layer of stratum corneum is periodically shed or cast off (ecdysis)**.** In frog, rabbit, man and most other vertebrates, it is shed off in small fragments, but in certain vertebrates, like snakes, it is cast off in one piece called the slough.

Modification of stratum corneum include many epidermal scales, hairs, bristles, nails, hoofs, horns etc. Keratinization is the whole process by which a cell forms in basal layer, rises to the surface, become keratinized and sloughs off take 2 to 4 weeks called keratinization.

EGF : Epidermal growth factor is a protein harmone that stimulates growth of epithelial and epidermal cells during tissue development, repair and renewal.

(b) **Epidermal cells :** The epidermal cells are of four types: Keratinocytes, Melanocytes, Langerhans cells and Merkel cells.

(1) **Keratinocytes :** The epidermal cells in which keratin is formed are called keratinocytes. They form about 85% of the epidermal cells. They are derived from the ectoderm.

(2) **Melanocytes :** The lower layer of the epidermis has pigment cells, the melanocytes. These are derived from the migratory cells from the neural crests.

(3) **Langerhans cells :** These are probably macrophages that invade the epidermis. They are irregular cells with branching processes which extend between the epidermal cells. They seem to arise from the mesenchyme (bone marrow) and migrate to the epidermis. They interact with helper T cells in immune responses and are easily damaged by UV radiation.

(4) **Markel cells :** These are sensory receptors located in stratum basal layer of hairless. Skin markel cell will form 1% of epidermal cell.

Modification of epidermis : In lower chordates (Protochordates) ie Balanoglossus and Branchiostoma epidermis is single-layered like invertebrates and has unicellular mucous glands. In cyclostomes and fishes, although the epidermis of multilayered and differentiated into stratified epithelium and stratum malpighii, but the cornification is not complete and the cells of stratum corneum are nucleated. In aquatic vertebrates epidermis contains mucous glands whose mucous keeps the skin slimy and protects it from bacterial and fungal growth.

(ii) **Dermis :** The deeper layer of the skin is dermis. Dermis is the inner thick, vascular region of the skin. It develops from the mesoderm. It is about 2–3 times as thick as the epidermis. It is formed of an outer loose layer of stratum spongiosum or papillary layer and an inner dense layer of stratum-compactum or reticulor layer. It is composed of dense connective (areolar) tissue containing bundles of wavy, unbranched white or collagen fibres; straight, branching yellow or elastin fibres and various types of cells, fibroblasts**,** histiocytes, mast cells and adipocyte cells. Papillory layer with corpuscles of touch, called meissners corpuscles.

The dermis also contains blood vessels, nerve fibres and lymph vessels. The blood vessels send capillaries to meet the epidermis. Motor nerve fibres innervate the muscles and glands in the dermis, sensory nerve fibres carry nerve impulses from sensory receptors present in the dermis. These receptors detect heat, cold, touch, pain, pressure etc,. A few macrophages and adipocytes may also occur. Beneath the dermis is a layer of loose connective tissue. Thus, the dermis forms a strong and elastic covering over the body. It is suitable for preparing leather. For this, the epidermis is first removed by maceration and, then, the connective tissue fibres of dermis are rendered thick and tough by treating the dermis with tanning agents like tannin, alum, chromium salts, etc. Contrary to tanning, Taxidermy is a process in which the hole skin, including both epidermis an dermis, is preserved by means of certain

chemicals. Leather is derived from dermis. Folded upper part of dermis is called dermal papilla. The dermis has two regions.

(a) **Papillary layer (Pars papillaris)** : It consists of loose connective tissue and sends projections into the epidermis, forming dermoepidermal junctions.

(b) **Reticular layer (Pars reticularis)** : It consists of dense connective tissue and has some reticular fibres in addition to collagen and elastin fibres. The reticular layers have more fibres and fewer cells than the papillary layer.

A thin layer of subcutaneous areolar connective tissue lies between dermis and underlying musculature of body wall. Often this tissue contains accumulations of fat cells (stratum adiposus). The fat serves as a shock absorber, "energy-storing" depot and thermal insulator against external heat and loss of body heat. In man and many other mammals, but not in rabbit, the fat forms a continuous layer called paniculus adiposus. The combination of collagen and elastin fibres in reticular region of dermis provides the skin with strength, extensibility (ability to stretch) and elasticity. (Elasticity is the ability to return to original shaped after stretching). The ability of skin to stretch can readily be seen in pregnancy, obesity and edema. The stretch marks known as STRIAE. Symmetry of body-shape and distinction in the shapes of men and woman are largely due to this layer. Marine mammals of temperate oceans, like seals, whales etc and large sized terrestrial mammals like the elephants, have scanty hairs because heat insulation is done by a specially thick fatty layer called blubber. In palms and soles, the fibres of the subcutaneous tissue are tightly interwoven with those of the dermis. Therefore, the skin is more firmly attached in these regions. In certain areas of the dermis, blood can pass directly from arteries to veins through the arteriovenous anastomoses or shunts. The latter play an important role in temperature and blood pressure regulation, since the skin can hold about 4.5% of the blood volume.

In addition a number of structure like hairs, feathers, scales, bony plates and glands etc. are also found embedded in it. The pigment is usually contained in a special type of branched cells, the chromotophores, which form an almost continuous layer below the epidermis. The chromatophores have pigment of different colours and are accordingly known as melanophores (black or brown pigment), lipophores (with yellow or red pigment) or iridocytes (with crystals of guanine).

(iii) **Functions of skin :** Though skin performs the largest number of functions, its principal function is to cover and protect the body. Skin is often called "the master organ" or "Jack of all trades" because of its several diverse functions.

(a) **Protection :** The skin forms a cover around the internal tissues and organs to protect them from mechanical injury by bumps and knocks dehydration and UV radiation. The cornified epidermis prevents damage by friction. The epidermis of skin has a great power of regeneration, helping in rapid healing of wounds.

(b) **Maintenance of body shape :** The skin is quite firm, and successfully resists external and internal pressure on it. It thus, helps in maintaining the shape of the body.

(c) **Safety against sunburn :** Melanin of the epidermal cells gives protection against the invisible ultraviolet rays of the sun. These rays cause sunburn. In sunburn, the cells of the germinative layer of the epidermis are injured, causing blisters.

(d) **Barrier to germs and poisons :** The outer hard, horny layer of the skin checks the entry of microorganisms and absorption of poisonous materials coming in contact with it. The microorganisms can nevertheless enter through the hair follicles and openings of sweat glands and by insect bites.

(e) **Maintenance of water balance :** The horny layer and sebum are impermeable. They prevent the loss of water by evaporation and also check the absorption of water. Dry dead cells of stratum corneum prevent evaporation of water from surface. This avoids desiccation and disturbance of water balance. Skin is responsible for regulation of water. Keratin enables us to take bath in fresh water without the body becoming swollen with water, or in salt water without the body becoming shrunken.

(f) **Excretion :** The skin removes the excess of water, traces of urea and lactic acid and some salts (chiefly *NaCl*) from the blood as sweat.

(g) **Secretion :** The skin secretes many useful materials. Sebaceous glands produce oil for the lubrication of the hair.

(h) **Chemical defences :** The sweat, oil and wax from skin glands contain lactic acid and fatty acids. These acids make the pH acidic enough to kill or slow the growth of many bacteria and fungi.

(i) **Sensation :** The skin has abundant receptors which are sensitive to variety of stimuli, such as touch, heat, cold, pain, chemicals, pressure and moisture. Proprio-receptors respond to mechanical stimuli.

(j) **Storage :** The deeper layer of the dermis stores water and fat.

(k) **Regulation of body temperature :** When body temperature rises, the heat is equally distributed to all part of body by blood circulation, however, all blood vessel and capillaries of skin dilate due to parasympathetic stimulation increasing cutaneous blood circulation manifold as a result heat radiate away from blood through the skin. The normal body temperature of man is 98.4ºF (37ºC), rabbit 96ºF. Thermoregulatory centre is hypothalamus.

(l) **Nourishment :** The skin is capable of forming vitamin D from a cholesterol derivative in the presence of sunlight. Primary function of subcutaneous fat in mammals is to provide a reserve food depot.

(m) **Colour :** Melanin in epidermal cells gives colour to the skin. Camouflage of chameleon is associated with chromatophore.

(n) **Absorption :** Skin can absorb certain ointments oils, iodine etc through the openings of sweat glands and hair follicles, if rubbed into it. Therefore, the poisonous chemicals should not be allowed to come into direct contact with the epidermis.

(o) **Respiration :** Frog respires by skin. The main function of skin of frog is to exchange respiratory gases. Eat fish and marine snakes also.

(p) **In sexual selection :** Brillantly coloured skin, antlers of male deer, long tail coverts of peacock, etc. lead to sexual dimorphism and also serve to attract the female for mating.

(q) **Formation of enzymes :** The integuments of certain larvae of fish and frog produce enzymes which dissolve the covering around their body and help in hatching.

(r) **Formation of membrane bones :** The membrane bones develop in the connective tissue of dermis.

(s) **Brood pouches :** Under the skin of some fishes and amphibians protect unhatched eggs.

(iv) **Cutaneous receptors :** The skin receptors originate from the embryonic ectoderm but they are found in the dermis. They are lacking in the epidermis to avoid unnecessary stimulation. The various skin receptors are as follows –

(a) **Free nerve endings :** They are naked or non-capsulated ends of the nerves which form a network. They are algesireceptors *i.e.,* sensory to the pain.

(b) **Meissener's corpuscles :** They are capsulated, cylindrical corpuscles which are found in the dermal papilla. They are tangoreceptor and particularly sensory to the surface texture. They are more in the skin of teats, external genitalia (clitoris) and tips of the fingers, lips.

(c) **Merkel's discs :** They are non-capsulated & cup-like. They are found in the reticular layer of the dermis. They are tangoreceptors & particularly sensory to continuous touch.

(d) **Pacinian corpuscles :** They are bulb-like corpuscles which are encapsulated. Their capsule is comparatively thick. They are found deep in the dermis and also in adipose tissue. They are pressure receptors & also known to receive vibrations.

(e) **Krau's end bulbs :** They are encapsulated & found deeply in the dermis. They are frigido-receptors i.e., sensory to cold.

(f) **Ruffini's end organs :** They are non-capsulated & found deeply in the dermis. They are thermoreceptors or caloreceptors i.e., sensory to heat.

(g) **Herbert corpuscles :** It is found in mouth parts of birds.

(h) **Golgi corpuscles :** This is found in subcutaneous region of fingers (tangoreceptors).

(i) **Mazzoni corpuscles :** This is also found in subcutaneous region of fingers (tangoreceptors).

(j) **Grandry's corpuscles :** Beak of birds (tangoreceptors).

(k) **Ampullae of lorenzini :** Head, snout of scoliodon (thermoreceptor).

(l) Lateral line canal or Rheoreceptors – skin of fishes and tadpoles of amphibians (water current).

Important Tips

- When a frog is transferred from 20°C to 30°C its body temperature rises to 30°C.
- Animal having capacity of temperature regulation are warm blooded. e.g., Mammals, Birds
- Regulation of body temperature in a homoiotherm when the environmental temperature is high would involve dilation of blood vessels of the skin.
- Shivering in cold is a method for production of heat by muscular contraction.
- If a rabbit is fully shaved all over its body, skin will have difficulty in regulating body temperature
- The gland cells and nerve plexus lie in between outer and inner epithelial layers.
- Syncytial (multinucleate) epidermis is found in Ascaris.
- In the vertebrate eye, the transparent conjunctiva is formed from a continuation of the epidermis of the eyelids.
- If stratum corneum is removed from the soles of rabbit, sensation increases.
- New born babies do not generally shiver inspite of low temperature because of brown fat which has 20 times greater heat value than white fat.
- The number of melanocytes is quite uniform in the people of all human races.
- Melanoblasts occur in junction of dermis and epidermis.
- Cold blooded or poikilothermal animals are those in which body temperature changes with that of environment.
- Tricology : It is a study of hair and its disease.

2.2 DERIVATIVES OF SKIN

(i) **Hair or pili :** Presence of true, epidermal hairs in skin is a unique feature of mammals. Hair present in the skin are epidermal in origin and made of dead cells. In most mammals, hairs occur nearly upon the whole body surface except a few places such as glans penis, teats, under surface of prepuce, clitoris, labia minor, inner surface of ear pinnae and palms and soles in some forms. Small scales of dead keratinised epidermal cells among the scalp hair form dandruff. Hair also absent in aquatic mammals, except tactile virbrissae below the nose. Tactile vibrissae also found in herbivorous and carnivorous mammals. Sea otter found Californea in North America has thickest hair overbody. Normal air loss in an adult scalp is about 70 to 100 hairs per day. Both the rate of growth and replacement cycle may be altered by illness, diet, high fever, surgery, blood loss or severe emotional stress. Rapid weight loss diets that severly restrict calories or protein increase hair loss. An increase in the rate of shedding can also occur for 3–4 months after childbirth and with certain drugs and radiation therapy for cancer.

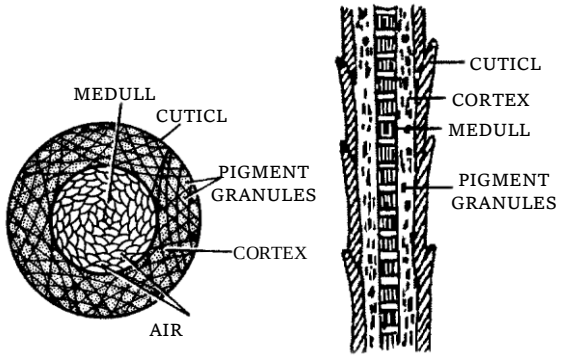


Fig. – T.S. of

(a) **Structure :** Hairs are made up of α-keratin. There are two types of keratins : α keratin and β keratin.

α -keratins contain many molecules of the sulphur containing amino acid cysteine and cystine and have abundant sulphur cross bridges between adjacent polypeptide chains. α keratin are major constituents of skin, horn, nail, wool and hair of mammal. β keratin by contrast have little or no sulphur or cross bridgeing and are soft protein such as those found in skin and scales of birds and reptiles. The hair are fine, cylindrical filaments. Each hair lies in a tubular pit called the hair follicle. The latter is formed by sinking in of the epidermis into the dermis. The base of the follicle is bulged out, forming an inverted cup. A mass of connective tissue with blood capillaries and nerve fibres fills this cup. This mass is called the hair-papilla. The pulp in hair is made up of blood and nerve. The wall of hair follicle is distinguished in to the strata called outer and inner root- sheaths. The outer sheath corresponds to the stratum spinosum of epiderms. The inner sheath comprises three layers.

(i) A delicate cuticle

(ii) Huxley layer – out side to cuticle composed of 2 sheath of horny & flattend but nucleated.

(iii) Henleys layer (outer most) single layer of cubical nucleated cell.

The blood capillaries provide nourishment to the hair and the nerve fibres make it sensitive to contact. The wall of the hair follicle is bulged out to form one or more lobulated oil or sebaceous glands. The base of the hair is expanded into a "bulb". Stratum germinativum of this "bulb" produces new cells that are gradually pushed out and get cornified. Addition of cornified cells results in the growth of the hair. The hair is thus, living only at the base, and consists of dead, cornified cells over most of its length. An arrector pili muscle of smooth fibres connects each hair follicle with the basement membrane of the epidermis. Its contraction squeezes the oil out of the gland and brings about movement of the hair. The part of the hair that lies within the follicle is termed the root and the part that projects out of the skin is called the shaft. Shaft is the keratinised part of hair. Hair shaft is lodged in follicle. Hair follicle is separated from the dermis by a non-cellular, hyaline membrane, the glassy membrane, which represents a thickening of the basement membrane. A hair shows 3 regions in cross-section :

(1) **Medulla :** A central pith, or medulla, with large vacuolated, two or three layers of polyhedral cells with pigmented granules and air space.

(2) **Cortex :** A middle cortex with heavily keratinised, compactly grouped, fusiform cells. Hair cortex contain shrunken cells and pigment**.** Cortex forms major part of shaft with pigmented granules in dark hair but mostly air in white hair.

(3) **Cuticle:** An outer cuticle of thin, heavily keratinised, overlapping cells having their free ends directed upward.

(b) **Functions**

(i) The covering of hairs upon mammalian body is called a pelage. Its primary function is protection. Often its colouration and colour patterns help in hiding from enemies and preys.

(ii) Hairs are basically meant for trap and cushion of air.

(iii) When pelage is dense, the air trapped in it provides thermal insulation against ill effects of environmental temperature, and loss of body heat. Thus, the pelage acts as a "temperature-proof blanket". That is why, mammals of cold regions, like the bears, possess thick pelage of long hairs.

(iv) In body reactions to such stimuli as pain, extreme cold, heat, burning, injury, fear, anger etc. the arrector pilli muscles contract due to effects of adrenaline hormone and sympathetic stimulation. Arrector pilli muscles are involuntary. These are elevator of the hairs. Their contraction reduces the obliquity of hair follicles, causing erection of the hairs. This is called "gooseflesh" or (cutis anserina). It enhances the protective and insulative functions of the pelage.

(v) The hairs are, in general, sensitive to touch (tactile) helping the animal in perceiving mechanical stimuli. The long and hard hairs, located upon the upper lip in rabbit and many other mammals and called vibrissae or whiskers (feelers) are especially meant for this function.

(vi) The eyelashes of eyelids serve to protect the eyes.

(vii) The hairs in nasal chambers trap particles of dust and other injurious matters, harmful micro-organisms and small insects etc. from the air inspired in breathing.

(viii) Many quadrapeds possess a thick tuft of longer hairs at the tip of their tails and use it in scaring away flies, mosquitoes and other insects that happen to sit upon their bodies.

(ix) The stiff bristles of pig's back, quills or spines of porcupine, scales of scaly anteater, horns of rhinoceros etc., are derivatives of hairs useful in tactile reception, offense and defense.

(x) Hair serves a protective function in the external ear canal and external neris.

(ii) **Scales**

(a) **Epidermal scales and scutes :** All the hard horny structures develop by the accumulation of a scleroprotein, known as *keratin*, in the cells of epidermis. Such cells are said to be keratinised or cornified, and they become dead. All stratum corneum cells are cornified and form hard horny exoskeletal structures like scales, beaks, horns, claws, nails, hoofs, feathers, hairs etc. in different vertebrates.

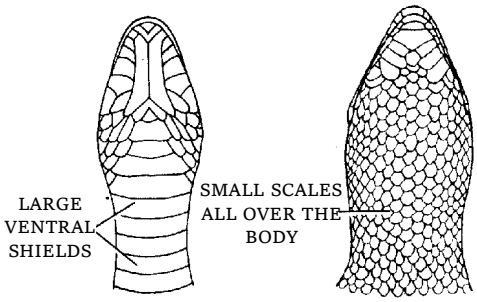


Fig. – Scales of snake

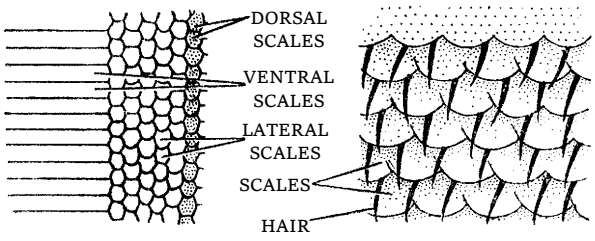


Fig. – Scales in snake

(1) **Reptiles :** Reptiles have a continuous outer covering of horny epidermal scales that prevents water loss through skin surface. Crocodilians and turtles have large, thick, rectangular scutes. The toothless horny beak of turtles, the rattle at the end of the tail of rattle snakes and horns of the horned toad (a lizard) are other modifications of stratum corneum in reptiles.

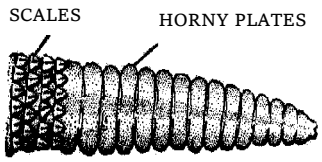


Fig. – Rattle of a rattle

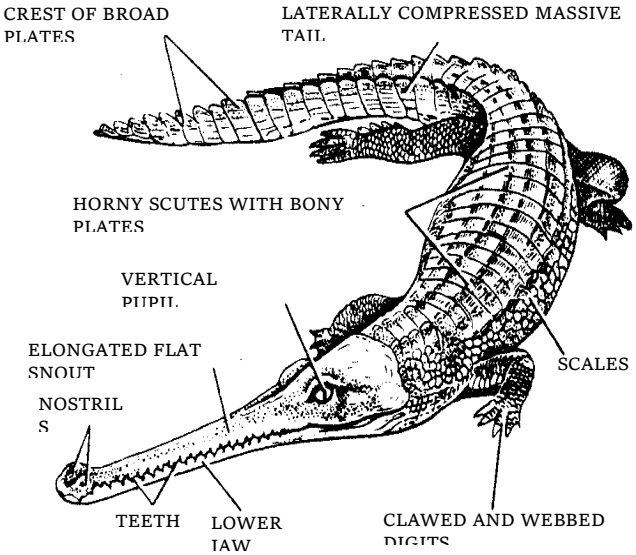
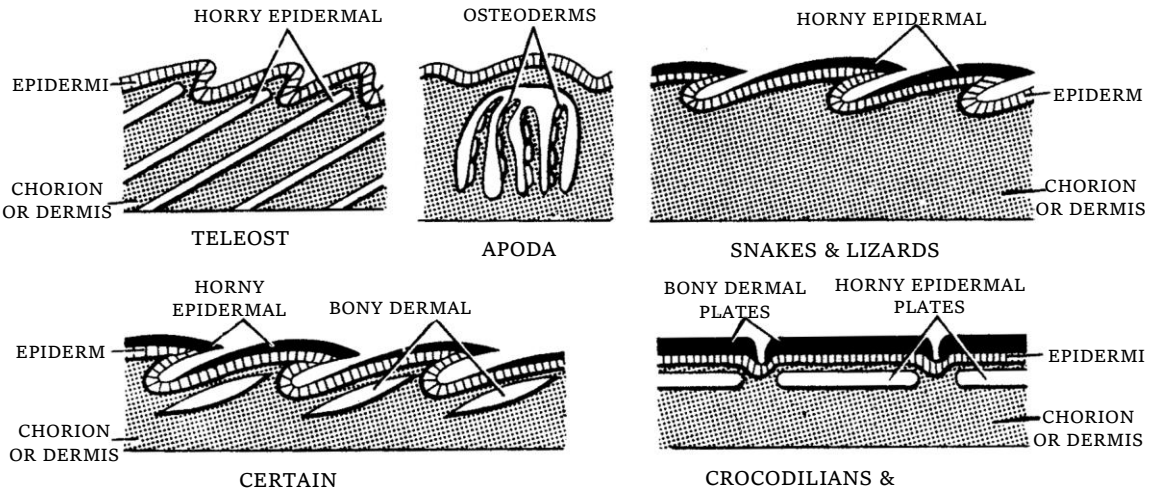


Fig. – Gavial or gharial Gavialis

(2) **Birds :** In birds, small epidermal scales are present on the lower leg, foot and base of beak. The sheath of beak (rhamphotheca) is also a modification of stratum corneum.



(3) **Mammals :** Reptile-like epidermal scales occur in some mammals also, such as on the feet and tails of rats or Rodents. The large scales on the body of a scaly anteater undergo ecdysis individually. In armadillos, large body scales become fused into plates and bands. They are supported beneath by dermal bony scales and do not moult. In armadillos and pangolins body is completely covered with epidermal scales.

(b) **Dermal scales and scutes :** Bony structures develop within the dermis are mesodermal in origin. The bony dermal scales are not shed but increase in size during life by the addition of new bone.

(1) **Fishes :** Bony or dermal scales develop in the dermis. In fishes, the overlying epidermis wears off so that the scales become exposed forming the exoskeleton. Five types of scales are known in fishes.

(i) **Cosmoid scales :** It occurred in extinct lobe finned fishes (crossopterygii).

(ii) **Placoid scales :** The base of the placoid scale is attached to stratum compactum by sharpey's fibres. It is found in elasmobranches (chondrichthyes) e.g. scoliodon fish.

(iii) **Ganoid scales :** These are present in ganoid fishes (chondrosteans & holosteans) e.g. polypterus, lepidosteus.

(iv) **Cycloid scales :** These rounded concentric scales round in bony fishes like rohu, catla (cyprinyforms).

(v) **Ctenoid scales :** These scales are characteristic of modern teleosts.

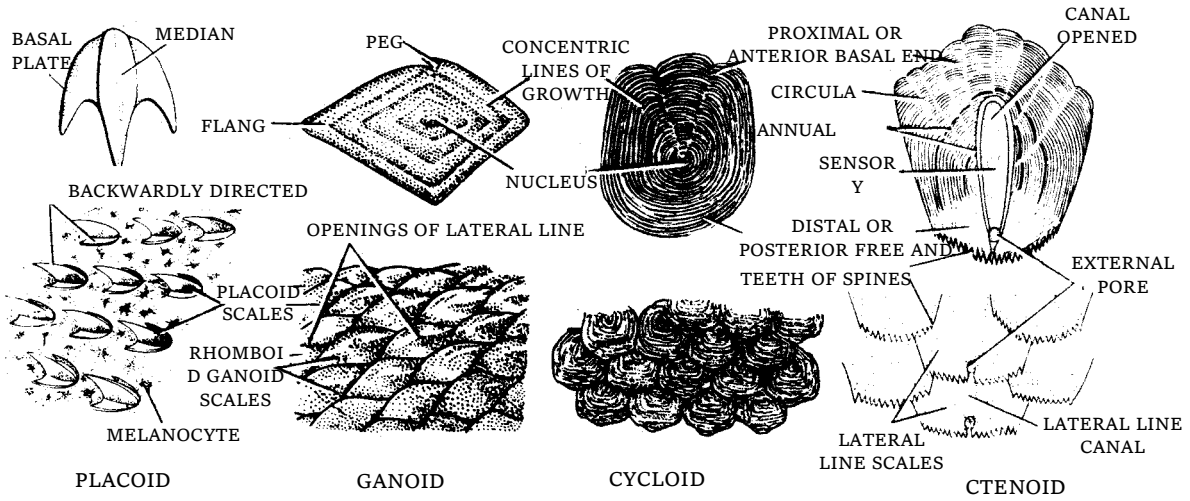


Fig. – Different types of dermal scales found in fishes. Lower row shows parts of skin with numerous scales. Upper row shows single scales.

Dermal fin rays : The fin rays supporting the fins of fishes are dermal in origin and are known as lepidotrichia. These are many jointed. Between lepidotrichia are found unjointed actinotrichia.

(2) **Amphibia :** Dermal scales or bony plates measuring 1 to 2 mm, called osteoderms, are found embedded in the pockets of dermis below epidermis, in some labyrinthodontia (stem amphibia), gymnophyona & few tropical toad, caecilians or apoda (amphibia). They also occur in the back of some tropical toads.

(3) **Reptiles :** A few lizards exhibit small dermal scales. Crocodiles and alligators have many oval bony plates embedded in the dermis of their back and neck. Osteoscutes are found in turtles & tortoises.

(4) **Mammals :** Amongst mammals, bony plates or osteoderms occur in armadillos and whales.

(iii) **Nails and Claws :** Each nail consists of nail body, free edge and a nail root. Nail root is buried in a fold of skin. The whitish semilunar area or proximal part of body near nail root is called lunula, best developed in thumb. The average growth in length of finger nails is about 1 mm (0.04 inch) per week. Nail growth is faster in summer and on the most used hands, in longer the digits nail growth is fast but growth rate is some what slower in toe nails. We do not feel pain in cutting our nail because nails are not supplied with nerves. Unguis or nail plate of man is made up of stratum lucidum.

Claws of reptiles, birds and mammals are identical in structure. A claw is made by a hard, pointed, narrow, curved, horny dorsal plate called unguis, and a less hard ventral plate, called subunguis, both enclosing the tip of the digit covering the last tapering phalanx. Claws are modified into nails which are characteristic of primates (mammals).

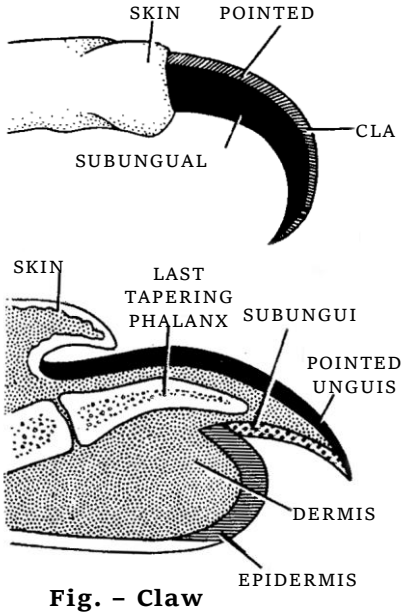


Fig. – Claw

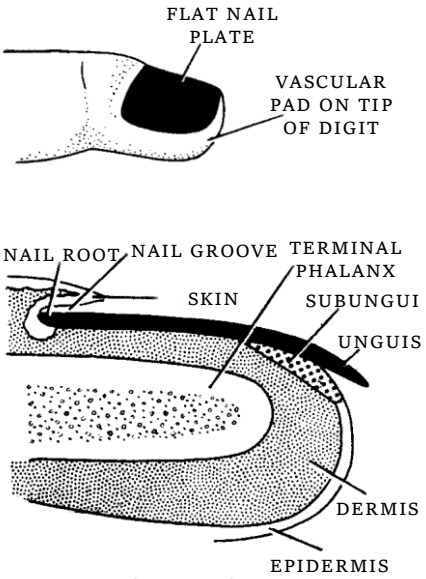


Fig. – Nail

(iv) **Horns :** Horns are found in hoofed mammals (Artiodactyla and Perissodactyla) only. They are present on their head and form organs of offense and defense. At least 5 types of horns are recognized, but all are not true horns, i.e. product of stratum corneum. Horns are out of growth of frontal bone, cover by stratum corneum.

(a) **True horns :** True or hollow horns usually occur in both the sexes in goats, sheep, cattle and others once damage never replace.

(b) **Prong horns :** The horns of prong-horned antelope (Antilocapra) are also true horns.

Fig. – Cattle (cow)

Fig. – Complete horn

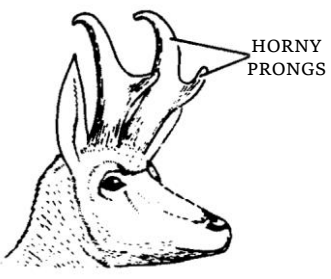


Fig. – Prong-horned antelope

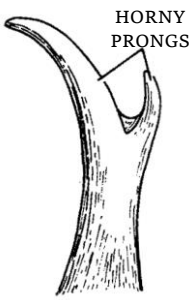


Fig. – Complete

(c) **Antlers :** Antlers are characteristic of deer family. They are found only on males but on both the sexes in reindeer and caribou. Antlers are annual growth and not true horns.

(d) **Giraffe horns :** Horns of giraffes are stunted, unbranched and permanent antlers present in both sexes.

(e) **Hair horns :** Hair horns or fibre horns are found in rhinoceros of both sexes, perched upon a roughened area of nasal bones. Indian rhino has a single horn, while the African species has two, one behind the other. These horns are entirely made of thick hairy and keratinised epidermal fibres fused together.

(v) **Hoofs :** These are characteristic of ungulates (hoofed mammals).

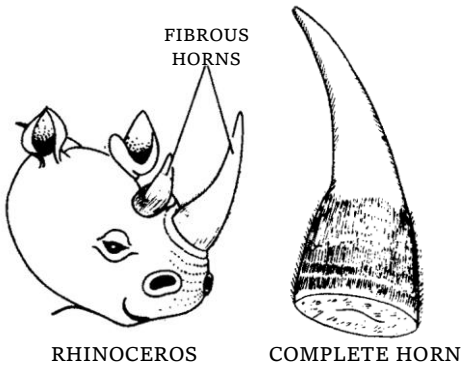


Fig. – Fibre horns

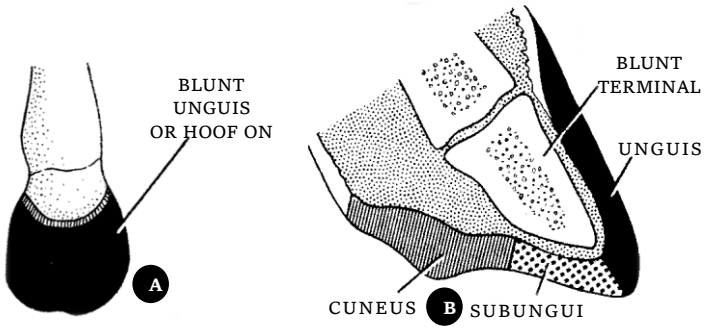


Fig. – Hoof

Claw, nails, hoof, whale bone plates of toothless whales and the horny covering of horn of sheep and cattle are modification of stratum corneum.

(vi) **Feathers :** Birds are covered by feathers which are not found in any other group of animals. They are dry, non-living and cornified products of stratum corneum of epidermis. These unique structures are light in weight, but strong, elastic and water-proof. Feathers are mainly five types such as quills, coverts, contours, filoplumes and down.

(vii) **Glands :** Cutaneous glands lie in the dermis but arise from the epidermis. Simple coiled tubular glands occur in the dermis of skin.

(1) **Sweat glands :** These are located in the dermis of skin. Sweat glands are also called sudoriferous glands. They are simple, tubular glands of merocrine type. Sweat glands are absent over lip margins in man. In rabbit, sweat glands are present in the lips. Large sweat glands are the characteristic of areola of mammae. Sweat glands are abundant on the pinna of hippopotamus. The secretion of sweat glands is red in hippopotamus and kangaroo.

The glands mostly secrete a watery (aqueous) fluid, called sweat, which contains 95% water and 5% of a number of metabolic wastes like those found in urine, namely chloride and phosphate salts, ammonia, urea, uric acid, ammonia, amino acid, glucose, lactic acid and ascorbic acid. Specific gravity of sweat 1.001 to 1.006 and *pH* of sweat is 3.8 to 6.5. There density can be as high as 450 per square centimetre (3000 per square inch in palm). Thus, the sweat is like diluted urine. When body

temperature tends to rise due to environmental heat, strenuous exercise, fever, etc., a lot of sweat is secreted (copious secretion = perspiration) under neural (sympathetic) and hormonal regulation. Evaporation of sweat from body surface, then, cools the body, reducing its increased temperature. Human beings normally secrete about half a litre of sweat per day in winters and two to three litres per day in summers, in fever and during exercise. Thus, sweat glands have a dual role of helping in excretion and thermo-regulation.

Sweat glands occur in the skin in most mammals except some like the spiny and scaly anteaters, moles, sirenians, cetaceans and some edentates also in prototheria. Two types of these glands are found – eccrine (merocrine) and apocrine. In eccrine glands, the secretion is discharged from the cells by simple diffusion without any damage to the cells. In apocrine glands, the secretion accumulates in apical part of each cell and, then, this part is pinched off from remaining cell and discharged as secretion.

Eccrine glands are always simple coiled tubular and best developed in primates, especially in man. Except the skin of lip borders, eardrums, clitoris, glans penis, nail beds, undersurface of prepuce, etc., sweat glands occur in whole of the remaining skin in man. These are, however, most plentiful in the skin of palms and soles. An average human being possesses nearly 2.5 million eccrine sweat glands Amongst other primates, these occur only in chimpanzee and gorilla. A few mammals, other than primates, also possess these glands, but only in the skin of feet or paws which come in contact with the ground.

Apocrine sweat glands occur in most mammals, including all primates. Mostly, these are also simple coiled tubular, but some are branched and less coiled. These are somewhat larger than eccrine sweat glands and secrete a relatively thicker sweat which may contain some fat protein, iron, carbohydrate, ammonia and pigment in addition to other normal constituents. In man, these are mostly confined to the skin of arm-pits (axillae), eyelids, around nipples and anus, pubic region, undersurface of prepuce, labia minora and other external genitalia. They are stimulated during emotional stresses and sexual excitement and the secretions are commonly known as “cold sweat”. Rabbits have these glands only around the lips. Horses, bears, dogs have these in the whole skin; deers around base of their tails; rats cats and mice in the paws; and sheep, goat, cattle, etc., in their muzzles. Secretions of these glands may be responsible for odours, colour of fur. The apocrine glands secrete an odourless milky fluid which may later produce an unpleasant odour due to bacterial degradation of substances present in the fluid. The most antiperspirants and deodorants contain zinc and aluminium compounds which check the activity of the glands and destory bacteria.

(2) **Sebaceous glands or Oil glands :** Sebaceous glands are found in dermis of skin of mammals. These glands occur almost all over the body except the hairless areas. They are holocrine glands. An oil gland arises as an outgrowth from the upper third of the hair follicle on the side of follicle slants. Often many sebaceous glands arise from each follicle. An oil gland opens by a duct generally into a hair follicle. It secretes an oily material, called sebum. Sebum contains fatty acids, waxes, protein, inorganic ions and steroids. It spreads along the hair to lubricate them. This makes the hair waterproof, keeps them soft and flexible. When sebaceous glands of face become inlarge because of accumulated sebum, black heads develop.

Sebum spreads onto the skin also. Here, it keeps the hair follicles free from dust and bacteria, forms a thin, water-proof layer over the skin to prevent water loss as well as water absorption. Check on water evaporation in winter helps to conserve body heat. Skin becomes dry during the winter because of vaso-constriction of sebaceous ducts. A few hairless sites also develop sebaceous glands. These include eyelids, papillae of breasts and labia minora, lips, nostrils, glans penis, nipples, clitoris, undersurface of ear pinna, prepuce etc, In man, these glands are more abundant in the skin of scalp, face, nostrils, ear, mouth and anus but absent in skin of sole and palms. Sebaceous glands are also absent in pangolins and marine mammals (Sirenia, cetacea) alos in prototherians. Secretion and cell proliferation are influeneed by factor like temperature, sex, hormone, age etc. Besides secreting sebum the cells of sebaceous glands probably synthesize vit. D_3 cholecalciferol, is produced in the skin by the action of sunlight upon Δ^{5-7} cholesterol. The first reaction in the conversion yield pre calciferol, In the second reaction a hydrogen on the C-19 methyl group migrates to C-9 producing cholecalciferol.

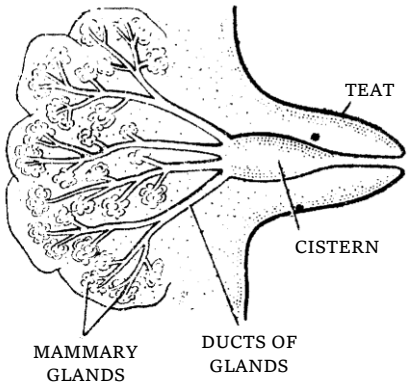


Fig. – V.S. Mammary

(3) **Mammary glands or milk glands :** Presence of milk-secreting mammary glands in ventral skin is, like the presence of hairs, another unique and universal characteristic of mammals. These are compound tubulo alveolar glands. Mammary gland are modified apocrine sweat glands. These glands occur in deep dermis or even in subcutaneous tissue and are normally functional only in lactating females. Prototherians posses only two groups of simple glands in abdominal wall. Rabbits generally possess four pairs of abdominal mammary glands. The first milk secreted following child birth is colostrum.

Since mammary glands are apocrine, the milk first accumulates in apical part of each cell and then, this part pinches off from the remaining cell and goes away in secretion. The broken cell is immediately repaired by regeneration. The milk, secreted by milk glands is used for suckling the youngs for nourishment. The milk is essentially of the same composition (proteins like casein, lactoglobulin and lactoalbumin, lactose and milk fat) in all mammals. The development and growth of mammary glands, and secretion and ejection of milk from these are controlled by certain hormones of ovaries, anterior pituitary and adrenal cortex. Mammary glands lie over pectoralis major, and are attached to them by a layer of deep fascia (dense irregular connective tissue). Mammary gland made up of loose aerolar connective tissue lobules containing alveoli, suspensory ligament of breast (cooper's ligament) and contractile myoepithelial cells. Each breast has one pigmented projection, the nipple, with circular pigment area of skin called areola. Areola appears rough due to presence of modified sebaceous gland. The growth of mammary galnds during puberty, under the control of estrogen hormone. Milk production is stimulated largely by prolactin hormone, with contributions from progesterone & estrogens. The ejection of milk occurs in presence of oxytocin, released from posterior pituitary gland.

Usually they occur only on females but are also present on males in monotremes (gynaecomastism), primates and some others. In monotremes the mammary gland lack nipples or teats and resemble modified sweat glands. In true teats (man, apes) ducts of mammary gland open separately

on the nipple. In false teats (ungulates) all duct empty into one cistern form a single tube leads to the tip of nipple.

(4) **Meibomian or Tarsal glands :** These are modified sebaceous glands found in the dense connective tissue plate (tarsus) that supports the free edge of each eyelid. These open into the follicles of eyelashes. Their oily secretion forms a thin film over the layer of lachrymal fluid (tear). The oily film normally holds the tear evenly over the surface of eyeball, preventing the tear from overflowing on to the cheeks. Their abnormal behaviour responsible for chalazian disease (non working). In chalazian disease formation of cyst or tumor on eye lids.

(5) **Harderian glands :** These are found on the inner side of the eye in many reptiles, birds and mammals. They lubricate the nictitating membrane. Among mammals only found in moles and aquatic mammals.

(6) **Glands of Zeis or sebaceous ciliary gland :** These are also modified sebaceous glands found in the skin of eyelids. These open into the hair follicles of eyelashes. Their secretion keeps the eyelashes smooth and supple. They responsible for sty diseases.

(7) **Lacrimal gland or Tear gland :** It occurs beneath the upper eyelid of many vertebrates. They secrete tear. Tear contains antibacterial enzyme lysozyme. Modified sweat glands on the eyelid of rabbit are known as Lacrimal glands. The fluid from this gland continually washes the front of the eye. Lacrimal fluid is a watery secretion with salt and mucus. In human each lacrimal gland produce 1ml secretion daily to clean, lubricate and moisten eyeball. Also help in blinking of eye lids. Over secretion and accumulation of tear, known as watery eyes. Water eyes also due to inflammation of nasal mucosa and blocks in lacrimal punclum aperture. Human are unique in expressing emotions, both happiness and sadness by crying. Lacrimal gland under the control of parasympathetic stimulation.

(8) **Ceruminous glands or Wax glands :** These are large modified apocrine sweat glands. They are present in the skin of external ear passages (auditory meatus). These secrete an oily substance. Their ducts often join the ducts of sebaceous glands to open into hair follicles. The mixture of the secretions of both types of glands forms earwax or cerumen. Airborne particles of dust and other matters and insects and other small organisms that happen to enter into the ear passages, become entangled in earwax thus the wax protects the eardrum.

(9) **Perineal or Inguinal glands :** These are a type of scent glands found in the skin of perinaeum and around genital organs and anus of rabbits. Anal gland is a scent gland of mammals. It is a gland whose secretion helps in the attraction of opposite sex. These are also modified apocrine sweat glands. Their milky secretion is highly odorous and responsible for the characteristic smell of rabbits. Many other mammals possess different kinds of scent glands at different locations. These may be modified sweat or sebaceous glands. Sent glands may occur between toes on feet (goat, rhino, horse), near eye on head (deer family), navel on abdomen (musk deer), mid dorsally on back (kangaroo, rats and dipodomys), around anus (shunks, many carnivores and rodents), etc. cloacal sent gland occur in epidermis of alligator.

(10) **Mucous glands :** They secrete mucin which forms slimy or sticky mucus on coming in contact with water. Mucous keeps the skin moist and slippery and protects against harmful bacteria and

fungi. They are abundant in amphibian skin. These are not found in mammals as the skin is not respiratory.

(11) **Poison glands :** Many fishes and amphibians have poison glands. These are modified multicellular cutaneous glands larger but fewer than mucous glands. The parotid glands behind the head of toads are aggregations of poison glands. Secretion of poison glands may be bitter, irritating and even dangerous to the predators. The mucous and poison glands are found in the skin of frog. These are specially abundant in the lateral dermal plicae.

(12) **Luminescent glands or Photophores :** In deep-sea luminious teleost fishes, like lophius and cyanoglossus or pleuronectus certain multicellular epidermal glands serve as light-emitting organs, known as photophores. In one type of photophore, the superficial layer of mucous cells forms a magnifying lens, lower or basal part consists of luminious cells surrounded below by reflecting pigment cells. Light emitted is not intense, may be of many hues, and serves to attract preys.

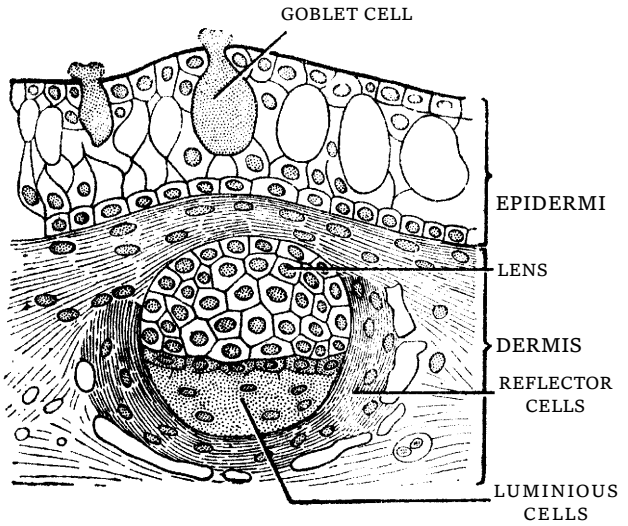


Fig. – V.S. Skin of a luminious fish showing

(13) **Femoral glands :** These are found in male lizards (e.g., Uromastix) on the ventral surface of each thigh, in a single row from knee to cloacal aperture. Their sticky secretion hardens in air to form temporary tiny spines that serve to hold the female during copulation.

(14) **Uropygial gland or preen gland :** It is one of the few integumentary glands found in birds, forming a prominent swelling just above the tail or uropygium. It is branched and alveolar and exudes an oily secretion used for lubricating beak, preening feathers and attracting the opposite sex. No skin glands occur in birds with the exception of a uropygial or preen gland on tail, which is particularly well developed in aquatic birds.

(15) **Tyson glands :** These are modified sweat glands. These are found on the skin of Glans-penis. These glands secrete a viscous fluid called smegma, which lubricates the glans penis during copulation

(16) **Moll gland :** These are sebaceous gland found in human.

(17) **Musk gland :** Are located over head in elephant, musk turtle and in alligators its location in the throat and cloaca. Below eyes in antelopes, at the base of neck in marsupials, on feet in rhinoceros producing attractive smell. These are type of sent glands.

(18) **Pterygopodial gland :** Found in the claspers of cartilagenous fishes, for its lubrication.

(19) **Stink glands :** In the cloaca of snakes for defence.

(20) **Civet glands :** It is present in certain carnivores, open into rectum just inside the anus

(21) **Mental glands :** It is found in male salamanders below chin to attract ot for copulation.

(22) **Sticky glands :** It is found in pads of male frogs and toad for grasping their ot.

(23) **Krause's gland :** Eye lids.

(24) **Woldeyeis gland :** Eye lids.

(24) **Bruchi gland :** Eye lids.

Important Tips

- Paniculus carnosus muscles are responsible for moving and shaking the skin.
- The glomus in skin of man functions in thermo-regulation.
- Prophylaxis response of the skin is due to the release of excessive histamine.
- Otter is an endotherm.
- During hibernation the body temperature of the warm blooded animals remains slightly higher than that of the surroundings due to the combined action by skin and the deposited fat beneath it.
- Cold sweat – Sweating on palms and soles in response to psychic stimuli instead of thermal stimulus.
- Lanugo – A temporary coating of fine hair developed by the foetus in all mammals. It is usually shed before birth.
- Spines – Spines of hedgehog, spiny anteater and porcupine are modified hair.
- Dermatoglyphics – The study of fingerprints.
- Bradykinin – When body temperature rises, the sweat glands release a potent vasodilator peptide, bradykinin which dilates blood vessels to lose heat quickly.
- Blushing – Results from vasodilation, perhaps through bradykinin, that sends more blood to the face.
- Seborrhoea – Oversecretion of sebaceous glands is called seborrhoea. It is noticeable on the face of some persons.
- Sty (Hordeolum): It is caused by infection of small sebaceous glands (glands of Zeis) opening into the hair follicles of eyelashes.
- Grey hair – Grey hair in humans result from a reduction in pigment and reflection of light from an increased number of air spaces in the hair.
- Mastology – The study of mammary glands is termed as mastology.
- Athlete's foot – A superficial fungus infection of skin of the foot.
- Epidermal wounds do not bleed because there are no blood vessels in epidermis.
- Coronary pad is epidermal modification in the form of pad like structure found at knee joint of camel and ischial part of monkey.
- In new born baby except head and eyelid hairs, rest of body with short, fine and unpigmented hairs called vellus hairs.
- At puberty much of vellus hairs replaced by permanent hair, specially in pubic and axillary hair,

called terminal hairs.

- Mucous gland of frog land poison gland of toad are modified simple alveolar gland.
- Arrangement are distribution of foetus called pterylosis.

ASSIGNMENT

EPIDERMIS

Basic Level

1. What kind of epithelium the skin epidermis in mammals is
(a) Glandular (b) Stratified squamous (c) Sensory (d) Simple squamous

2. Stratum lucidum is found in
(a) Dermis and secretes keratin (b) Epidermis and of root hair follicle originate
(c) Epidermis and found below stratum corneum (d) Dermis

3. Colouration in frog and other amphibians is due to
(a) Algae upon skin (b) Iridescence (c) Chromatophores (d) Keratin

4. Which kind of epithelium is the stratum germinativum
(a) Squamous (b) Cuboidal (c) Columnar (d) Ciliated

5. Vertebrates other than birds and mammals can change the colour of skin to certain extent, because they possess
(a) Chromatophores (b) Melanosomes (c) Melanocytes (d) Melanophages

6. In albinism, the absence of the following pigment makes the skin and hair very light coloured
(a) Chlorophyll (b) Melanin (c) Carotene (d) Haemoglobin

7. Epidermis of the skin is specialized for
(a) Protection (b) Respiration (c) Absorption (d) All of these

8. External layer of the skin is formed by
(a) Dermis (b) Scaly stratum corneum
(c) Columnar stratified epithelium (d) Simple columnar epithelium

9. Epidermis is the derivative of embryonic
(a) Mesoderm (b) Ectoderm
(c) Endoderm (d) Ectoderm and mesoderm both

10. The living and dividing layer of epidermis is
(a) Stratum granulosum (b) Stratum corneum
(c) Stratum germinativum (d) Stratum spongiosum

11. The layer of epidermis which prevents the entry of water and other substances in the body
(a) Stratum spongiosum (b) Stratum granulosum
(c) Stratum germinativum (d) Stratum corneum

12. In man, melanophores are situated in
(a) Stratum compactum (b) Stratum spongiosum
(c) Stratum germinativum (d) Stratum corneum

13. Synthesis of vitamin D is the function of
(a) Epidermis (b) Dermis (c) Sebaceous gland (d) None

14. Which is outermost layer of skin
(a) Stratum corneum (b) Stratum granulosum (c) Stratum lucidum (d) Stratum basale

15. Ecdysis is the removal of
(a) Stratum malpighi (b) Dermis (c) Stratum corneum (d) Entire epidermis

16. A person who does hard manual work with his hand is likely to develop
(a) Thick subcutaneous fat in his palms (b) Thick epidermis on his palms
(c) Greater number of sweat pores on his hands
(d) Greater quantity of melanin all over the body

17. Stratum germinativum is found in
(a) Epidermis of skin (b) Around the bones (c) Large intestine (d) Oesophagus

18. Which of the following body wall is regenerative
(a) Epicardium (b) Endothelium (c) Dermis of skin (d) Epidermis of skin

19. Stratum Malpighii is a part of
(a) Epidermis (b) Startum spongiosum (c) Stratum compactum (d) Renal tubule

20. In the vertebrate eye, the transparent conjunctiva is formed from
(a) A continuation of the epidermis of the eyelids (b) Stratum corneum of skin
(c) Stratum compactum of skin (d) Stratum spongiosum of skin

21. In the old age of man, the skin gets wrinkled because of
(a) Gradual loss of elasticity in the subcutaneous layer
(b) Gradual loss of adipose tissue present below dermis
(c) Poor supply of blood to the skin (d)None of the above

22. Epidermis of skin does not contain
(a) Blood vessels (b) Epithelial cells (c) Fibrils (d) Melanin granules

23. The thinnest skin is present on the
(a) Eyelids (b) Soles of feet (c) Back of the hand (d) Forehead

24. Melanoblasts lie
(a) In stratum corneum (b) In stratum malpighi
(c) At the junction of epidermis and dermis (d) In dermis

25. Layer of skin which is called barrier layer is
(a) Stratum corneum (b) Stratum lucidum
(c) Dermis (d) Stratum germinativum

26. The layer which is best developed in the epidermis covering palms and soles
(a) Stratum corneum (b) Stratum lucidum (c) Stratum granulosum (d)All the above

27. Which stratum layer helps to add new cells to the epidermis
(a) Malpighian layer (b) Stratum granulosum (c) Stratum lucidum (d) Stratum corneum

28. Identify the false statement
(a) An areolar connective tissue is present in dermis and underlying musculature of body
(b) Melanocytes contain carotene
(c) The connective tissue fibres
(d) Dermis forms a strong elastic covering

29. All the glands and keratin structure in the rabbit are derived from
(a) Stratum granulosum (b) Stratum germinativum (c)Stratum lucidum (d) Stratum spinosum

30. Identify the layer of skin whose cells continue to divide mitotically throughout life
(a) Stratum spinosum (b) Stratum corneum
(c) Stratum germinativum (d) Stratum lucidum

31. Colouration in frog is due to
(a) Iridescence of skin (b) Presence of melanophores
(c) Growth of algal colonies on the skin
(d) Presence of special chromatophores below the epidermal cells

32. In the skin of frog, the cells of stratum germinativum are
(a) Living and flat squamous (b) Dead and flat squamous
(c) Living and columnar (d) Dead and columnar

Advance Level

33. The tergal sclerites of thorax in insects are termed as
(a) Pronota (b) Nota (c) Pleuron (d) Sternae

34. In frogs the stratum corneum of skin contains
(a) Living nucleated columnar cells
(b) Living non- nucleated flattened cells
(c) Dry non-nucleated flattened squamus epithelial cell
(d) Non-living nucleated columnar cells

35. Select the correctly matched pair
(a) Keratin – Stratum Malpighi (b) Eleidin – Stratum corneum
(c) Keratohyaline granules – Stratum lucidum
(d) Polyhedral cell layer (6-7) – Stratum spinosum

36. Keratohyalin granules are present in the cells of
(a) Dermis (b) Stratum lucidum (c) Stratum granulosum (d) Stratum spinosum

37. The hyaline, non-stainable layer of shiny and refractile cells in the integument of rabbit is called
(a) Stratum germinativum (b) Stratum spinosum
(c) Stratum granulosum (d) Stratum lucidum

38. Which of the following is a transitional layer of skin
(a) Stratum lucidum (b) Stratum granulosum
(c) Stratum spinosum (d) All of these

39. Which one of the following animal contains idiophores in its integument
(a) Parrot (b) Dog fish (c) Orang utan (d) Siren

40. Slough is
(a) Outermost layer of stratum corneum periodically cast off
(b) Stratum corneum shed off in small fragments
(c) Stratum corneum shed off in one piece (d) None of the above

41. Melanin is present in the
(a) Stratum spongiosum (b) Stratum germinativum only
(c) Stratum germinativum and hair (d) Whole skin

42. Shining substance present in stratum lucidum is
(a) Keratohyalin (b) Eleidin (c) Both (a) and (b) (d) None of these

43. An enzyme which is involved in the production of melanin is
(a) Amylase (b) Proteolytic enzyme (c) Dopaoxidase (d) All of these

44. The prickle-cell layer of the skin is
(a) Stratum spinosum (b) Stratum corneum (c) Stratum germinativum (d)None of these

45. Prickle cell are present in
(a) Skin (b) Intestine (c) Kidney (d) Ureter

46. Skin of a vertebrate develops from
(a) Epidermis (b) Ectoderm (c) Mesoderm (d) Both (b) and (c)

47. If a frog is kept in water for some time, it sheds pieces of a thin epithelium from skin. This epithelium is
(a) Squamous (b) Cuboidal (c) Ciliated (d) Columnar

48. Chromatophores in skin of frog are found in stratum
(a) Corneum (b) Compactum (c) Germinativum (d) Spongiosum

49. Layer of actively dividing cells in skin of frog is termed as stratum
(a) Corneum (b) Malpighi (c) Spongiosum (d) Compactum

50. Vitamin D_3 is produced in the skin by the action of sunlight upon
(a) Cephano-cholesterol (b) Δ 5,7 -cholesterol (c) 1,4 dihydroquinone (d) All of these

51. Melanoblasts lie
(a) In dermis (b) In stratum corneum
(c) In stratum lucidum (d) At the junction of epidermis and dermis

52. Cells of stratum corneum are
(a) Nonliving, flattened, keratinized, without nucleus (b)Nonliving, nucleated, without keratin
(c) Living, without nucleus (d)Living, nucleated

53. Had the dead keratinized cells of stratum corneum of our skin been living cells, the most important disadvantage to us would have been
(a) Stopping of perspiration (b) Growth of bacteria upon skin
(c) Entrance of bacteria into body through skin (d) Stopping of hair growth upon skin

DERMIS

Basic Level

54. Dermis is the derivative of embryonic
(a) Mesoderm (b) Ectoderm
(c) Endoderm (d) Ectoderm and mesoderm both

55. The leather is formed from one of the following layer
(a) Epidermis (b) Stratum spongiosum
(c) Stratum compactum (d) Both (b) & (c)

56. Heat insulating layer of skin is
(a) Stratum spongiosum (b) Stratum corneum
(c) Stratum malpighi (d) Fat layer below the dermis

57. Folded upper part of dermis is known as
(a) Skin papilla only (b) Dermal papilla only (c) Hair papilla only (d) (a) and (b) both

58. Leather from mammalian skin is derived from
(a) Epidermis (b) Dermis (c) Subdermal tissue (d) Whole skin

59. Formation of leather is called
(a) Taxidermy (b) Tanning (c) Both (a) and (b) (d) None of these

60. Preservation of whole skin is
(a) Tanning (b) Taxidermy (c) Both (a) and (b) (d) None of these

61. In mammalian skin, adipose tissue is found
(a) In the epidermis (b) In muscles (c) Both (a) and (b) (d) Below the dermis

62. Fat in the body are stored under the skin as

63. Due to weakening of collagen fibres, skin gets stretched. For its control, the proper diet is
(a) Protein (b) Fat (c) Carbohydrates (d) All the above

64. Adipose cells or fat cells occurring mostly in subcutaneous portion of the body are classed as
(a) Connective tissues (b) Epithelial tissues (c) Nucleus tissues (d) Special cells

65. Which is a vascular layer of skin
(a) Epidermis (b) Dermis (c) Both (a) and (b) (d) None of these

66. Leather for shoes is obtained from dermis because
(a) It is cellular (b) It becomes harder
(c) It is compact and elastic (d) It is naturally cast off by ecdysis

67. Corium is another name for
(a) Epidermis (b) Dermis (c) Both (a) and (b) (d) None of these

Advance Level

68. Brown fat is found in
(a) Human babies (b) Certain rodents (c) Both (a) and (b) (d) None of these

69. Which of the following is correct

(a) Dermis of frog contains melanophores (b) Epidermis of frog has only stratum corneum

(c) Hair is dermal derivative (d) Sebaceous gland secretes watery substance

70. Simple coiled tubular glands are found in

(a) Dermis of skin (b) kidney (c) Liver (d) Spleen

71. Panniculus adiposus is

(a) Horney layer of skin (b) Fat deposits

(c) Subcutaneous layer rich in fatty connective tissue

(d) Found only in palms of the hands

72. New born babies do not generally shiver inspite of low temperature because of

(a) The skin is not covered by hairs

(b) Brown fat which has 20 times greater heat value than white fate

(c) White fat having 20 times greater heat value than brown fat

(d) The skeleton not very strong

73. Which of the following is not a part of dermis of skin

(a) Nerves (b) Sense organs

(c) Muscle fibres (d) Stratum germinativum

74. What is not true about the dermis of rabbit's skin

(a) Pain receptors (b) Touch receptors (c) Olfactory sensillae (d) Thermoreceptors

75. Dermis does not contain

(a) Blood vessels and lymph vessels (b) Pigment cells

(c) Yellow elastic fibres (d) Gustatory sensilla

76. Capillary loops of dermis that project into epidermis play an important part in

(a) Thermoregulation (b) Mechanoreception (c) Olfaction (d) Gustation

FUNCTION

Basic Level

77. The organ responsible for regulation of water is

(a) Liver (b) Heart (c) Lungs (d) Skin

78. Function of integument is

(a) Excretion (b) Absorption (c) Protection (d) All of these

79. Integument does not perform the function of

(a) Absorption (b) Circulation (c) Excretion (d) Protection

80. The expansion of pigment in the skin is stimulated mainly by

(a) Vitamins (b) Ultraviolet rays (c) Infra-red rays (d) Vitamin D

81. Pigmentation of skin is due to the presence of

(a) Heamocyte (b) Melanin (c) Leucocyte (d) Thesocyte

82. Mammalian skin is

(a) Permeable to water (b) Impermeable to water

(c) Impermeable to oil (d) Impermeable to ointments

83. Sebum acts as a

(a) Lubricant (b) Protective substance (c) Antibacterial agent (d) All of these

84. The capacity of mammals to raise their hair erect by muscles attached to hair follicles is primarily concerned with

(a) Frightening enemies (b) Faster evaporation of sweat for cooling

(c) Greater insulation for preservation of body heat

(d) Greater perception of contact stimuli

85. Melanin protect us from

(a) X-rays (b) UV rays (c) Infrared rays (d) Visible rays

86. Which of the following is correctly matched

(a) Saliva- taste of food (b) Humerus – hind limb

(c) Sweat – temperature regulation (d) Sebum – sexual attraction

87. In albinism, the absence of following pigment makes the skin and hair very light- coloured

(a) Melanin (b) Chlorophyll (c) Carotene (d) Haemoglobin

88. The function of skin is

(a) Storage of food only (b) Control of heat loss

(c) Removal of excretory substances of the body (d) All of these

89. Which of the following organ of the body is called as *"jack of all trades"*

(a) Liver (b) Brain (c) Heart (d) Skin

90. One of the following directly helps in keeping the body warm

(a) Sweat gland (b) Connective tissue (c) Adipose tissue (d) Hairs

91. One of the main function of frog's skin is

(a) Diffusion of respiratory gases

(b)Absorption of ultraviolet rays to produce vitamin D

(c) Excretion of nitrogenous waste in the form of uric acid

(d) Storage of excess food in the form of subcutaneous fat

92. Skin is called " jack of all trades" because it

(a) Gives shape to the body (b) Protects the body

(c) Is the most incomplete organ (d) Performs various functions

93. The skin of mammals is primarily meant to

(a) Beautify the body (b) Cause sexual difference

(c) Help in the prevention of radiation (d) Act as the organ of body protection

94. Which one of the following features of human skin tends to facilitate evaporation of water from its surface

(a) Presence of melanin (b) Dry, dead cells of stratum corneum

(c) Thick subcutaneous fat (d) Presence of sweat glands and their secretion

95. Maintenance of high body temperature helps mammals in carrying fast

(a) Reproduction (b) Digestion (c) Respiration (d) Locomotion

96. Elephant is an inhabitant of hot climate. This is suggested by

(a) Its huge size (b) Allmost hairless skin (c) Small eyes (d) Fleshy feet

97. Dense fur in temperate animals protects these from

(a) Snow (b) Air (c) Enemies (d) Cold

98. Bears have thick fur because these animals live in

(a) Hot climate (b) Dangerous conditions (c) Cold climate (d) None of these

99. Perspiration in mammals mainly helps in

(a) Keeping skin moist for cutaneous respiration

(b) Maintaining body temperature at constant level by losing heat

(c) Elimination of nitrogenous waste matter

(d) Getting rid of excess water from body

100. Temperature regulation in mammals involves

(a) Increase in the body temperature with an increase in the environmental temperature

(b) Decrease in the body temperature with an increase in the environmental temperature

(c) Increase or decrease in the body temperature with the rise or fall in the environmental temperature

(d) Maintenance of a constant body temperature with the increase or decrease in the environmental temperature

101. When a frog is transferred from 20^{o}C to 30^{o}C, its body temperature

(a) Rises to 25^{o}C (b) Rises to 30^{o}C (c) Falls to 15^{o}C (d) remains unchanged

102. Normal temperature of human body is

(a) 98.6^{o}F (b) 96^{o}F (c) 96.8^{o}F (d) 92^{o}F

103. Normal body temperature of a rabbit is

(a) 96^{o}F (b) 98.6^{o}F (c) 32^{o}F (d) 92.0^{o}F

104. Warm-blooded animals besides mammals are

(a) Reptiles (b) Fishes (c) Frogs (d) Birds

105. While walking in sunshine the face generally becomes reddish. This is due to

(a) Release of more blood by the spleen into circulatory system

(b) Widening of the capillaries of the skin to allow more blood flow under the skin

(c) Oozing out of certain blood cells through the pores of the skin

(d) Breakdown of some haemoglobin in the skin

106. Cold-blooded animals are those in the which body temperature

(a) Remains constant

(b) Changes with that of environment

(c) Remains few degrees higher than environmental temperature

(d) Remains a few degrees lower than environmental

107. In rabbit, conservation of heat and maintenance of body temperature is controlled by

(a) Pilo- erection of hairs (b) Increased output of the adrenaline

(c) Shivering (d) All of the above

Advance Level

108. Whale is a warm-blooded animal. It survives in cold seas. Its main device for keeping warm is thick

(a) Blubber (b) Blood vessels (c) Muscles (d) pelage

109. The term 'blubber' refers to

(a) A substitute for natural rubber (b) A subcutaneous deposition of fat in whales

(c) The irregular heart beat sounds (d) None of these

110. Thermoregulatory centre in mammals is located in

(a) Skin (b) Pituitary (c) Diencephalon (d) Hypothalamus

111. Homoiothermal animals are those in which

(a) Body temperature changes with that of environment

(b) Body temperature first changes according to environmental temperature but soon returns to normal constant level

(c) Body temperature always remains constant

(d) Body temperature remains at constant level for some time but ultimately changes according to environmental temperature

112. When a bird is transferred from 30^{o}C to 10^{o}C its body temperature

(a) Remains at original constant level due to increased conservation and production of heat

(b) Is maintained at original level due to increased dissipation of heat

(c) Declines due to increased dissipation of heat

(d) Rises above normal due to increased production and conservation of heat

113. Animals having capacity of temperature regulation are

(a) Aquatic (b) Cold-blooded (c) Warm-blooded (d) All of these

114. Temperature regulation within the body is helped by

(a) Decreasing urination (b)Blood circulation

(c) Changing rate of digestion (d) None of these

115. The glomus in skin of man functions in

(a) Excretion (b) Thermoregulation

(c) Chemoreception (d) Protection from micro organisms.

116. Maintenance of the body shape, protection from foreign harmful bodies and the secretion is the function of

(a) Only epidermis (b) Stratum compactum

(c) Only dermis (d) Skin as a whole

117. The following vertebrate respires by skin

(a) Fish (b) Frog (c) Crocodile (d) Whale

118. Mucous glands are not found in skin of mammals because

(a) Skin does not respire (b)Skin is not slimmy

(c) Skin does not have vessels (d) Outer skin is having strata of cells

119. In rabbit the thermo- regulation of body is basically

(a) A clear case of neuroendocrine synergism

(b) An endocrine based phenomenon

(c) A neural process

(d) A compound sensory- neuroendocrine/ integrative mechanism

120. Which one of the following muscles are responsible for moving and shaking the skin

(a) Arrector pili (b) Collagen fibres

(c) Paniculus carnosus (d) Sphincter muscles

121. In human skin which of the following prevents evaporation of water from its surface

(a) Sweat glands and their secretion (b)Thick subcutaneous fat

(c) Black pigment, the melanin (d)Dry dead cells of stratum corneum

122. If a rabbit is fully shaved all over its body

(a) Skin will start secreting oil (b)Skin will stop sweating

(c) Skin will have difficulty in regulating body temperature

(d) Skin will start sweating

123. Metachrosis is a phenomenon in which

(a) Colour of the skin changes by age

(b) Colour of the skin changes during reproduction

(c) Colour of the skin changes with the colour of external environment

(d) None of these

124. Lipophores is another name of

(a) Melanophores (b) Xanthophores (c) Guanophores (d) Irridocytes

125. Arrector pilli muscles contract due to

(a) Extreme cold

(b) The effects of adrenaline hormone and sympathetic stimulation

(c) (a) and (b) both

(d) None of the above

126. During hibernation the body temperature of the warm blooded animals remains

(a) Same as that of surroundings

(b) Normal because of the accumulated fat under the skin prior to hibernation

(c) Normal because skin can regulate it

(d) Slightly higher than that of the surroundings due to the combined action by skin and the deposited fat beneath it

127. Metachrosis is not exhibited by

(a) Rabbit (b) Man (c) Monkey (d) All the above

128. Which of the following substance present in the sebaoceous gland cells of humans is transformed into vitamin D on exposure to UV-light

(a) Tyrosine (b) Methionine (c) Ergosterol (d) Bilirubin

CUTANEOUS RECEPTOR

Basic Level

129. Sensory corpuscle is present in the

(a) Stratum malpighi (b) Stratum compactum (c) Stratum spongiosum (d) Stratum granulosum

130. If stratum corneum is removed from the soles of rabbit

(a) Sensation increases (b) Sensation decreases (c) Sweating decreases (d) Sweating increases

131. Golgi and Mazzoni corpuscles are found in

(a) Epidermis of mammal (b) Nasal chambers

(c) Finger's subcutaneous tissue (d) None of the above

132. Herbert corpuscles are found in

(a) Ligaments and tendons (b)Buccal cavity of birds (c)Skin of mammals (d) Rectum of frog

133. In the deep layer of skin the receptors of pressure are known as

(a) Pacinian corpuscles (b) Corpuscles of Ruffini

(c) Krause's end bulbs (d) Meissner's corpuscles

134. Corpuscles of Ruffini are for the detection

(a) Cold (b) Pressure (c) Touch (d) Temperature

135. In human's skin Merkel's discs are

(a) Thermoreceptors (b) Algesireceptor (Pain)

(c) Vibroreceptors (d) Tangoreceptors (tactile)

136. Pain receptors of skin are called

(a) Tangoreceptors (b) Algesireceptors

(c) Meissner's corpuscles (d) Merkel's cartilage

Advance Level

137. Meissner's corpuscles are located in

(a) Adrenal cortex and secrete mineral corticoids (b) Pancreas and secrete trypsinogen

(c) Skin to perceive gentle pressure (d) Spleen to destroy worn out cells

138. The Pacinian (Vater's) corpuscles present in the skin are for

(a) Pain (b) Pressure (c) Temperature (d) Movement

139. Pacinian corpuscles occur in the skin of certain parts of body in mammals. These are

(a) Type of glands (b) Pain receptors

(c) Naked tactile receptors (d) Encapsulated pressure receptors

140. Which of the following is not a tangoreceptor

(a) Merkel's cartilage (b) Pacinian corpuscles

(c) Meissnei's corpuscles (d) Algesireceptors

141. Nipples and external genitalia contains abundance of

(a) Algesireceptors (b) Propioceptors (c) Visceral receptors (d) Pacinian corpuscles

142. The vibrissae of rabbit contain

(a) End organs of Ruffini (b) End bulbs of Krause

(c) Merkel's cartilage (d) Naked sensory ending

143. Select the correctly matched pair

(a) Vibroreceptor – Vibrissae of rabbit (b) End organs of Ruffini – Cold receptors

(c) End bulbs of Krause – Sensitive to heat (d) Genital corpuscles – Lips of rabbit

144. Select the pair that does not match

(a) Meissner's corpuscles - Algesireceptor (b) Pacinian corpuscles – Tangoreceptor

(c) Genital corpuscles – Present on glans penis of male

(d) Frigidoreceptor – End Bulb of Krause

DERIVATIVES OF SKIN

Basic Level

145. Hair are basically meant for

(a) Beautify the body (b) Organs of defence

(c) Sexual dimorphism (d) Trap and cushion of air

146. The hair of mammal is a structure which is

(a) Epidermal (b) Mesodermal (c) Dermal (d) Endodermal

147. The pulp in hair is made up of

(a) Blood vessels only (b) Blood and connective tissue

(c) Blood and nerve (d) None of these

148. Whitening or greying of hair is due to

(a) Old age (b) Absence of melanin formation

(c) Stoppage of melanin formation (d) Heredity

149. Which of the following structure in skin of rabbit is closely associated with the hair

(a) Sweat gland (b) Scent gland

(c) Sebaceous (d) Meissener's corpuscles

150. Hairs are made up of

(a) α-keratin (b) β-keratin (c) Protein (d) Lipid

151. Hairs on the skin are derived from

(a) Dermis and have dead cells (b) Epidermis and have living cells

(c) Dermis and are made up of living cells (d) Epidermis and have dead cells

152. Scaled epithelium is found in which part of the body

(a) Skin (b) Bowman's capsule

(c) Wall of alimentary canal (d) Wind pipe

153. Which of the following scales are present in sharks

(a) Placoid (b) Ctenoid (c) Cycloid (d) Rhomboid

154. Placoid scales are present in

(a) Scoliodon (b) Labeo (c) Catla (d) Rohu

155. Ganoid scales are present in

(a) Shark (b) Labeo (c) Polypterus (d) All teleosts

156. The finger nails develop from the

(a) Dermis (b) Epidermis (c) Bone (d) Cartilage

157. Keratin of integument is the

(a) Mucoprotein (b) Scleroprotein (c) Cartilage (d) Bony tissue

158. The nails, claws, horns and hoofs in mammals are produced by

(a) Stratum corneum of the skin (b) Muscles of the skin

(c) Bone (d) Cartilage

159. The horns in mammals are produced by

(a) Cartilage (b) Skull (c) Stratum corneum of the skin (d)Bone

160. Conjunctiva is a

(a) Part of skin (b) Type of connective tissue

(c)Type of adipose tissue (d)All of the above

161. The protein which hardens the cells of skin is

(a) Cuticle (b) Chitin (c) Keratin (d) None of these

162. Nails, hooves and horns are derived from the tissue

(a) Cartilage (b) Bone (c) Supporting tissue (d) Epithelium

163. The exoskeleton of rabbit consists of

(a) Hairs (b) Hairs and claws

(c) Hairs, claws and horns (d) Hairs, horns and hooves

164. Nails, hooves and horns are formed of

(a) Keratin (b) Chitin (c) Cartilage (d) Bone

165. The characteristic protein of the horny parts of the skin of terrestrial vertebrate hairs, feathers, nails, hooves, etc. is

(a) Cuticle (b) Keratin (c) Spicule (d) Cartilage

166. The antlers of a deer is made up of one of the following named

(a) Cartilage (b) Corneum (c) Bone (d) Seasmoid bone

167. If a cat is deprived of its vibrissae, stiff long hair on the snout

(a) It can run fast (b) It can not run freely (c) It can not run at all (d) Nothing will happen

168. What is not true about rabbit's hair

(a) The hair follicle has an outer and inner root sheath

(b) Sebaceous glands open into each hair follicle close to epidermis

(c) Inner sheath of hair follicle contains cuticle, Huxley's layer and Henley's layer

(d) Each hair is made up of hyaluronic acid and collagen fibres

Advance Level

169. Choose the incorrect sentence

(a) Placoid scale is epidermal and dermal both in origin

(b) Sebaceous gland is of epidermal origin

(c) Feather is of epidermal origin

(d)Reptilian scale is epidermal and dermal both in origin

170. Which one of the following sets of derivatives of integumentary structures characterise birds as glorified reptiles

(a) Syrinx and scales (b) Scales and claws

(c) Claws and uropygial glands (d) Syrinx and uropygial glands

171. The skin of frog is characterised by the absence of

(a) Epidermis (b) Scales (c) Chromatophores (d) Mucous glands

172. The horns of Rhinoceros on snout are produced by

(a) Stratum corneum (b) Bone (c) Muscle fibres (d) Cartilage

173. Which of the following is not a function of hair in rabbit

(a) Impart colour and camouflage (b) Insulate body

(c) Act as tactile receptors (d) Used as sexually dimorphic feature

174. Bone formed by the skin are called

(a) Investing bones (b) Replacing bones (c) Sesamoid bones (d) None of these

175. Sclero proteins are

(a) Keratin (b) Collagen (c) Both (a) and (b) (d) Glycoprotein

176. Which of the following is not a part of the inner sheath of hair follicle

(a) Sebaceous gland (b) Cuticle (c) Huxley's layer (d) Henle's layer

177. Hair root and shaft consists of

(a) Medulla and cortex (b) Henle's layer (c) Huxley's layer (d) Dermal hair papilla

178. The hair of mammalian skin get erected when the temperature is low. The muscles which pull the hair follicle and hairs is

(a) Petrithyoid muscles (b) Abductor muscles (c) Arrector muscles (d) Contractor muscles

179. Huxley's layer is found in

(a) Wall of the hair follicle (b)Shaft of the hair (c) Root of the hair (d) None of the above

180. The part of hair which is keratinized

(a) Only medulla (b) Root (c) Shaft (d) Bulb

181. The epidermal derivatives are

(a) Hair and sweat glands only (b) Hairs and sebaceous glands only

(c) Sebaceous glands and sweat glands only (d) Hair, sweat glands and sebaceous glands

182. Which of the following is not associated with hair follicle

(a) Melanin (b) Arrector pili (c) Sebaceous gland (d) Sweat gland

183. The covering of hair on human's body is called

(a) Hairiness (=Hirsutism) (b)Fur (c) Insulation (d) Pelage

184. What happens when arrector pili muscle contract

(a) Hairs are shed (b)Hair become more closely applied to each other

(c) Temperature of the body is reduced (d)Hairs stand on their roots

185. Identify the hormone which induce arrector pili muscles to contract

(a) Thyroxine (b) Adrenaline (c) Parathormone (d) Androgen

186. Hair cortex contains

(a) Air spaces (b) Shrunken cells and pigments (c)Carotene (d) Sebum

GLANDS

Basic Level

187. Meibomian glands are found in

(a) Eye lashes (b) External ear (c) Stomach (d) Nose

188. Sweat glands in human skin are located in the

(a) Granular layer of epidermis (b) Dermis

(c) Malpighian layer of epidermis (d) Subdermal layer of fat cells

189. Sebaceous glands are

(a) Apocrine (b) Merocrine (c) Holocrine (d) None of these

190. Cutaneous glands are

(a) Gastric glands (b) Sebaceous glands (c) Thyroid gland (d) Thymus gland

191. The function of sebaceous glands in mammals is

(a) Plug the skin pores (b) Cool the skin by vaporisation

(c) Make skin and hairs waterproof (d) Nourish the hair follicles

192. Secretion of sebaceous glands is known as

(a) Watery liquid (b) Oily liquid (c) Creamy substance (d) None of these

193. Sudorific glands are also known as

(a) Sebaceous glands (b) Sweat glands (c) Meibomian glands (d) Perinaeal glands

194. Meibomian glands are modified

(a) Mammary glands (b) Sweat glands (c) Sebaceous glands (d) Dermal glands

195. In evaporation of sweat from the skin, the heat required is adjusted from

(a) The body of the animal (b)Lungs of animal (c) Fat layers of the skin (d)None of these

196. The gland whose secretion helps in the attraction of opposite sex is

(a) Sebaceous gland (b) Sweat gland (c) Scent gland (d) Wax

197. Glands of Zeis are associated with the eyelashes. These are modified

(a) Sebaceous glands (b) Sweat glands (c) Mucous glands (d) Sudorific glands

198. In mammals, mammary glands are modified

(a) Sweat glands (b) Sebaceous glands (c) Ceruminous glands (d) Meibomian glands

199. Lachrymal gland produces

(a) Sebum (b) Mucous (c) Tear (d) Sweat

200. Sebaceous glands are found in

(a) Epidermis of skin of mammals (b)Dermis of skin mammals

(c) Epidermis of skin of frog (d)Dermis of skin of frog

201. Modified sweat glands on the eyelid of rabbit are known as

(a) Meibomian gland (b) Retinal gland (c) Lachrymal gland (d) Pituitary gland

202. Function of human sweat gland is

(a) To regulate water content (b) To remove excess salt

(c)Both (a) and (b) (d) None of above

203. Glands of Moll are

(a) Sebaceous glands (b) Modified dermal glands

(c)Modified sweat glands (d) Langerhans cells

204. Sebaceous glands in the mammalian skin are concerned with the secretion of

(a) Sweat for maintaining body temperature (b) Growth hormone

(c) Oil to keep the skin smooth and waterproof (d) Excretion of salt

205. The mucous and poisonous glands are found in the skin of frog. These are specially abundant

(a) In the lateral dermal plicae (b) On the dorsal side of the body

(c) On the ventral side of the body (d) On the snout

206. In mammals, the scent glands may be modified

(a) Mucous glands (b) Sebaceous glands (c) Sudorific glands (d) Both (b) and (c)

207. In rabbit, which of the following types of epidermal glands are present

(a) Ceruminous sebaceous and sweat glands (b) Mammary glands

(c) Meibomian and glands of Moll (d) All of these

208. Modified sebaceous glands in the margins of eyelids are

(a) Perineal gland (b) Lacrimal gland (c) Meibomian gland (d) Sudoriferous glands

209. Tarsal glands are associated with

(a) Legs (b) Eyes (c) Ears (d) Buccal cavity

210. Musk glands are located over forehead in

(a) Rhinoceros (b) Marsupials (c) Antelopes (d) Elephants

211. Preen glands occurs in

(a) Pisces (b) Reptilia (c) Aves (d) Mammalia

212. Sweat glands are primarily concerned with

(a) Keeping skin moist (b) Removal of excess of salts from, body

(c) Regulation of body temperature (d) Killing bacteria upon skin

213. The most important function of sweat is that

(a) It clears the pores (b) It lubricates the skin (c) It cools the body (d) It nourishes the hair

214. Sweat glands are absent in

(a) Ant-eaters (b) Sea cows (c) Whales (d) All of these

215. Temperature controlling by sweating occurs in

(a) Rabbit (b) Toad (c) Lizard (d) Crocodile

216. The first milk secreted following childbirth is called

(a) Casein (b) Colostrum (c) Infant milk (d) None of these

217. Nature of mammary gland is

(a) Holocrine (b) Apocrine (c) Merocrine (d) None of these

218. Milk glands are characteristic of

(a) All mammals (b) Placental mammals

(c) All vertebrates (d) Man and domestic animals

219. Mental glands are found in

(a) Crocodiles (b) Salamanders (c) Mammals (d) Snakes

220. Parotid glands are

(a) Poisonous glands found in frog (b)Mucous glands found in frog

(c) Tear glands found in rabbit (d)Poisonous glands found in toad

221. Which of the following is a cutaneous gland of fish

(a) Civet glands (b) Ptery gopodial glands (c) Lacrimal glands (d) Uropygial glands

222. Prototherians

(a) Lack milk glands (b)Are devoid of nipples in their mammary glands

(c) Have four pairs of thoracic mammary gland (d) Have three pairs of axillary glands

223. The skin of frog is attached to the underlying body muscles loosely leaving many

(a) Air spaces for respiration (b) Blood spaces

(c) Lymph spaces (d) Mucous filled spaces

224. Which of the following is not a constituent of milk

(a) Caesin (b) Lactoglobulin (c) Milk fat (d) Immunoglobulins

225. Which of the following is not true about sweat

(a) Excretory function (b) Thermoregulatory function

(c) Secreted only during summer

(d) Contain 95% water and 5% metabolic wastes

226. Perineal glands are involved with the secretion of

(a) Pheromones (b) Sebum (c) Cerumen (d) Tear

227. Nipple less mammary glands occur in

(a) Gorilla (b) Prototherians (c) Marsupials (d) Human female

Advance Level

228. The skin becomes dry during the winter because of

(a) Less sweat in winter (b) Vaso-dilation of sebaceous ducts

(c) Vaso-constriction of sebaceous ducts (d) All the above

229. Mammals without sweat glands is

(a) Kangaroo (b) Lepus (c) Tachyglosus (d) Cat

230. Sweat glands are absent in man on

(a) Lips (b) Nipples (c) Thumbs (d) Face

231. Large sweat glands are the characteristics of

(a) Glans (b) Scrotum (c) Pinna (d) Aereola of mammae

232. In rabbits and hares the sweat glands are confined to

(a) Area around the lips (b) Base of the tail (c) Soles of the paw (d) Tips of the pinnae

233. Which of the following glands is present in frog's skin and not in rabbit's skin

(a) Sebaceous gland (b) Sweat gland (c) Mucous gland (d) Moll's gland

234. Coiled tubular gland are found in

(a) Gut of liver (b) Fundus (c) Sweat gland (d) Pancreas

235. The integument of rabbit differs from that of frog in

(a) Possessing stratum corneum for protection against wear and tear

(b) Possessing mucous glands for producing mucous

(c) Possessing sebaceous glands which produce sebum for keeping skin greasy and waterproof

(d) Not possessing subcutaneous fat

236. Coiled tubular glands are present in

(a) Villi (b) Skin epidermis

(c) Skin dermis (d) Seminiferous tubules

237. Which of the following is found in the skin of eyelids

(a) Ceruminous gland (b) Glands of Zeis (c) Perinial gland (d) Sudorific gland

238. Select the correctly matched pair

(a) Glands in the skin of auditory meatus- Meibomian gland

(b) Gland that opens in follicles of eye lashes - lacrimal glands

(c) Gland that produces tear- Ceruminous gland

(d) Scent gland that occur around anus and genitalia of rabbit – Perineal gland

239. Which of the hormones are concerned with development growth and secretion of milk in mammary gland

(a) Ovarian (b) Adenohypohyseal (c) Adrenal cortical (d) Parathormones

240. Sweat glands are confined to external ears area in

(a) Hare (b) Hippopotamus (c) Camel (d) Kangoroo

241. Which of the following is not an epidermal gland

(a) Sebaceous (b) Sudorific

(c) Mammary (d) Bulbo-urethral gland

242. The mucous and poison glands in frog are embedded in

(a) Stratum compactum (b) Stratum corneum

(c) Stratum germinativum (d) Stratum spongiosum

ANSWER

ASSIGNMENT (BASIC & ADVANCE LEVEL)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	c	c	b	a	b	d	b	b	c	d	c	c	a	c	b	a	d	a	a
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
a	a	a	c	b	a	a	b	b	c	d	c	b	c	d	c	d	d	b	c
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	b	c	a	a	d	a	d	b	b	d	a	b	a	d	d	b	b	b	b
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
d	b	a	a	b	c	b	c	a	a	c	b	d	c	d	a	d	d	b	b
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
b	b	d	c	b	c	a	d	d	c	a	d	d	d	c	b	d	c	b	d
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
b	a	a	d	b	b	d	a	b	d	c	a	c	b	b	d	b	a	d	c
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
d	c	c	b	c	d	d	c	c	a	c	d	a	d	d	b	c	b	d	d
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
d	d	a	a	d	a	c	c	c	a	d	a	a	a	c	b	b	a	c	a
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
c	d	b	a	b	b	b	d	d	b	b	a	d	a	c	a	a	c	a	c
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
d	d	d	d	b	b	a	b	c	b	c	b	b	c	a	c	a	a	c	b
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
c	c	a	c	a	d	d	c	b	d	c	c	c	d	a	b	b	a	b	d
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
b	b	c	d	c	a	b	c	c	a	d	a	c	c	c	c	b	d	b	b
241	242																		
d	d																		