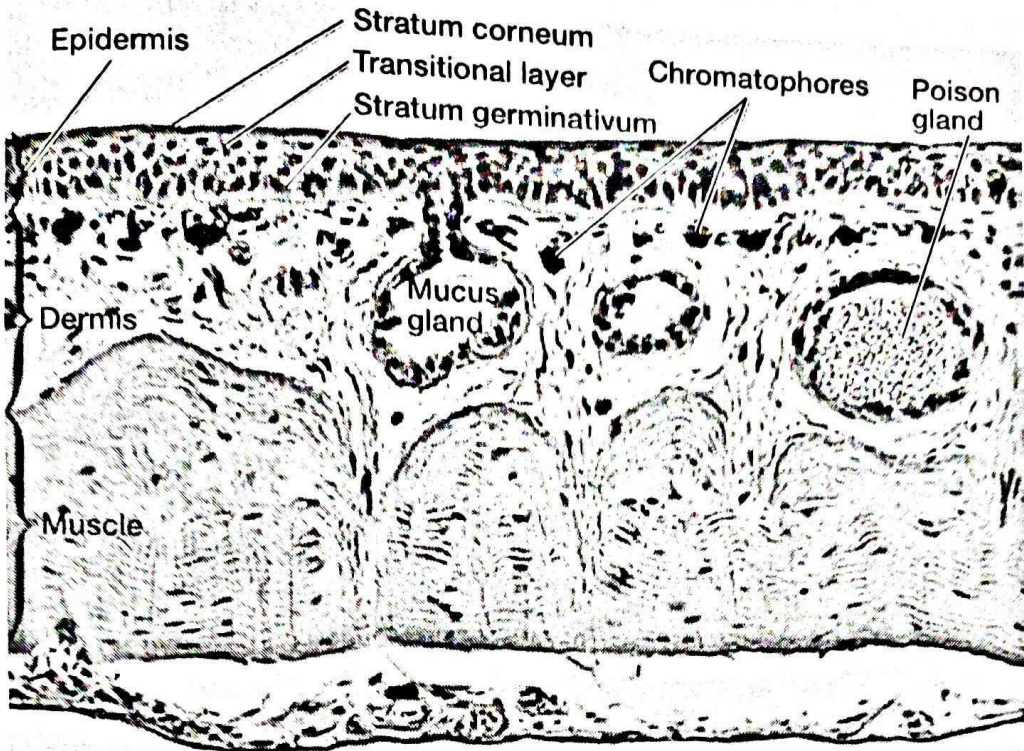


## Integument of Amphibians

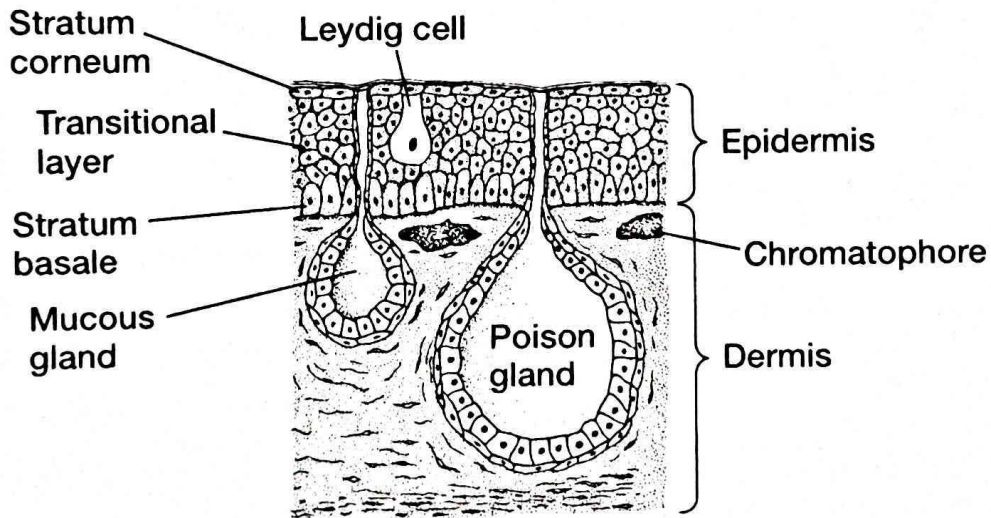
Primitive amphibians had thick, dry skin with scales like the fishes. In apodans (e.g. *Ichthyophis* sp.) dermal scales are still present as vestiges. But modern amphibians like urodels (e.g. *Salamandra* sp.) and anurans (*Bufo* sp.) do not have any dermal scales. Living amphibians have thin epidermis with five to eight layers of cells. It has a stratum corneum that contains  $\alpha$  - keratin.

Amphibian skin in most modern forms acts as a respiratory surface for exchange of oxygen and carbon-dioxide. Capillary beds are present in the lower part of the epidermis and the dermis.

Dermis is two layered and it contains mucus glands which are small in size and granular glands or **poison glands** which are large and capable of secreting an acrid milky fluid that is distasteful and poisonous to the predators. Dermis also contains chromatophores which are occasionally present in the epidermis.



(a)



(b)

**FIGURE 6.12 Amphibian skin.** (a) Section through an adult frog skin. A basal stratum basale and a thin, superficial stratum corneum are present. The transitional layer between them includes a stratum spinosum and a stratum granulosum. (b) Diagrammatic view of amphibian skin showing mucous and poison glands that empty their secretions through short ducts to the surface of the epidermis.

In the larval stage, which is essentially aquatic, amphibian epidermis contains large **Leydig cells** that secrete substances to resist the entry of microbes into the body. In adult amphibians the dermis bears multicellular glands that open to the body surface through ducts. These glands may be either mucus glands bearing a cluster of cells or the poison glands or granular glands that store poison which is released when the animal feels disturbed.

Poison glands accumulate in low numbers to form structures in the form of **warts**, as in the dorsal surface of toads. When the poison glands are present in large numbers, protuberant structures, known as macroglands develop. Parotoids are the most common macroglands. Other macroglands are radial and tibial macroglands.

Three types of poison glands have been observed in toadskin. These are (i) common poison glands (COM), (ii) parotoid poison glands (PAR) and (iii) peripheral parotoid poison glands (PER). COM glands are found in the dorsal warts and the ventral and pelvic skin. The cytoplasm is syncytial and containing numerous nuclei in the periphery. Poison granules are spherical and heterogenous. PAR glands consist of a dense syncytium and lower number of elliptical nuclei. The PER glands found near the periphery of parotoid and other macroglands contain dense syncytial cytoplasm with nuclei and spherical or elliptical secretory granules.

## **Amphibian Scales**

Amphibian integument is devoid of hard structures. On the limbs or digits of frogs and salamanders **nuptial pads** may develop in breeding season. These are pad like raised structures that are found only in male amphibians with the help of which the male can hold the female during mating. These are calluses of cornified epidermis and contain no bony material. But it is probable that the integument of terrestrial paleozoic amphibians had bony ossicles.

Dermal scales are found in one order, Gymnophiona, of modern amphibians. Amphibian dermal scales are small flat disks arranged in pocket like structures in the transverse ridges of the skin.

These scales also contain three layers like the teleost fishes, but the layers are not similar in the two groups. Scales in gymnophione amphibians (e.g. *Ichthyophis*, *Dermophis*, *Microcaecilia* etc.) are composed of a basal plate of several layers of unmineralized collagen fibres. Cells of the basal layer lie deepest. These cells that line the basal plate synthesize the collagenous stroma of the plate. Above the basal plate there is mineralized **squamulae** composed of many mineralized globules and thick collagen fibres which are also mineralized. On the outer surface of the squamulae there are isolated flattened cells which are probably involved in mineral deposition. Squamulae form a discontinuous layer on the scale surface and are the only mineralized part of the scale.