Integumentary System
Zoology (Hons.) 2nd SEM
DC4 Unit 1

The integument is the outer protective covering of an animal. It is the structural and functional interface between the organism and its environment. The integumentary system includes hair, scales, feathers, hooves, and nails.

Structure

The integument is composed of at least two major layers of tissue: the epidermis and dermis. The epidermis is the outermost layer, providing the initial barrier to the external environment. It is separated from the dermis by the basement membrane. The epidermis contains melanocytes and gives color to the skin. The deepest layer of epidermis also contains nerve endings. Beneath this, the dermis comprises two sections, the papillary and reticular layers, and contains connective tissues, vessels, glands, follicles, hair roots, sensory nerve endings, and muscular tissue. The deepest layer, the hypodermis, is primarily made up

of adipose tissue.

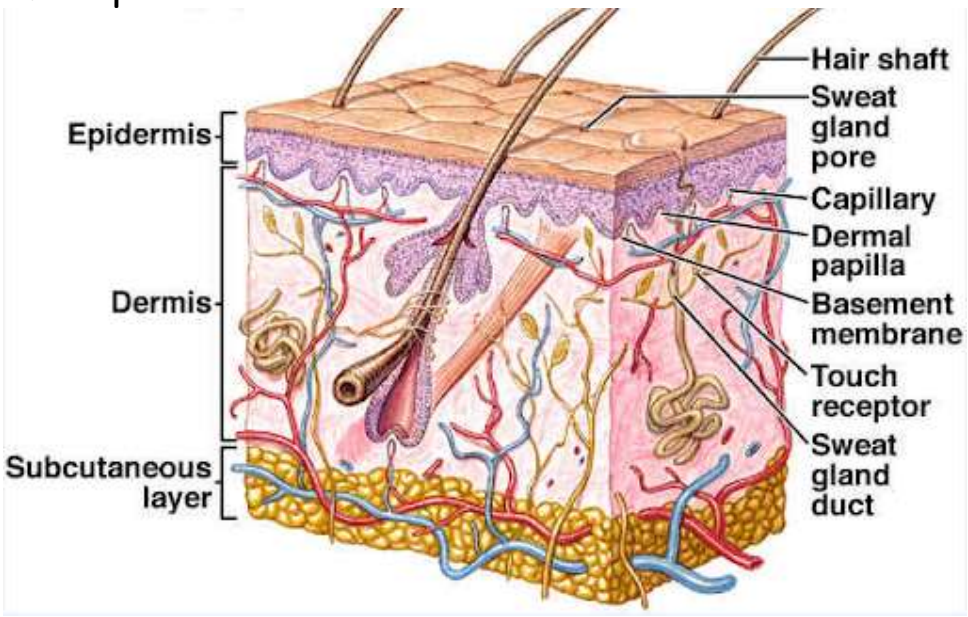


Fig. Structure of Integument

Epidermis

The epidermis, derived from somatic ectoderm, is the exterior-most covering of the chordate body. It provides protection against the invasion of microorganisms, provides flexibility in motion, and seals in moisture.

All true vertebrates, however, have developed a multi-layered epithelium. Fishes and amphibians have a mucus layer for mechanical protection and to prevent drying on land. Terrestrial vertebrates have replaced the cuticle with keratin.

Epidermal Derivatives of the Integument

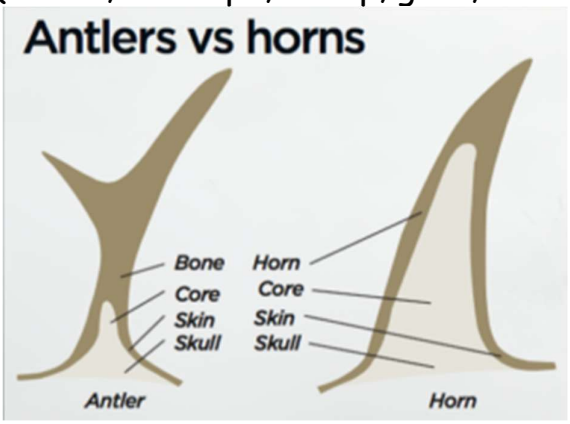
Epidermal Scales: This is a continuous layer of repetitious thickenings of the stratum corneum; These scales may be shed entirely (moulting) or in small flakes.

Claws and Talons: They are curved, laterally compressed keratinized projections from the tips of digits.

Hooves: It is enlarged keratinized plate found on the ends of ungulate digits.

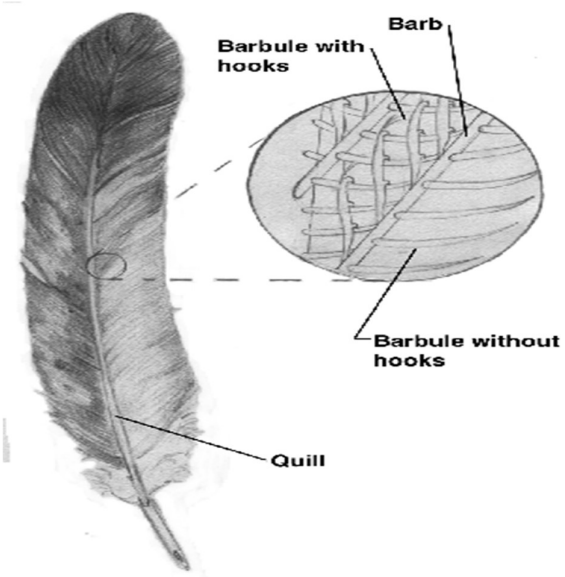
Nails: The keratinized epithelial cells are produced at the nail base and push the existing nail forward. They provide protection from mechanical injury and stabilize skin for better grasping. Found only in primates.

Horns: A tough, cornified layer of the integument covers horns. Their core, however, is bone, which is of dermal origin. Horns are found in bovines (cattle, antelope, sheep, goat, bison).

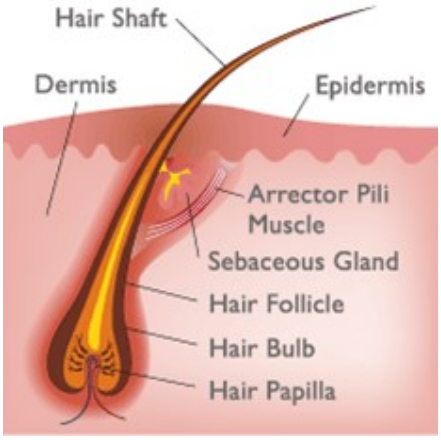


Beaks: It is epidermal structure, jaws are covered by keratinized sheaths in birds.

Feathers: They are believed to have evolved from reptilian scales. Columns of epidermal cells project into the skin initially to form an invagination called the feather follicle. Later growth results in a projection out of the skin of a keratinized epidermal sheath with an inner feather shaft. These columns then separate and develop into barbs. Feather growth is initiated by dermal papillae, which die in the grown feather to form feather pulp.



Hair: There is an initial ingrowth of epidermal cells to form the hair follicle, followed by an outward growth of keratinized cells to form the hair shaft. Dermal papillae cells of the outer edge die and form the core substance of hair follicles. They both possess dermal papillae, shafts, an inner pulp and columns of specialized keratinized cells. Hair is characteristic of mammals.



Structure of Hair

Glands

Specialized to secrete specific products (oil, sweat, milk, etc.), these structures are derived by an infolding of the epidermis. In many cases they retain a connection to the **stratum corneum** whereby their secretions can be released at the skin surface.

DERMIS

The dermis is generally much thicker than the epidermis and lies more deeply. It is made of a fibrous mass of connective tissue (**collagen**) and is of **mesodermal** origin. It may directly produce dermal (membrane) bone. The dermis is important in defence against injury and in the maintenance of body heat. Deeper regions of the dermis often contain fatty deposits, smooth muscle, blood vessels and nerves. **Chromatophore** cells are sometimes epidermal, but usually dermal in origin. They secrete melanin, which can be passed to the stratum corneum of skin and to hair shafts to produce colour and block harmful sunlight.

Hypodermis

The hypodermis is the subcutaneous layer. It invaginates into the dermis by collagen and elastin fibers. It is essentially composed of a type of cell known as adipocytes specialized in accumulating and storing fats. These cells are grouped together in lobules separated by connective tissue.

The hypodermis acts as an energy reserve. The fats contained in the adipocytes can be put back into circulation, via the venous route, during intense effort or when there is a lack of energy-providing substances, and are then transformed into energy. The hypodermis participates, passively at least, in thermoregulation since fat is a heat insulator.

Functions

The integumentary system has multiple roles in maintaining the body's equilibrium. The integument has an important job of protecting the body and acts as the body's first line of

defense against infection, temperature change, and other challenges to homeostasis. Functions include:

- Protect the body's internal living tissues and organs
- Protect against invasion by infectious organisms
- Protect the body from dehydration
- Protect the body against abrupt changes in temperature, maintain homeostasis
- Help excrete waste materials through perspiration
- Act as a receptor for touch, pressure, pain, heat, and cold (see Somatosensory system)
- Protect the body against sunburns by secreting melanin
- Generate vitamin D through exposure to ultraviolet light
- Store water, fat, glucose, vitamin D
- Maintenance of the body form
- Formation of new cells from stratum germinativum to repair minor injuries
- Protect from UV rays.
- Regulates body temperature

It distinguishes, separates, and protects the organism from its surroundings.