

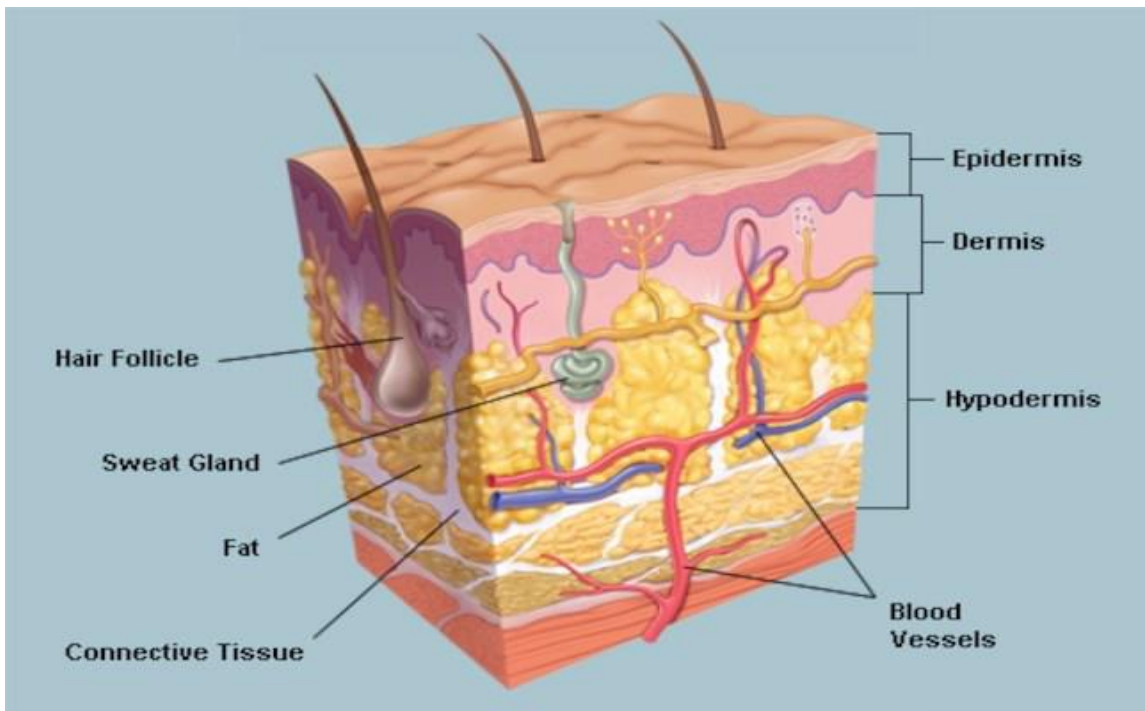
Integumentary System

The integumentary system consists of:

1. Skin
2. Skin derivatives (epidermal skin appendages).

Skin has three layers

1. Epidermis, a superficial layer
2. Dermis, a deeper layer
3. Hypodermis contains variable amounts of adipose tissue



Epidermal derivatives of the skin

1. Hair follicles and hair
2. Sweat (sudoriferous) glands
3. Sebaceous glands
4. Nails
5. Mammary glands

Functions of the skin:

1. **Barrier** that protects against physical, chemical, and biologic agents
2. **Immunologic** information antigen processing to the appropriate effector cells
3. **Homeostasis** by regulating body temperature and water loss.
4. **Sensory** information about the external environment to the nervous system.
5. **Endocrine** functions by secreting hormones, cytokines, and growth factors
6. **Excretion** through the exocrine secretion of sweat, sebaceous, and apocrine glands

EPIDERMIS

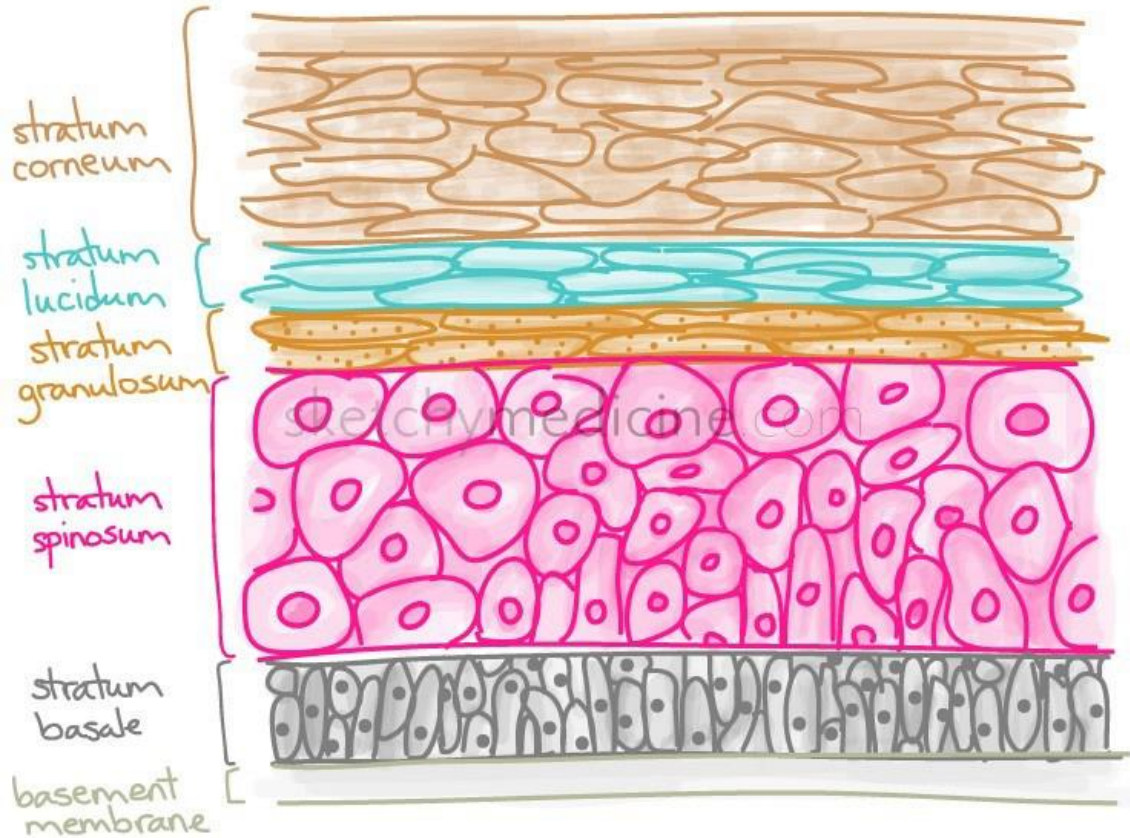
- ✓ Composed primarily of **keratinocytes** (85%)
- ✓ **Four** distinct layers of epidermis (**strata**):

1- Stratum basale :Single layer of small, mitotically active basal cells

2- Stratum spinosum: Several layers of larger keratinocytes (attached to each other by **desmosomes** containing keratin filaments).

3- Stratum granulosum : Distinct layer of **flattened** keratinocytes filled with **keratohyalin granules** (contain precursors to **filaggrin**, which aggregates **keratin filaments** and lamellar bodies containing lipids, which, when secreted, are responsible for the formation of the epidermal **water barrier**).

4- Stratum corneum: Most superficial layer of terminally differentiated squamous cells (with no nuclei) that are entirely filled with keratin filaments. These cells are constantly.



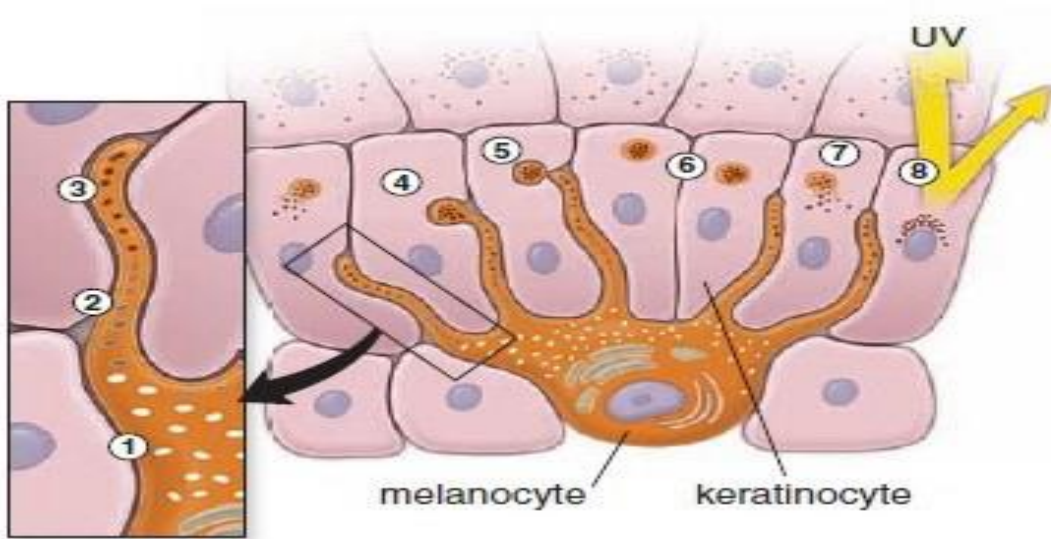
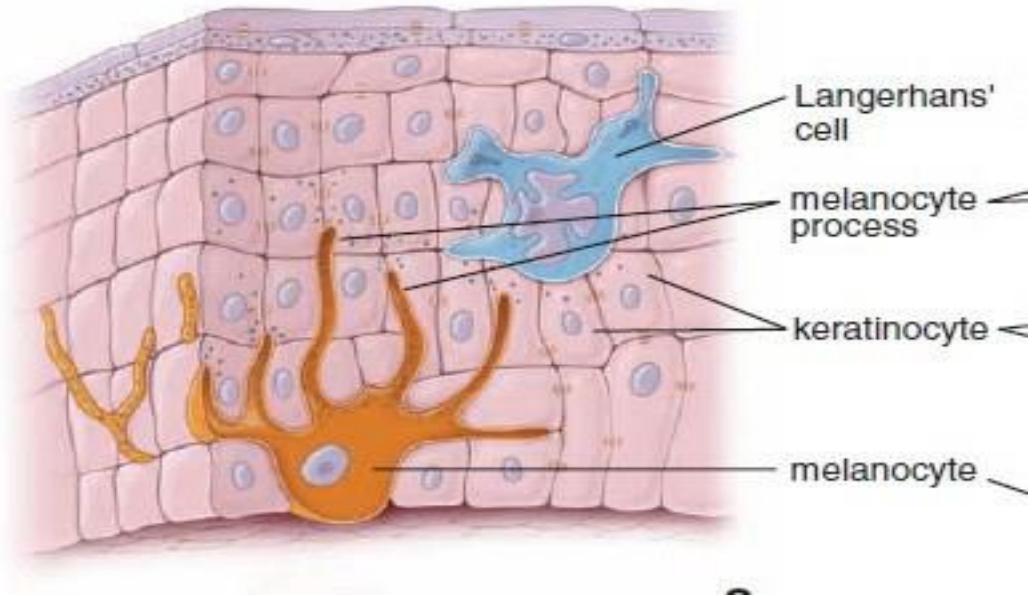
Cells of the epidermis

1- Melanocytes (5% of cells in epidermis)

- ✓ Reside in the stratum basale and have long processes that extend between keratinocytes into the stratum spinosum.
- ✓ Synthesize **melanin** pigment in **melanosomes** and during the process of **pigment donation**, melanocytes transfer them into adjacent keratinocytes. The transferred pigment accumulates above nuclei of keratinocytes to protect nuclear DNA from ultraviolet (UV) radiation and damage.

2- Langerhans' cells (2% to 5%) :The antigen-presenting cells involved in signaling of the immune system

3- Merkel's cells (6% to 10%) :Mechanoreceptor cells associated with sensory nerve endings



DERMIS

The **dermis** is composed of two layers:

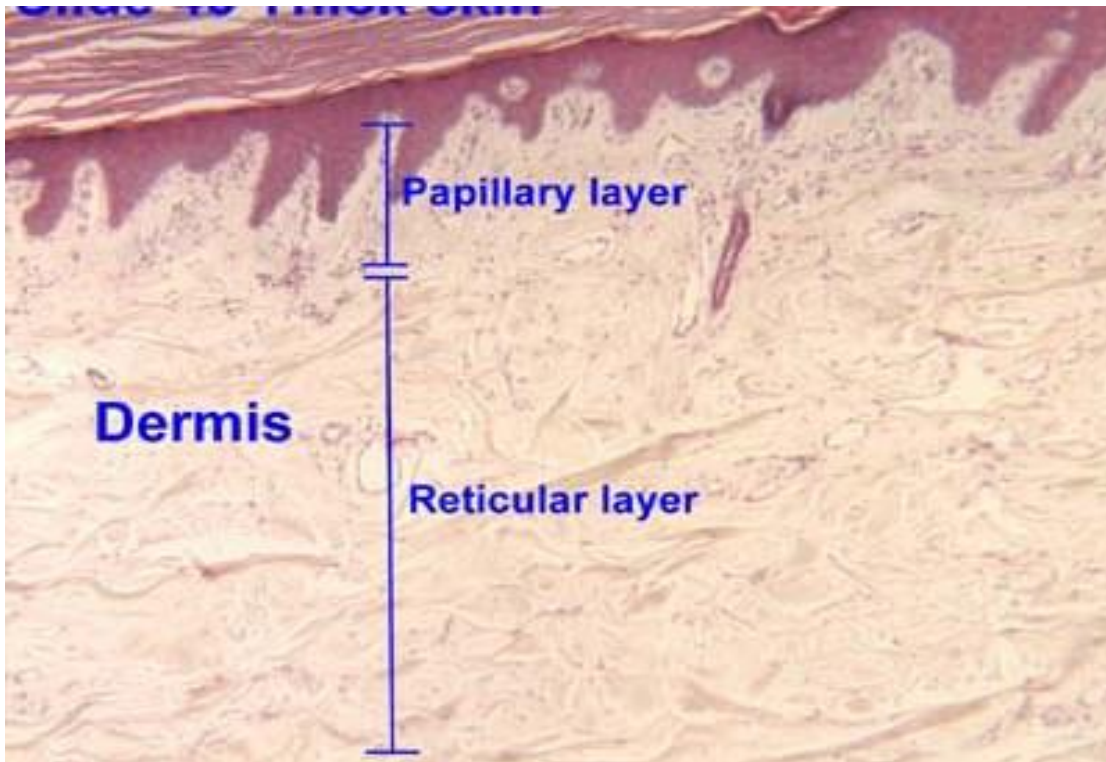
1- Papillary layer :Superficial and consists of loose connective tissue (collagen I and III) that contains extensive plexus of blood, lymphatic vessels, and sensory nerve endings.

2- Reticular layer : Deeper and is composed of dense irregular connective tissue containing type I collagen, elastic fibers, and larger blood vessels.

3- Epidermal–dermal junction:

Has numerous finger-like connective tissue protrusions called **dermal papillae** that correspond to similar epidermal protrusions (**epidermal ridges**).

Dermal papillae contain nerve endings and a network of blood and lymphatic capillaries.



SENSORY NERVE RECEPTORS OF SKIN

The epidermis:

- ✓ Contains **free nerve endings**, which detect fine touch, heat, cold, and pain.
- ✓ In addition, **Merkel's corpuscle** (Merkel's cell with a nerve ending) is a sensitive mechanoreceptor.

The dermis

- ✓ Contains several encapsulated nerve endings:
 1. **Pacinian corpuscles** to detect pressure and vibrations
 2. **Meissner's corpuscles** to detect light touch
 3. **Ruffini's corpuscles** to detect skin stretch and torque.

