Integumentary System (Skin Anatomy & Physiology)

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Contents of the Lecture:

- Introduction
- Structure of Skin
- Major Functions

Anatomy & Physiology of Skin

- Also known as **Integumentary System**.
- The skin is the outer layer of the body which covers the body and is continuous with the membranes lining the body orifices.
- Major Role are:
- **Protection** against injury and Microbial attack
- Contains **sensory nerve endings** that enable discrimination of pain, pressure, temperature, and touch
- Regulation of **body temperature**.

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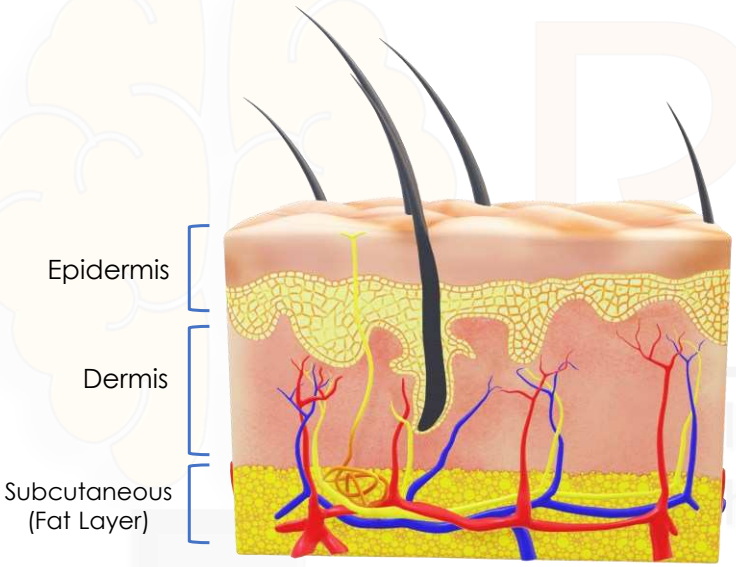
Anatomy and Physiology of Skin



- Largest Organ (Surface area- 1.5 to 2 m^2)
- In certain areas, it contains accessory structures: glands, hair and nails

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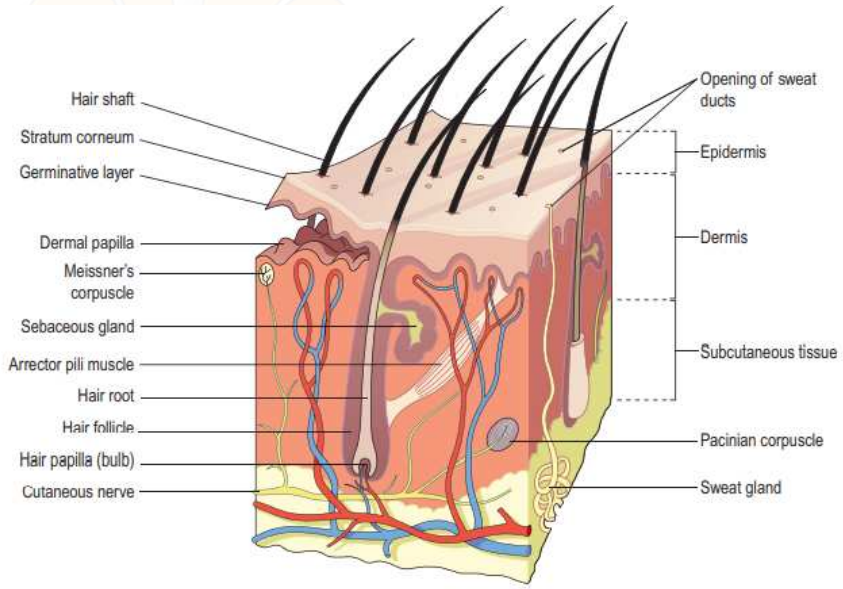

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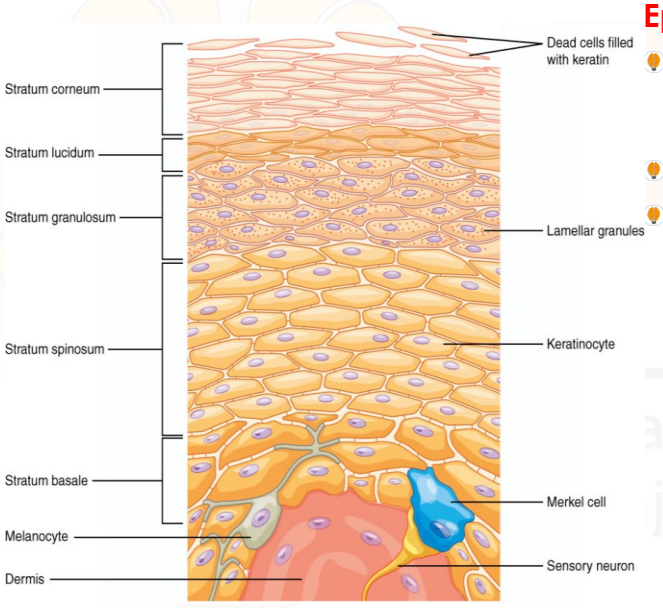

Epidermis

- Superficial layer and is composed of stratified keratinised squamous epithelium
- No blood vessels or nerve endings
- Its deeper layers are bathed in interstitial fluid from the dermis, which provides oxygen and nutrients, and drains away as lymph.

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Epidermis

- Deepest layer formed by germinative cells, which produce epidermal layer
- The surface cells are flat, non nucleated cells, or squames, in which the cytoplasm has been replaced by the fibrous protein keratin
- A healthy epidermis depends on-
  - Desquamation (shedding) of the keratinised cells from the surface
  - Effective keratinisation of cells approaching the surface
  - Continual cell division in the deeper layers with newly formed cells being pushed upwards to the surface.
- Dermal papillae are arranged in parallel lines and make fingerprint in rigid surface like palm and fingers of hands and soles.

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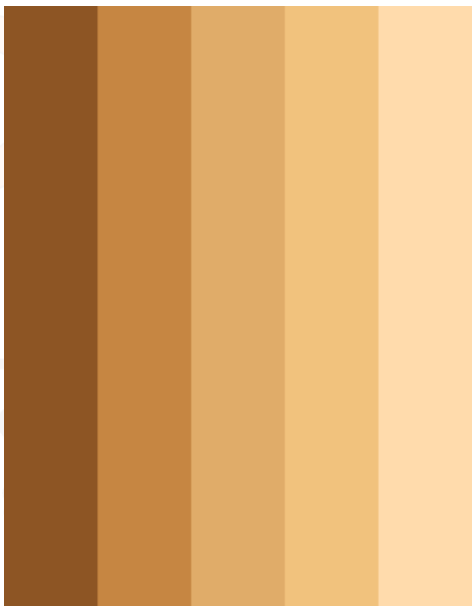
Epidermis

- **Skin Colors & Tones**
- Mainly Depends on **Melanin pigments**.
- **Melanin,** a dark pigment derived from the tyrosine and secreted by melanocytes in the deep germinative layer,
- It is absorbed by surrounding epithelial cells. The amount is genetically determined and varies between different parts of the body
- It protects the skin from the harmful effects of ultraviolet rays in sunlight. Exposure to sunlight promotes synthesis of melanin.
- Normal Blood/Oxygen circulation- Pink skin
- Lake of Oxygen supply- Blueish skin
- Excessive Bile pigments in Blood- Yellowish



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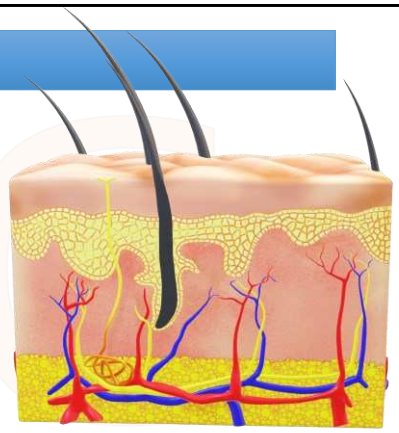

Dermis

- The dermis is tough and elastic
- It is formed from connective tissue and the matrix contains collagen fibres interlaced with elastic fibres.
- Overstretching (during pregnancy and obesity) elastic fibres are ruptured and produces striae, or stretch marks.
- Collagen fibres bind water and give the skin its tensile strength, but as this ability declines with age, wrinkles develop
- It contains-
  - Blood & Lymph Vessels
  - Sensory nerve endings
  - Sweat glands and their ducts
  - Hairs, arrector pili muscles and sebaceous glands.

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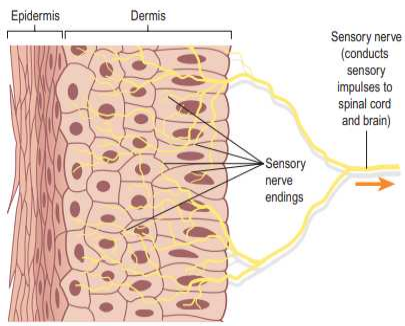

Figure 14.3 Pacinian corpuscle.

Major Functions:

1. Sensory

- It contains **Sensory receptors** (specialised nerve endings) sensitive to **touch, temperature, pressure and pain** are widely distributed in the dermis.
- **E.g.,-**
  - Sensory receptor- Stimulus
  - Meissner's corpuscle- Light pressure
  - Pacinian corpuscle- Deep pressure
  - Free nerve ending - Pain

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2. Temperature Regulation: by Sweating through sweat glands

- Sweat Glands: Eccrine & Apocrine
- Eccrine sweat glands: more common, open at skin surface, they produce clear, watery fluid important in regulating body temperature.
- Apocrine glands open into hair follicles and become active at puberty. They may play a role in sexual arousal.

3. Protection

- The skin forms a relatively waterproof layer, provided mainly by its keratinised epithelium, which protects the deeper, more delicate structures
- Involve in non specific defense system-
  - Invasion by micro-organisms
  - Chemicals
  - Physical agents, e.g. mild trauma, ultraviolet light
  - Dehydration

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3. Protection

- The epidermis contains specialised immune cells called dendritic (Langerhans) cells, which are a type of macrophage, involved in phagocytic action

4. Absorption

- Some drugs or substance can be absorbed by skin
- some drugs, in transdermal patches, e.g. hormone replacement therapy during the menopause, nicotine as an aid to smoking cessation
- some toxic chemicals, e.g. mercury

5. Excretion

- The skin is a minor excretory organ for some substances including:
- NaCl in sweat; excess sweating may lead to low blood sodium levels (hyponatraemia)
- Urea, especially when kidney function is impaired
- Aromatic substances, e.g. garlic and other spices

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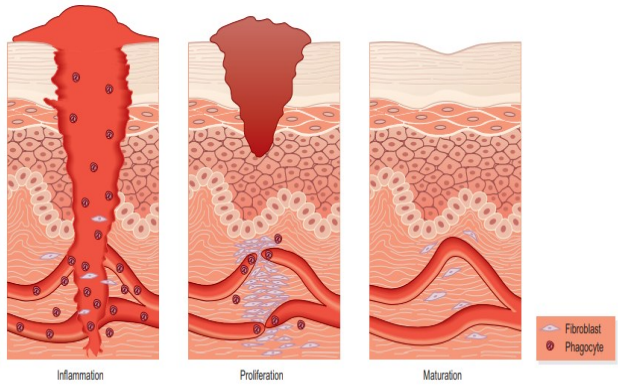

Figure 14.8 Stages in primary wound healing.

6. Vitamin D formation

- 7-Dehydrocholesterol is a lipid-based substance in the skin and is converted to vitamin D by sunlight. This vitamin is used with calcium and phosphate in the formation and maintenance of bone.

7. Wound Healing

- Repair & Regeneration

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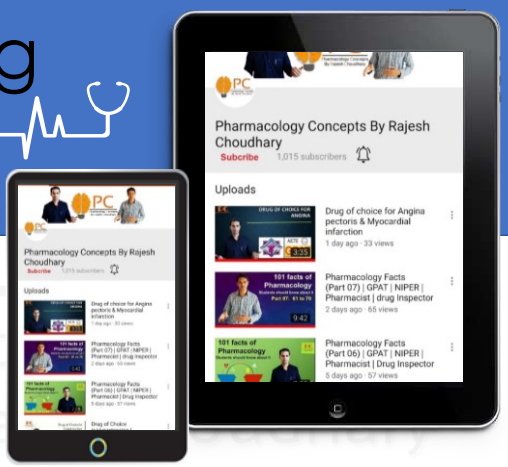

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