

Integumentary System

The Skin & Accessory Structures

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Hypodermis

- ◆ Bottom layer or foundation layer
- ◆ Attaches to underlying bone and muscle
- ◆ Supplies the bone & muscle below with blood vessels and nerves
- ◆ Also called **subcutaneous** tissue or **superficial fascia**

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Hypodermis

- ◆ NOT part of the integumentary system
- ◆ Made up of loose areolar connective tissue and adipose tissue
- ◆ Accounts for ½ of the body's stored fat
- ◆ Prevents heat loss from the body

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Skin

- ◆ Skin or Integument
 - Two parts:
 1. **Dermis**
 2. **Epidermis**

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Dermis

- ◆ If the hypodermis is the foundation then this is the majority of the house.
- ◆ Mostly dense, irregular connective tissue
- ◆ Structural strength of the skin
- ◆ Contains nerve endings, hair follicles, smooth muscles, glands & lymphatics

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Dermis

- ◆ Divided into two parts:
 1. Reticular layer
 2. Papillary layer

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Reticular layer

- ◆ Deeper layer
- ◆ 80% of the thickness of the dermis.
- ◆ Reticulum refers to “Network”, it does not refer to the amount of reticular fibers.

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Reticular layer

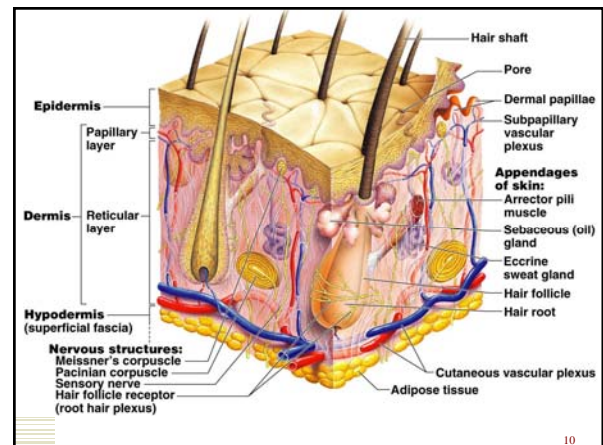
- ◆ Abundant with collagen for strength
- ◆ Extreme stretching of the skin can result in tearing the collagen fibers which result in striae or “stretch marks”
- ◆ Continuous with the hypodermis

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Papillary layer

- ◆ More superficial layer
- ◆ 20% of the thickness of the dermis
- ◆ Made up of areolar connective tissue
- ◆ More cells than fibers
- ◆ Large number of blood vessels that supply the overlying epidermis

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Epidermis

- ◆ Stratified squamous epithelium
- ◆ Separated from dermis by basement membrane
- ◆ Not as thick as the dermis
- ◆ Contains no blood vessels

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Epidermis

- ◆ Nourished by papillary layer through diffusion.
- ◆ Contains many **keratinocytes** which produce a protein mixture called **keratin**
 - Structural strength
 - Tough - protective properties
 - Produce antibiotics & detoxify

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Epidermis

- ◆ Made up of five layers
 1. Stratum Basale (Basal Layer)
 2. Stratum Spinosum (Spiny Layer)
 3. Stratum Granulosum (Granular Layer)
 4. Stratum Lucidum (Clear Layer)
 5. Stratum Corneum (Horny Layer)

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Stratum Basale

- ◆ Deepest epidermal layer.
- ◆ Site of new cell production.
- ◆ Takes 40-56 days for new cells to reach the epidermal surface and desquamate.
- ◆ Contains **melanocytes** which make the dark skin pigment **melanin**. Darker people have more melanin not more melanocytes.

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Stratum Spinosum

- ◆ Superficial to the stratum basale.
- ◆ Limited new cell production.
- ◆ Contains **Langerhans** cells – Part of the immune system – Police outer body surface

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Stratum Granulosum

- ◆ Where the keratinocytes are “toughening up” to make the outer layer of the skin.
- ◆ Last layer that receives nutrients.
- ◆ Contains **lamellated granules** – they have a glycolipid that is secreted to help slow water loss across the epidermis.

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Stratum Lucidum

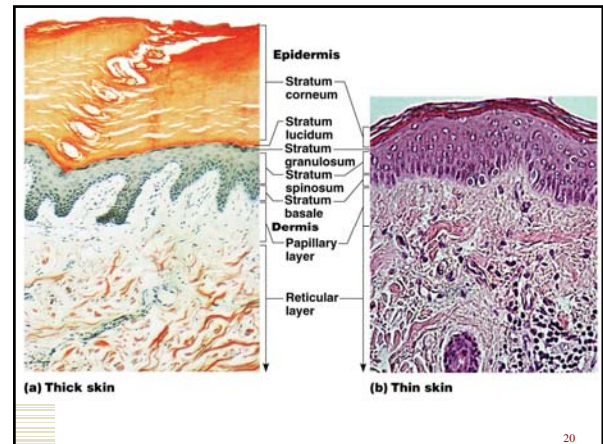
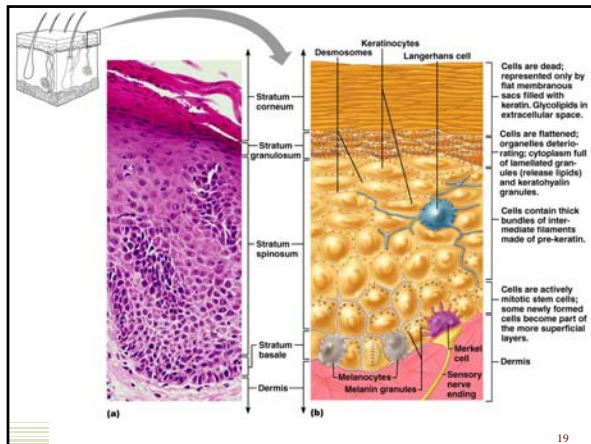
- ◆ Occurs in thick skin – Palms of the hands, finger tips & soles of the feet – Not found elsewhere in the skin.
- ◆ Also named the “transition zone”

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Stratum Corneum

- ◆ Most external part of the epidermis.
- ◆ Dead, flat keratinocytes completely filled with keratin.
- ◆ Protect against abrasion and penetration.
- ◆ Glycolipids between cells keeps this layer waterproof.

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Skin, Hair & Eye Color

- ◆ The color is determined by the amount of melanin produced by melanocytes.
- ◆ Provides UV protection from the sun.
- ◆ Large amounts are found in certain regions – Freckles, moles, nipples, areolae of the breasts, axillae and the genitalia.
- ◆ UV light stimulates the production of melanin, resulting in a sun tan.

Skin, Hair & Eye Color

- ◆ Melanin production is determined by genetic factors, hormones & exposure to light.
- ◆ Genetic factors are responsible for variations in skin color between races and people within the same race.
- ◆ Albinism – Recessive genetic trait – In ability to produce pigment.
- ◆ During pregnancy certain hormones cause the darkening of the nipples, areolae, etc.

Accessory Structures of Skin

- ◆ Nails
- ◆ Hair
- ◆ Sebaceous Glands
- ◆ Sweat Glands
- ◆ Muscles

Nails

- ◆ Scalelike modification of epidermis.
- ◆ Used for grabbing small objects.
- ◆ Made of hard keratin.
- ◆ Corresponds to claws or hooves that are found in other mammals.

Nails

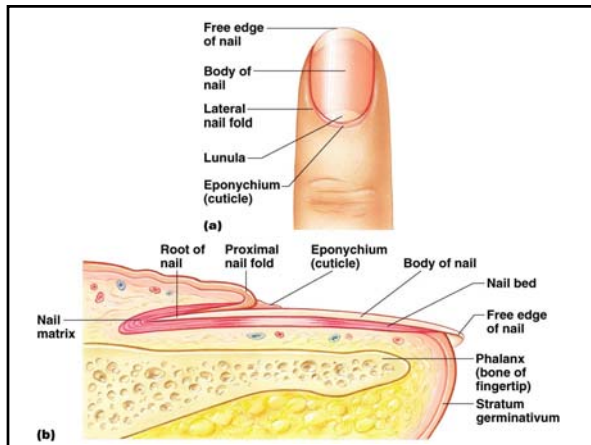
- ♦ Proximal – Nail root – covered by skin
- ♦ Distal – Nail body – not covered
- ♦ Lateral & proximal edges are covered by skin called the **nail fold**.
- ♦ Edges are held in place by the **nail groove**.

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Nails

- ♦ **Eponychium** – Cuticle
- ♦ **Hyponychium** – Beneath the free edge.
- ♦ Nails appear pink due to capillaries below.
- ♦ **Lunula** – White crescent shaped are at base of nail. Thick & can't see vessels beneath.

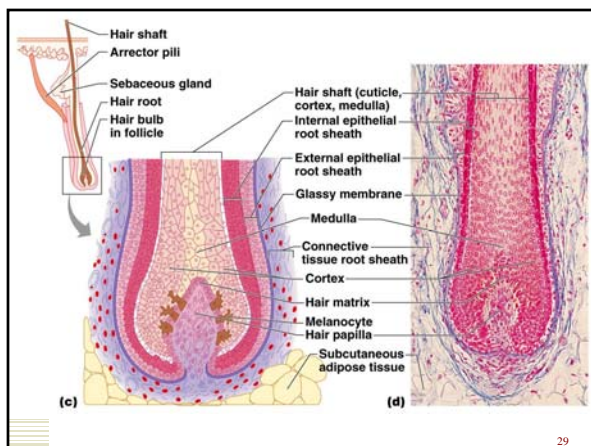
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Hair

- ♦ **Hair Structure**
 - Shaft – above the skin
 - Root – below the skin
 - Bulb – base of the root
 - Made of 3 keratin layers
 - Cuticle
 - Cortex
 - Medulla

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Glands

- ♦ **Sebaceous Glands**
 - Located in the dermis
 - Simple or compound alveolar
 - Produce **sebum** (oily & rich in lipids)
 - Connected to the surface at follicle
 - Prevents drying of hair & bacteria

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Glands

♦ Sweat Glands

- **Eccrine** sweat glands
 - Simple coiled tubular glands that secrete sweat. Modified filtrate of blood.
 - Evaporation cools the body.
- **Apocrine** sweat glands
 - Occur primarily in axillary, anal & genital region.
 - Protein & fatty acids. Bacterial action = odor

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Muscles

♦ Arrector Pili

- Associated with each hair follicle.
- Extends from dermal root sheath to the papillary layer of the dermis.
- Makes hair "Stand on end".

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Vitamin D Production

- ♦ Vit. D synthesis begins in skin exposed to UV.
- ♦ Humans can produce all they need, however, due to lifestyle most people have inadequate Vit. D.
- ♦ Vit. D synthesis & absorption require a healthy digestive system.

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Vitamin D Production

- ♦ Vit. D functions as a hormone to stimulate the uptake of calcium & phosphate from the intestines, to release calcium from bone and to reduce calcium loss from the kidneys in order to increase blood calcium & phosphate.
- ♦ Calcium is needed for bone health & normal nerve & muscle function.

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Sensation

- ♦ The integumentary system is well supplied with sensory receptors including touch & pressure receptors.

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Excretion

- ♦ The removal of waste products.
 - Urea
 - Uric Acid
 - Ammonia
- ♦ Loss of water and salts.
 - During heavy sweating replace w/ electrolytes & water.

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