



INTEGUMENTARY SYSTEM

DND Primary Care Paramedicine

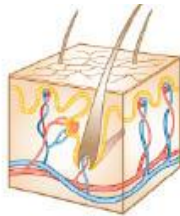
Module: 05

Section: 05

- The largest system of the human body
- Contains the skin and its appendages:
 - Glands
 - Hair
 - Nails

- Providing a waterproof flexible shield against invading pathogens
- Healing wounds through cell division
- Temperature regulation
- Allows substances (urea, nitrogen) to be expelled

Roles of the skin



Provides a barrier against hazardous materials and pathogens.

Reproductive
 Gonads provide hormones that promote growth, maturation, and maintenance of skin.
 Skin forms scrotum that protects testes; tactile receptors in skin provide sensations associated with sexual behaviors.

Skeletal
 Provides structural support.
 Synthesizes vitamin D needed for calcium absorption and metabolism for bone growth and maintenance.

Urinary
 Eliminates metabolic waste and maintains normal body fluid composition.
 Alternative excretory route for some salts and nitrogenous wastes; limits fluid loss.

Muscular
 Generates heat to warm the skin, muscle contraction pulls on skin to produce facial expressions.
 Synthesizes vitamin D needed for absorption and metabolism of calcium essential for muscle contraction.

Digestive
 Provides nutrients needed for skin growth, maintenance, and repair.
 Provides vitamin D for intestinal absorption of calcium.

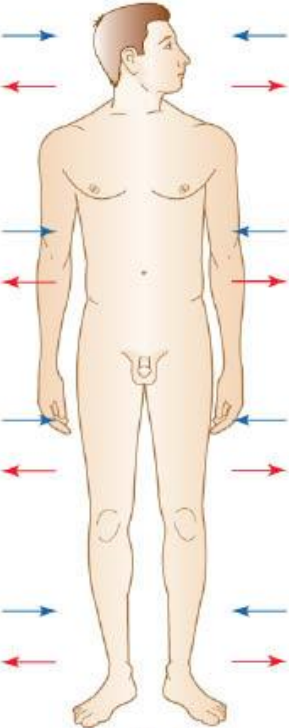
Nervous
 Controls diameter of cutaneous blood vessels and sweat gland activity for temperature regulation.
 Dermis contains receptors that detect stimuli related to touch, pressure, pain, and temperature.

Respiratory
 Furnishes oxygen and removes carbon dioxide by gaseous exchange with blood.
 Hairs of nasal cavity filter particles that may damage the upper respiratory tract.

Endocrine
 Sex hormones influence hair growth, sebaceous gland activity, and distribution of subcutaneous adipose.
 Synthesizes vitamin D needed for the absorption and metabolism of calcium, which acts as a messenger in some hormone actions.

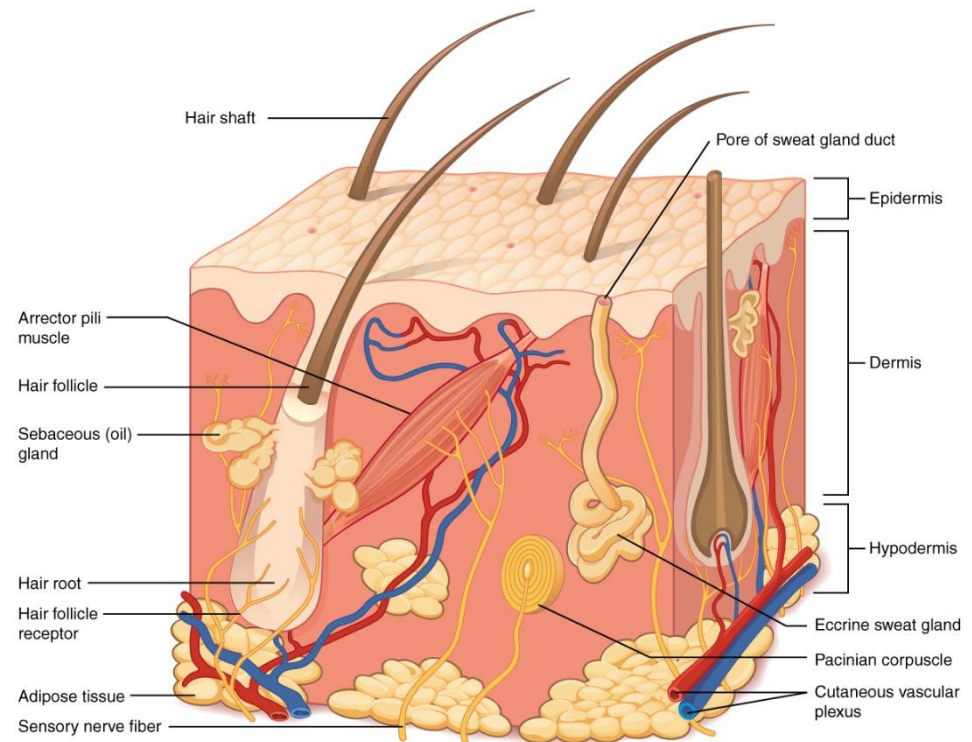
Lymphatic/Immune
 Prevents loss of interstitial fluid from skin, protects against skin infection, and promotes tissue repair.
 Prevents pathogen entry; connective tissue cells in the skin activate the immune response.

Cardiovascular
 Transports gases, nutrients, wastes, and hormones to and from the skin; hemoglobin provides color.
 Prevents fluid loss from the blood; vasoconstriction of dermal vessels diverts blood flow to other organs.



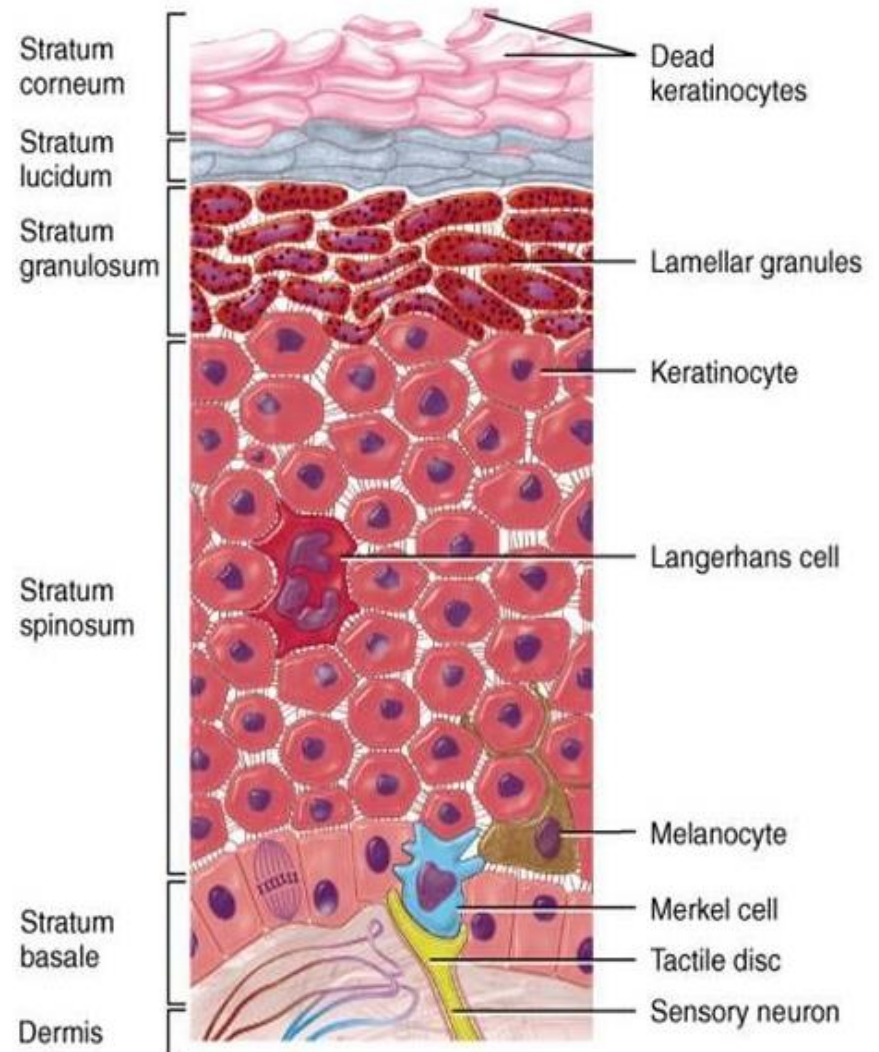
← Gives to Integumentary System
 → Receives from Integumentary System

- Structure
 - AKA The cutaneous layer
 - Has two distinct layers
 - Epidermis
 - Dermis
 - Is anchored to the underlying structures by subcutaneous tissue

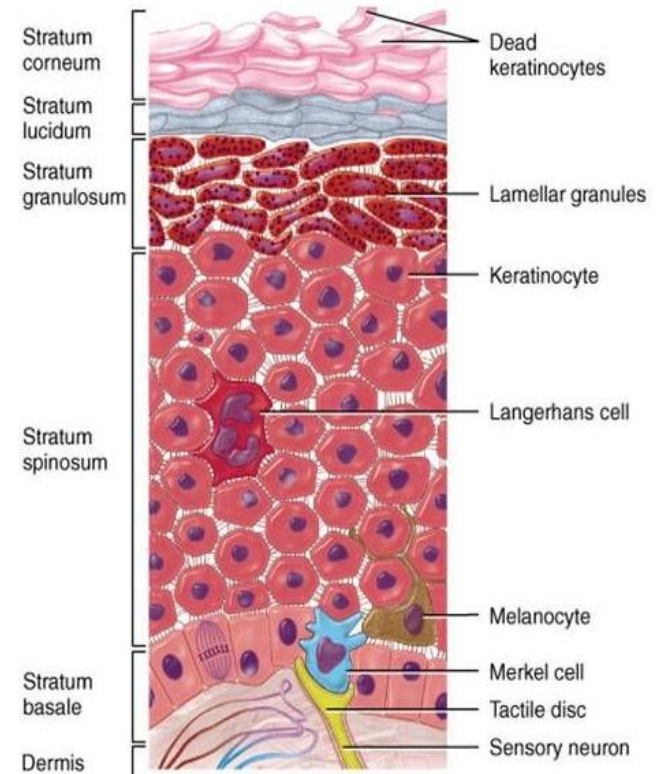


- Has no blood vessels
- Receives nutrition through diffusion
- Actually divided into 5 separate layers (4 in thinner regions)
 - Bottom layer receives ample nutrition and is able to grow
 - As the cells move upward they receive less nutrition and a protein (keratin) is deposited into the cell
 - The keratin changes the shape and internal composition (keratinization)
 - When the cell reaches the top it is dead tissue and will fall off

- Stratum corneum
- Stratum lucidum
- Stratum granulosum
- Stratum spinosum
- Stratum basale

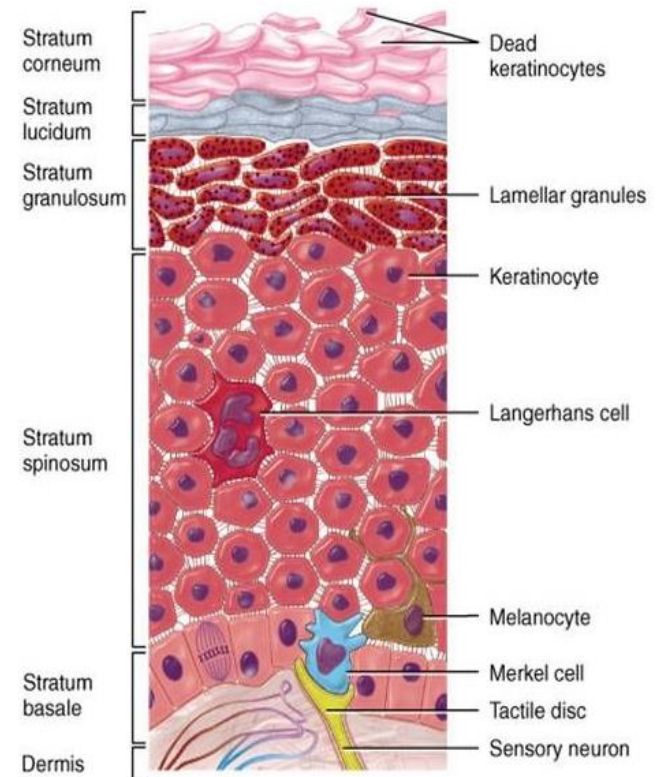


- Deepest layer of epidermis
- Squamification (adhesion to underlying layer)
- Consists of:
 - Keratinocytes
 - Responsible for keratinization (formation of a protective layer)
 - Melanocytes
 - Produce pigment melanin
 - Langerhans cells
 - Immune cells
 - Merkel cells
 - Touch receptors



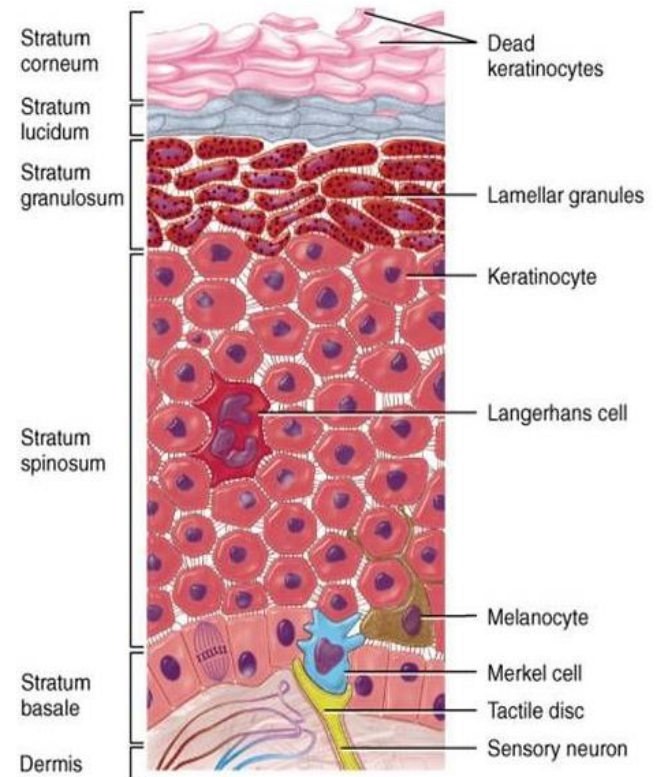
Stratum Spinosum

- Middle layer of epidermis
- Limited, but some mitotic ability
 - One daughter cell remains in basale, the other pushed upward in spinosum
- Basale + spinosum = stratum germinativum



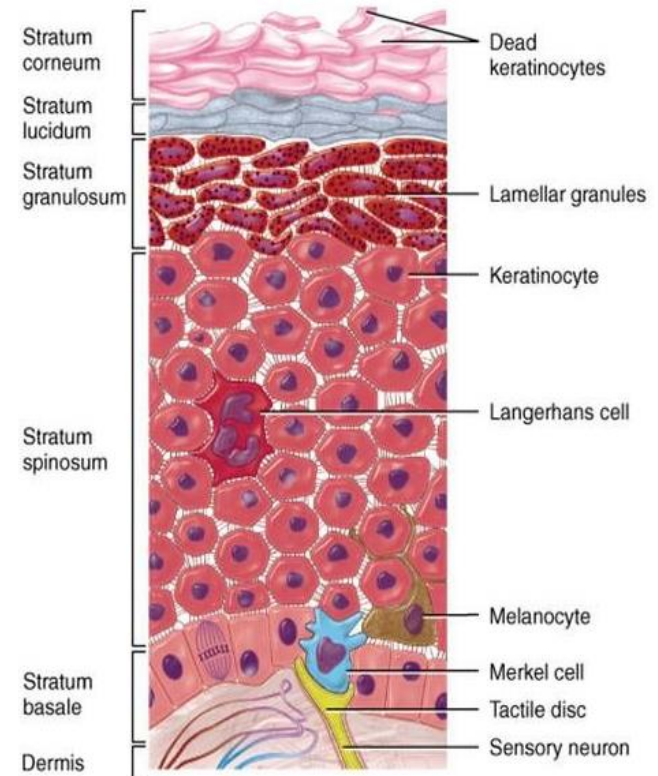
Stratum Granulosum

- Thin layer of epidermis above stratum spinosum
- Keratinization occurs
 - Fill with keratin and die during migration to stratum corneum
 - Start to appear granular



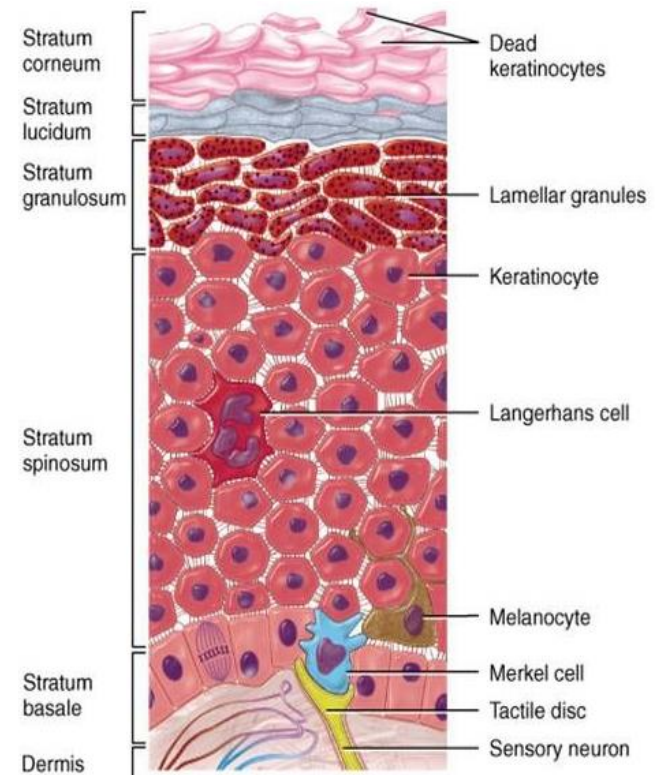
Stratum Lucidum

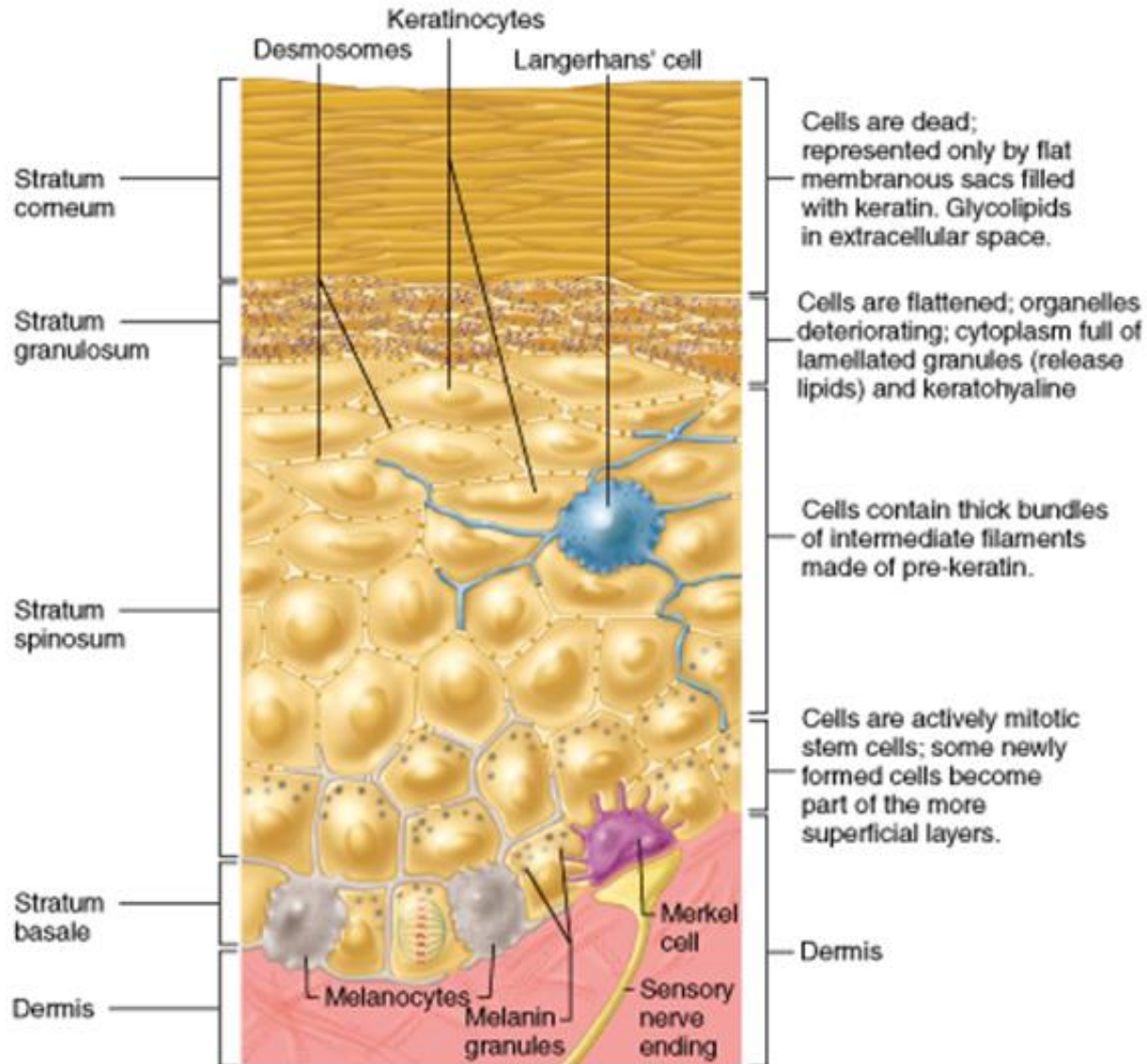
- Only found in thick epidermis
 - soles of feet, palms of hands
- Layers of flattened, anucleated cells
- Represents the transition of the stratum granulosum to the stratum corneum.



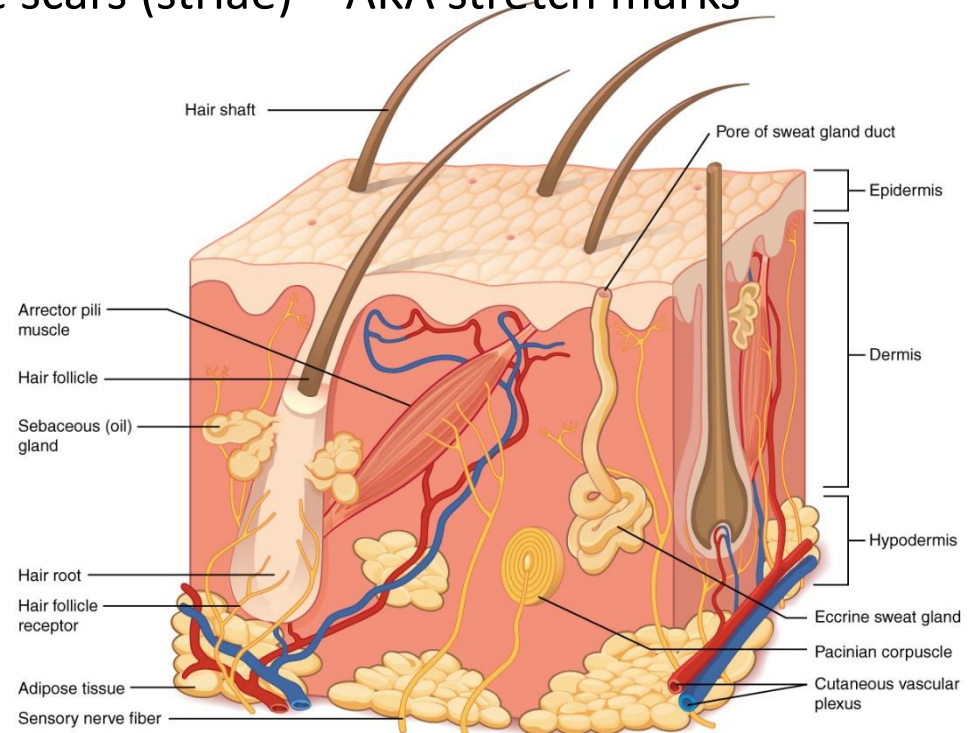
Stratum Corneum

- Outer layer of epidermis
- Flat dead cells
 - 20 – 30 layers (approximately 75% of epidermal thickness)
- Constantly sloughed off as dandruff, during movement, washing, and other daily contact
- Contains keratin which assists in preventing evaporation
 - Keratin is a water repellent protein that prevents the loss of H₂O





- Thicker than the epidermis (4 X)
- Contains hair, nails and glands
- Gives the skin its elasticity and strength
 - If over stretched leaves white scars (striae) – AKA stretch marks
- Contains blood vessels and nerves
- Nerves have sensory receptors to detect changes in environment
 - Temp, pain, pressure, touch

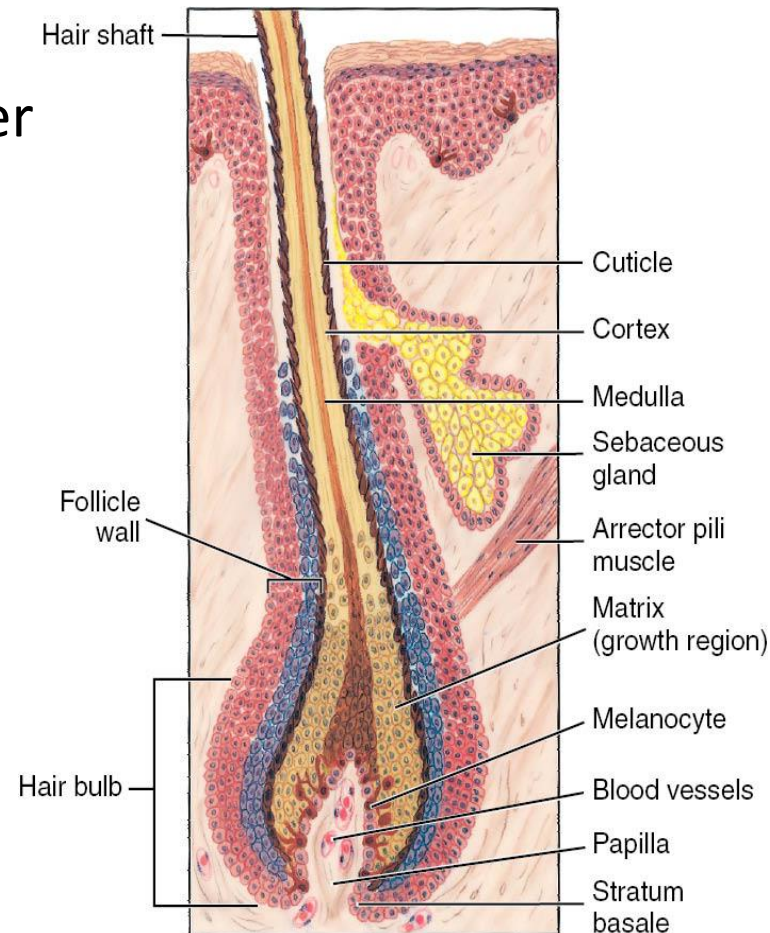


- AKA Hypodermis or Superficial fascia
- Technically not part of the skin
- Contains mostly adipose tissue
 - Provides a cushion for organs beneath it
 - Provides heat insulation
 - Can provide energy from the adipose

- Due to many factors:
 - Genetic
 - Physiological
 - Environmental
- Basically due to the pigment melanin produced by the epidermis
 - Everyone has same number of melanocytes but the number of active ones is dependent on above factors
 - Many → Dark Skin
 - Few → Light Skin
 - None → Albino

- Some people also have yellow pigment called carotene in addition
 - Results in a yellowish tint to the skin
 - Converted into vitamin A in the liver
- Pinkish tint is due to blood vessels (Hemoglobin) in the dermis
- UV Lights will increase melanocyte activity producing a tan

- Hair and Hair Follicles
 - Found in most areas of the body
 - Shaft extends past epidermis layer
 - Has no nerve endings
 - Root is below the surface
 - Surrounded by the hair follicle
 - Color is dependent on melanin
 - Decrease activity as we age and replaced with air bubbles
 - Smooth muscles attached (arrector pili) to each pulling the hair upwards causing goose bumps

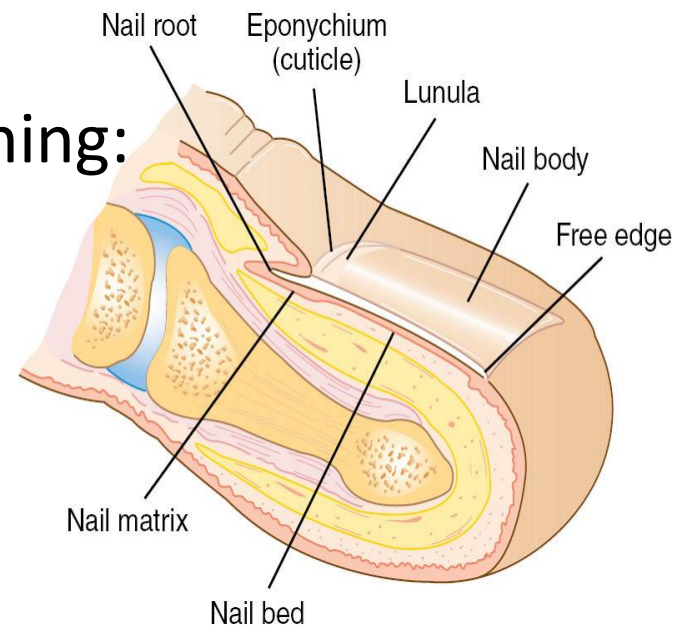


- Nails

- Made of thin plates of keratinized stratum corneum.
- Nails are derived from the stratum basale in the nail bed

- Grows from the cuticle out forming:

- The nail root
- The nail body
- The free edge



- Glands
 - Two major glands
 - Sebaceous
 - Sweat
 - Also may involve ceruminous (modified sweat gland)

- Sebaceous
 - Found mainly with hair
 - Gives hair and skin soft and pliable
 - Inhibits growth of bacteria on skin
 - Helps prevent water loss
 - Highly active during puberty and decreased in elderly

- Sweat (Sudoriferous)
 - Found all over except lips, nipples and external genitalia and most abundant in the palms and soles
 - Three types:
 - Eccrine (Merocrine)
 - Apocrine
 - Ceruminous

- Eccrine (Merocrine)
 - Most numerous
 - Opens to the surface through a sweat pore
 - Contains mainly salt and water
 - Activated with exertion or stress

- Apocrine
 - Larger and found in axillae and around external genitalia
 - Ducts open into the hair follicles
 - Contains salt, water and organics (fatty acids and proteins)
 - Are activated at puberty
 - Stimulated by nervous system to pain, emotional stress and sexual arousal
 - Odorless when released but quickly broken down

- Ceruminous
 - Found in the ear canal
 - Secrete an oily, sticky substance called cerumen (AKA earwax)
 - Thought to protect from infection

- Normal temp?
- Two ways
 - Constriction and dilatation of blood vessels
 - Decreased blood flow = decreased temperature to the skin
 - Activation or deactivation of sweat glands
 - Increased sweat = decreased temperature via evaporation
 - Both are negative feedback mechanisms

Synthesis of Vitamin D

- Skin contains precursor to Vit D and it is modified as a result of UV ray exposure
- Vit D is needed to absorb calcium and phosphorus in the small intestine
- They are needed for bone metabolism and muscle function

