MEDAVIE HealthEd ÉduSanté

Integumentary System

Advanced Care Paramedicine

Module: 08

Section: 02

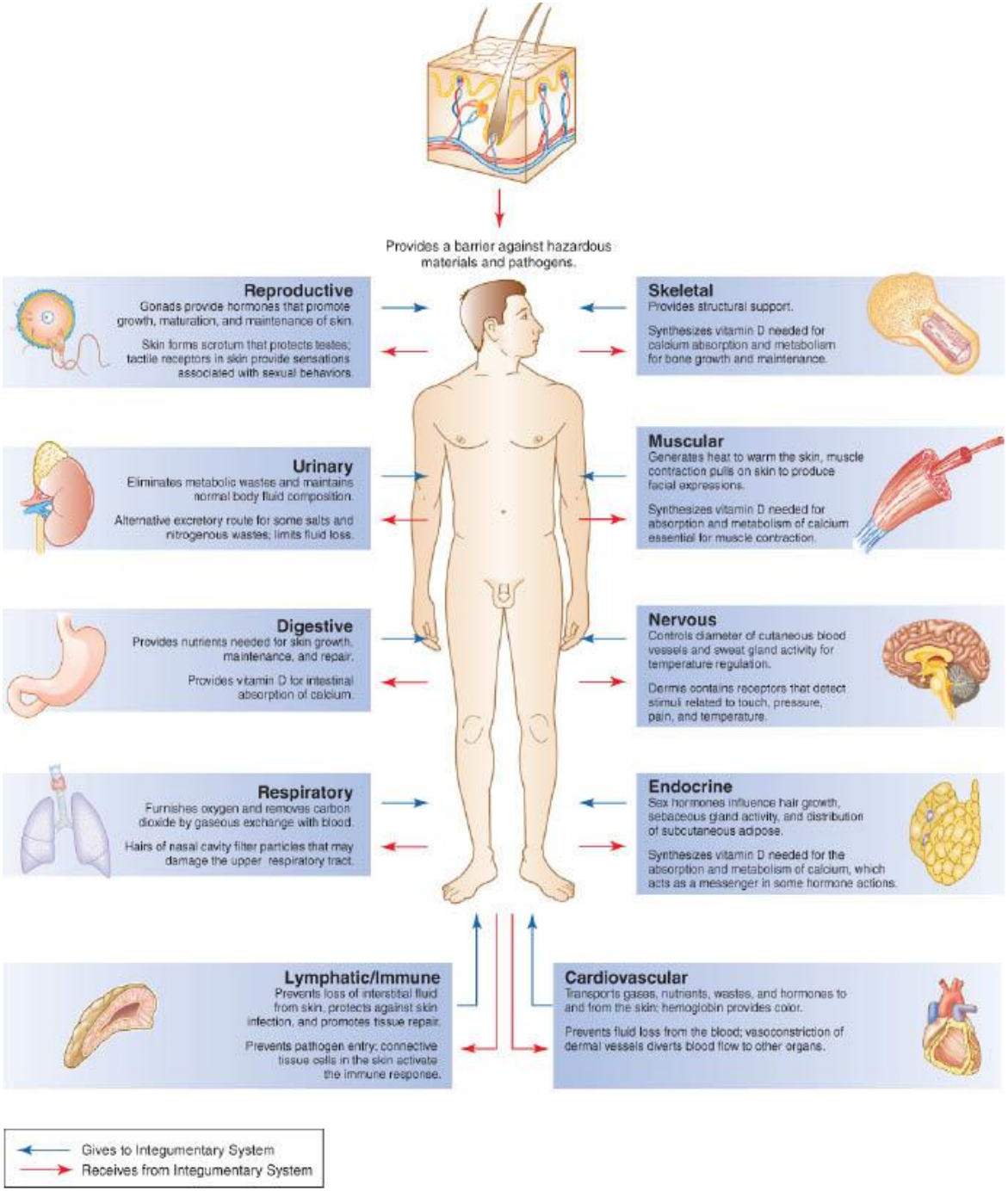
Integumentary System

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

Roles of the skin

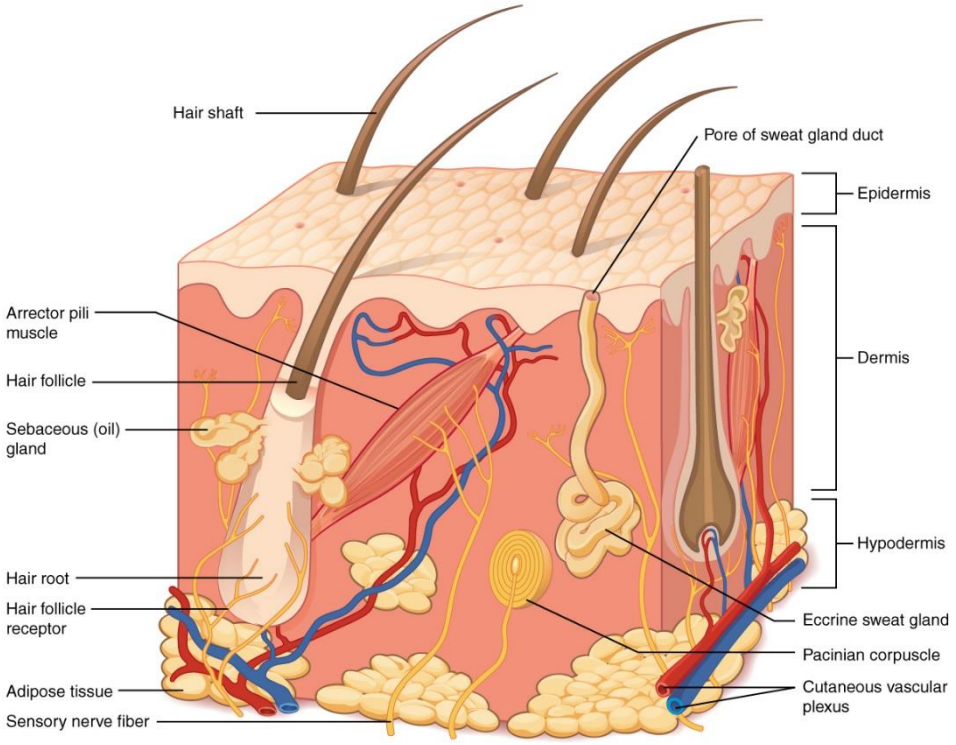
- Providing a waterproof flexible shield against invading pathogens
- Healing wounds through cell division
- Temperature regulation
- Allows substances (urea, nitrogen) to be expelled

Roles of the skin



The Skin

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

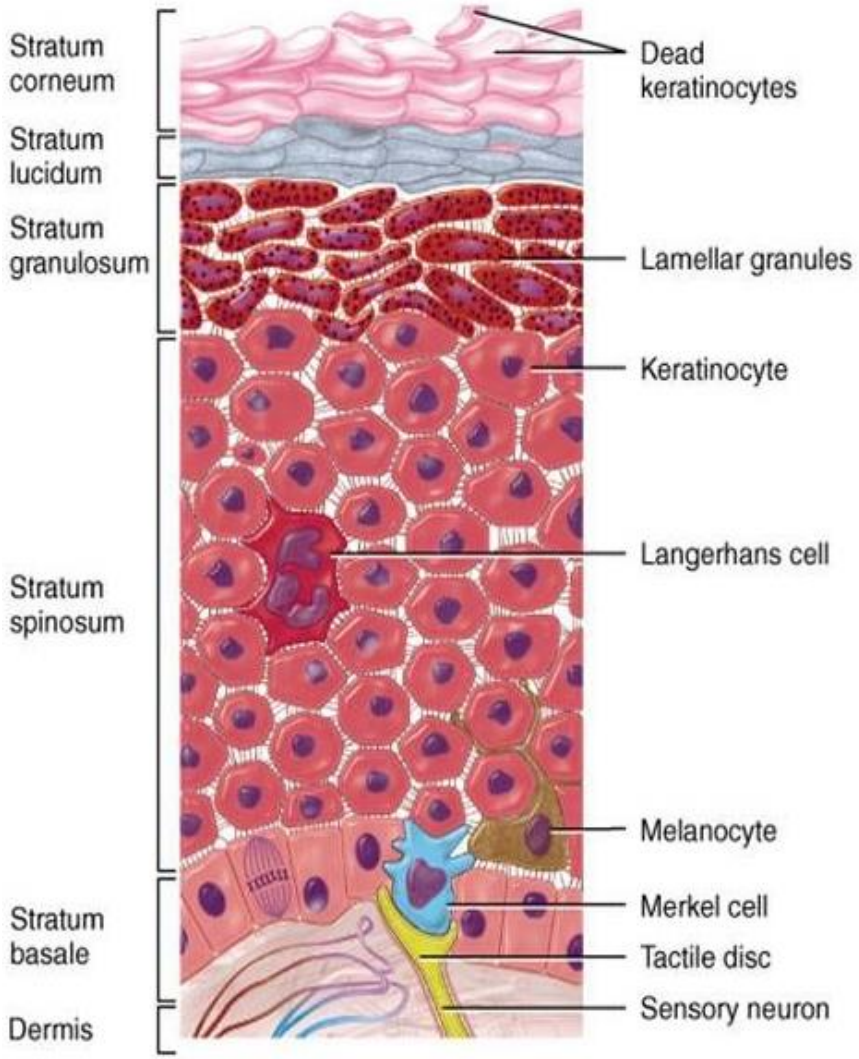


Epidermis

- Has no blood vessels
- Receives nutrition through diffusion
- Actually divided into 5 separate layers (4 in thinner regions)
  - Bottom layer receives ample nutrition and are able to grow and mitotic
  - As they 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 it reaches the top it is dead tissue and will fall off

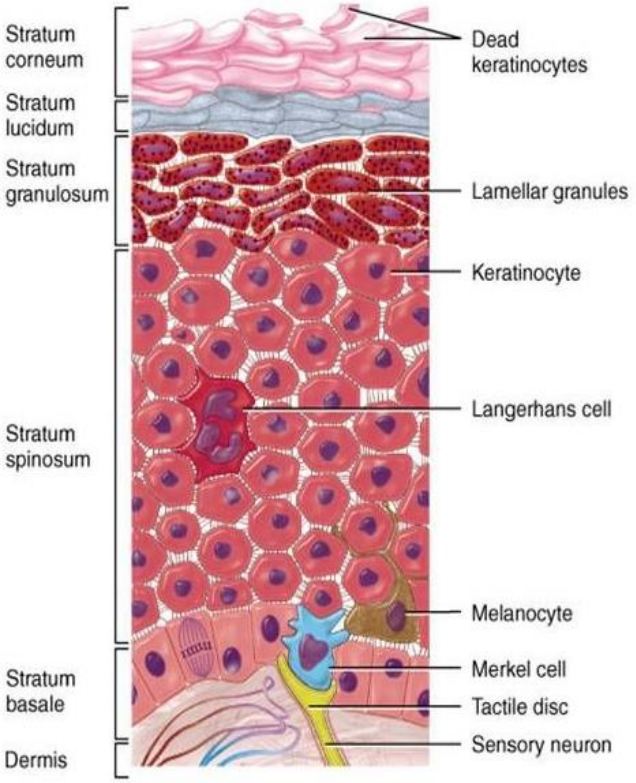
Epidermis

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



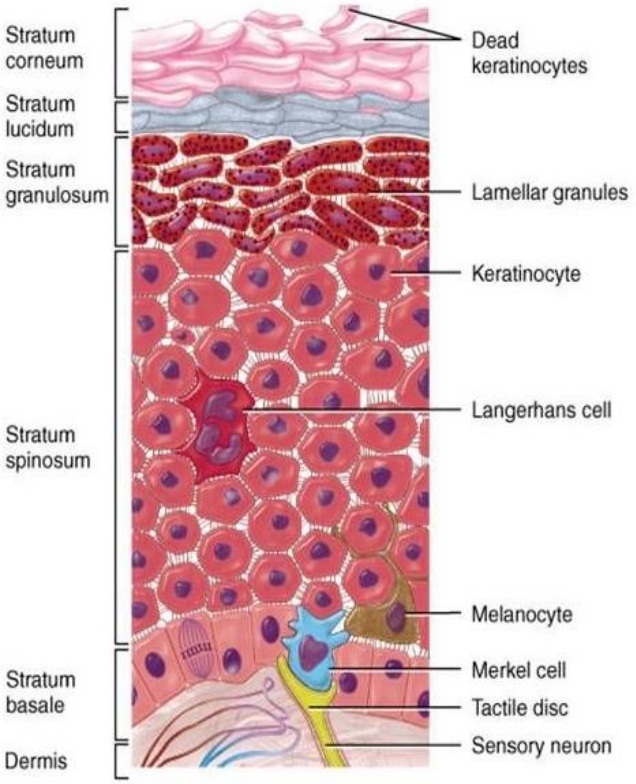
Stratum Basale

- 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



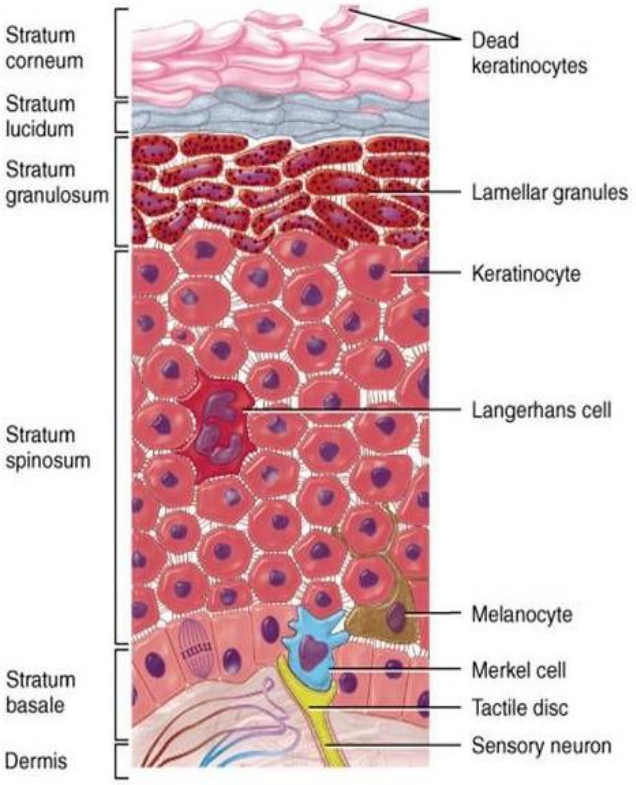
Stratum Spinosum

- 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



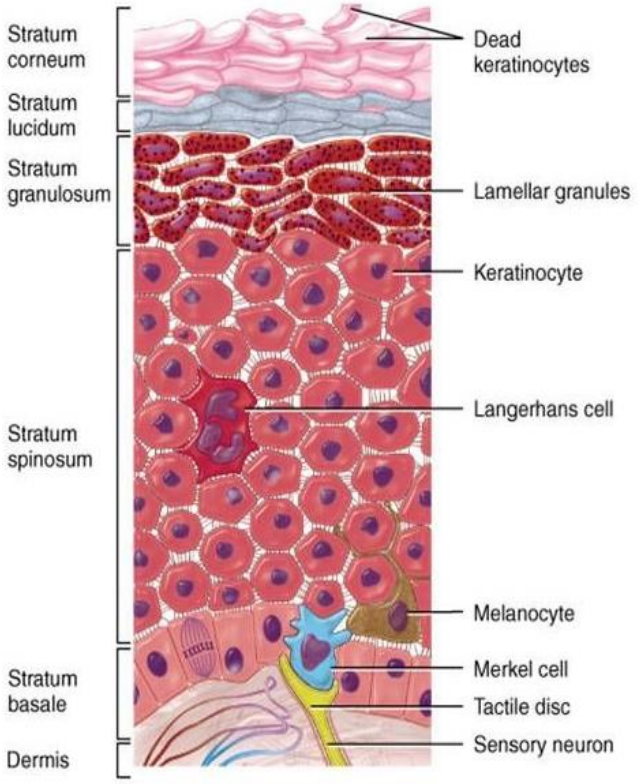
Stratum Granulosum

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



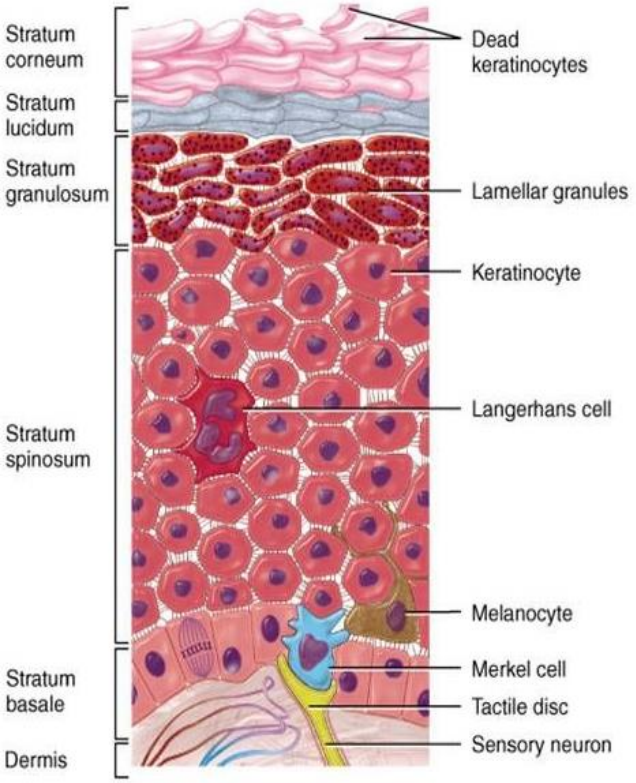
Stratum Lucidum

- 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.

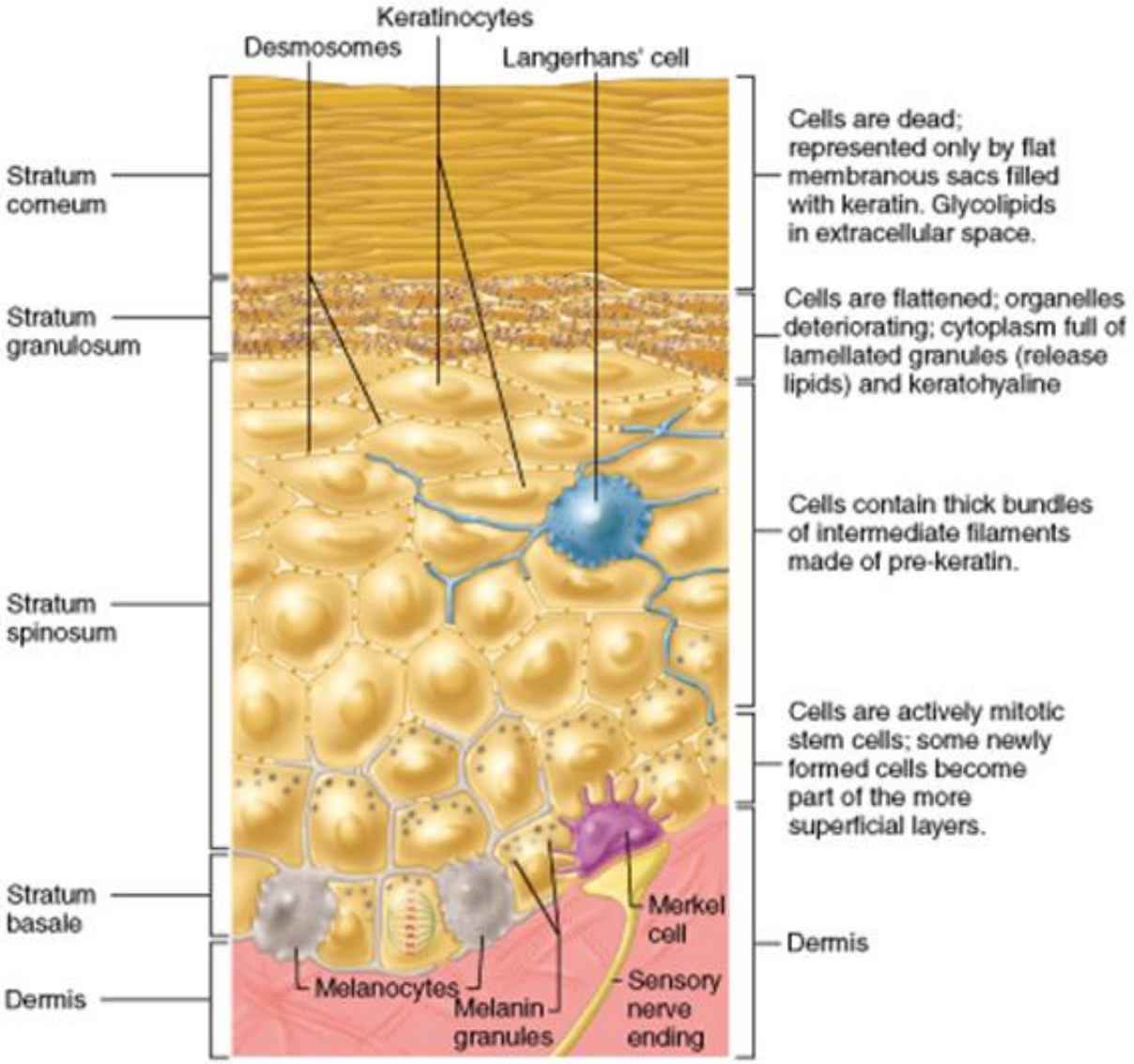


Stratum Corneum

- 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 H_2O

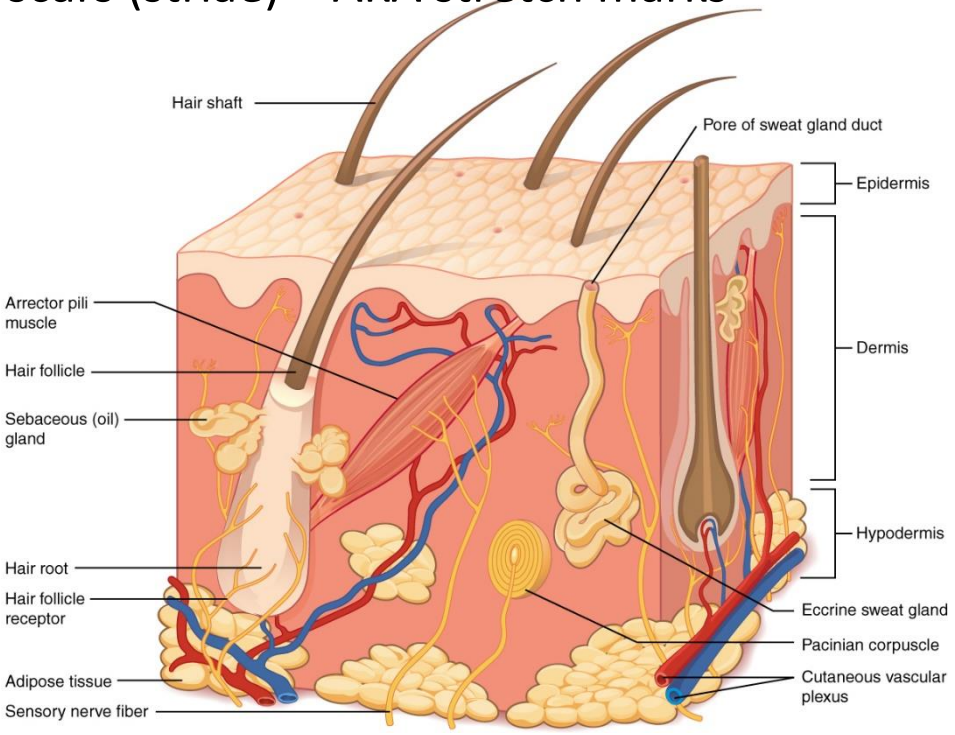


Epidermis


Keratinocytes
Desmosomes
Langerhans' cell
Stratum corneum
Stratum granulosum
Stratum spinosum
Stratum basale
Dermis
Melanocytes
Melanin granules
Merkel cell
Sensory nerve ending
Cells are dead; represented only by flat membranous sacs filled with keratin. Glycolipids in extracellular space.
Cells are flattened; organelles deteriorating; cytoplasm full of lamellated granules (release lipids) and keratohyaline
Cells contain thick bundles of intermediate filaments made of pre-keratin.
Cells are actively mitotic stem cells; some newly formed cells become part of the more superficial layers.
Dermis

Dermis

- Thicker then 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



Subcutaneous Layer

- 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

Skin Color

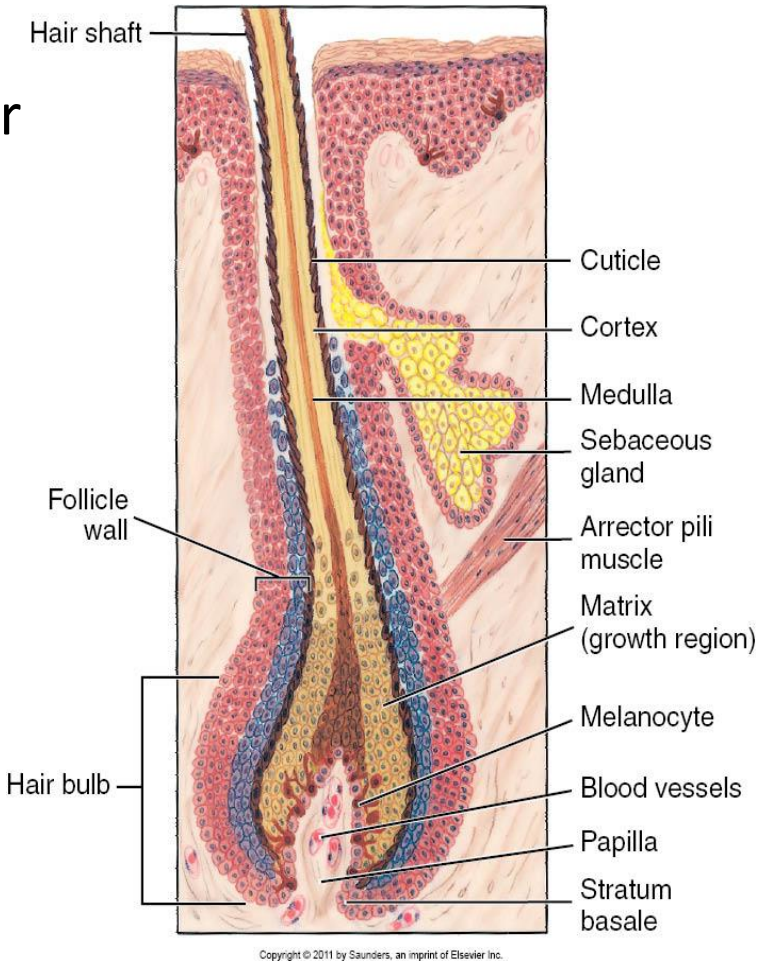
- Due to many factors:
  - Genetic
  - Physiological
  - Environmental
- Basically due to the pigment melanin produced by the epidermis
  - Everyone has same number of melanocytes but the number of active ones is dependent on above factors
    - Many → Dark Skin
    - Few → Light Skin
    - None → Albino

Skin Color

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

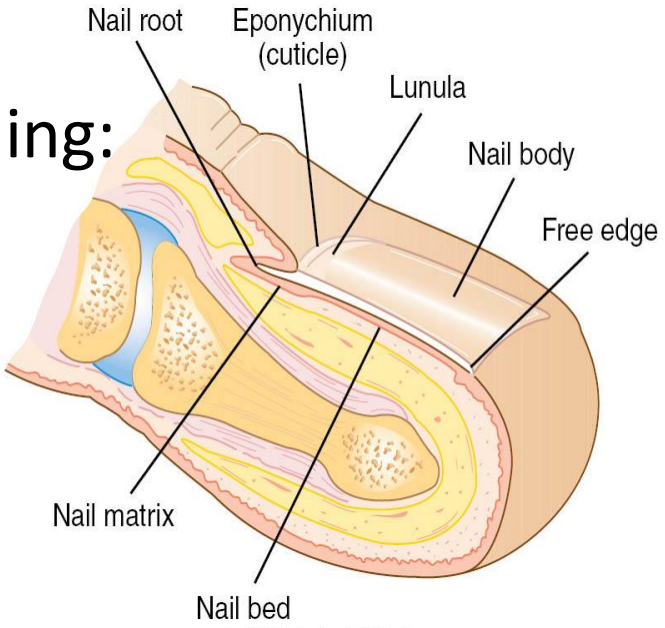
Epidermal Derivatives

- 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



Epidermal Derivatives

- 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



Epidermal Derivatives

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

Epidermal Derivatives

- 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

Epidermal Derivatives

- 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

Epidermal Derivatives

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

Epidermal Derivatives

- 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

Epidermal Derivatives

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

Regulation of Body Temp

- 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