

Integumentary System
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Skin: surface area of 1.2-2.2 square meters, weighs 4-5 kg, 7% body weight, 1.5-4.0 mm thick

Epidermis: composed of stratified squamous epithelium, outermost protective shield

Dermis: composed of fibrous connective tissue, makes up bulk of skin (tough & leathery)

Hypodermis:

- subcutaneous (adipose) tissue, not part of skin but shares protective functions.
- called superficial fascia bc it is superficial to the tough connective tissue of skeletal muscles
- loosely anchors the skin so it can slide and acts as shock absorber and insulator
- thickens with weight gain

Cells of the epidermis -

Keratinocytes:

- produce keratin, the fibrous protein that helps give the epidermis its protective properties
- most epidermal cells are keratinocytes
- connected by desmosomes and found in the deepest part of the epidermis (stratum basale)
- undergo continuous mitosis with help from a peptide called epidermal growth factor
- keratin production is accelerated in areas of friction -> thickening of epidermis called callus

Melanocytes: (spider-shaped)

- produce melanin in deepest part of epidermis
- melanin accumulates in membrane-bound granules called melanosomes
- melanosomes transfer to nearby keratinocytes and form a pigment UV shield on nucleus

Dendritic cells: (star-shaped)

- arise from bone marrow and travel to epidermis
- also called Langerhans cells and ingest foreign substances/key activators of immune system

Tactile cells: (spiky hemisphere-shaped)

- present at the epidermal-dermal junction
- also called Merkel cells and are intimately joined with a disclike sensory nerve ending
- together, a tactile or Merkel disc function as a sensory receptor for touch

Layers of the epidermis -

Stratum basale: (basal layer)

- deepest epidermal layer, attached to underlying dermis
- single row of stem cells representing the youngest keratinocytes
- also called stratum germinativum for its rapid division
- when it divides, one daughter cell is pushed into layer above and one remains
- 10-25% of cells here are melanocytes

Stratum spinosum: (prickly layer)

- several layers thick and contain a weblike system of intermediate filaments
- tension resisting bundles that attach to desmosomes
- keratinocytes in this layer appear to have spines (cells shrink and desmosomes remain)
- melanin granules and dendritic cells are most abundant in this epidermal layer

Stratum granulosum: (granular layer)

- thin, 4-6 layer where keratinocyte appearance changes and process of keratinization occurs
- this process is where cells fill with keratin protein
- cells flatten, nuclei and organelles disintegrate and accumulate two types of granules
- keratohyaline granules: help form keratin in upper layers
- lamellar granules: contain water-resistant glycolipid that is put into the extracellular space and slows water loss across epidermis

Stratum lucidum: (clear layer)

- visible only in thick skin and just above stratum granulosum
- contains two or three rows of clear, flat, dead keratinocytes
- keratohyaline granules cling to the keratin filaments causing aggregation called tonofilaments

Stratum corneum: (horny layer)

- 20-30 cell layers thick that accounts to 3/4 of epidermal thickness
 - keratin and thickened plasma membranes of cells here protect against abrasion/penetration
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Dermis

- cells are typical of those found in any CT: fibroblasts, macrophages, mast cells/ WBCs
- rich supply of nerve fibers, blood vessels and lymphatic vessels

Papillary layer

- thin superficial areolar CT of fine interlacing collagen and elastic fibers
- looseness allows phagocytes and other defensive mechanisms to wander freely
- peglike projections called dermal papillae indent overlying epidermis
- contain either capillary loops, pain receptors or touch receptors
- in thick skin, they lie atop larger mounds to make friction ridges (for gripping ability)

Reticular layer

- deeper and accounts for 80% of thickness of dermis, irregular dense fibrous CT
- network of blood vessels that nourishes (cutaneous plexus) lies between this and hypodermis
- its extracellular matrix contains pockets of adipose cells and thick bundles of collagen fibers
- separations between these bundles form cleavage or tension lines in circular patterns (helps SURGERY wounds if incision is parallel to these lines)
- flexure lines are dermal folds that occur at or near joints (hand creases)
- pregnancy can cause extreme stretching or striae, blisters are separation of epidermis and dermis

Skin colour

- three pigments contribute to skin colour: melanin, carotene, and hemoglobin

Melanin:

- made of tyrosine amino acids (reddish yellow to brownish black)
- lysosomes break down the melanosomes so the melanin pigment is found only in deeper layers of epidermis
- skin colour based on melanin made and retained (more = darker)
- freckles and moles are accumulation of melanin

Carotene:

- yellow to orange pigment
- accumulates in stratum corneum and fatty tissue of hypodermis
- can be converted to vitamin A for vision, epidermal health

Hemoglobin:

- pinkish hue of fair skin is oxygenated pigment hemoglobin (less melanin)