



The Integumentary System

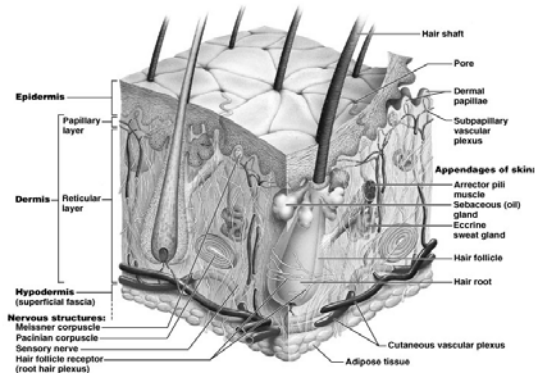
The Integumentary System

- Skin – our largest organ
 - Accounts for 7% of body weight
 - Divided into two distinct layers
 - Epidermis
 - Dermis
 - Hypodermis – lies deep to the dermis

The Integumentary System

- Functions
 - Protection & Defense
 - Thermoregulation
 - Energy storage & synthesis
 - sensory reception
 - Excretion & Secretion

Skin Structure



Epidermis

- Contains four main cell types
 - Keratinocytes
 - most abundant cell type in epidermis
 - Arise from deepest layer of epidermis
 - Produce keratin – a tough fibrous protein
 - Produce antibodies and enzymes
 - Keratinocytes are dead at skin's surface
 - Melanocytes – produce melanin
 - Merkel cells – sensory
 - Langerhans cells – defense cells

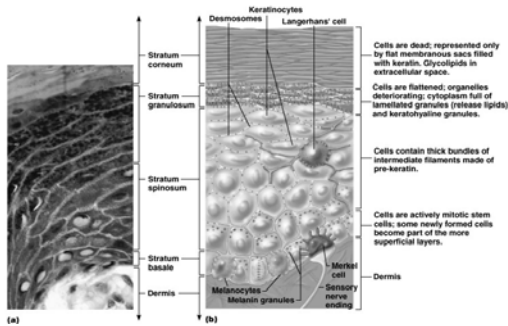
Layers of the Epidermis

- Stratum basale (stratum geminativum)
- Stratum spinosum
- Stratum granulosum
- Stratum lucidum (only in thick skin, i.e. volar surfaces)
- Stratum corneum

mnemonic device:

Boys Spit Gross Luggies Constantly

Epidermal Cells and Layers of the Epidermis



Layers of the Epidermis

- Stratum basale
 - Deepest layer of epidermis
 - Attached to underlying dermis
 - Cells actively divide
 - Stratum basale contains
 - Keratinocytes – most common cells in this layer
 - Manufacture (via sunlight conversion) vitamin D₃
 - Merkel cells – associated with sensory nerve ending
 - Melanocytes – secrete the pigment melanin
- Stratum spinosum (spiny layer)
 - "Spiny" appearance caused by artifacts of histological preparation
 - Contains thick bundles of intermediate filaments (tonofilaments)
 - Contains star-shaped Langerhans cells

Layers of the Epidermis

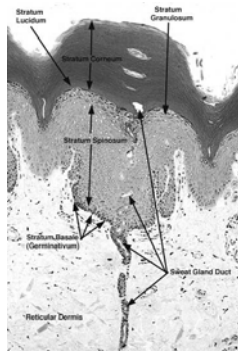
- Stratum granulosum
 - Consists of keratinocytes and tonofilaments
 - Tonofilaments contain
 - Keratohyaline granules – help form keratin
 - Lamellated granules – contain a waterproofing glycolipid
- Stratum lucidum (clear layer)
 - Occurs only in thick skin
 - Composed of a few rows of flat, dead keratinocytes

Layers of the Epidermis

- Stratum corneum (horny layer)
 - Thick layer of dead keratinocytes and thickened plasma membranes
 - Protects skin against abrasion and penetration

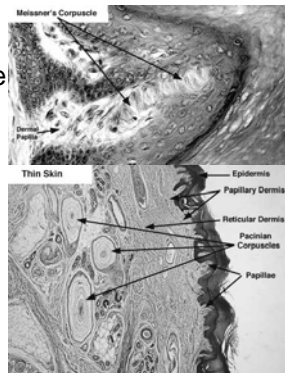
Dermis

- Second major layer of the skin
- Strong, flexible connective tissue
- Richly supplied with blood vessels and nerves
 - Thermoregulation?
 - Cyanosis?
- Has two layers
 - Papillary layer – includes dermal papillae
 - Reticular layer – deeper layer – 80% of thickness of dermis



Sensory Structures of the Dermis

- Meissner's Corpuscle
- Pacinian Corpuscles
- Hair root plexus
- Free nerve endings
 - Pain & thermoregulation



Hypodermis

- Deep to the skin – also called superficial fascia
- Contains areolar and adipose connective tissues
- Anchors skin to underlying structures
- Helps insulate the body

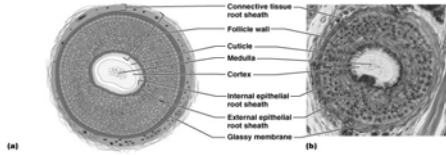
Skin Color

- Three pigments contribute to skin color
 - Melanin – most important pigment – made from tyrosine
 - Carotene – yellowish pigment from carrots and tomatoes
 - Hemoglobin – Caucasian skin contains little melanin
 - Allows crimson color of blood to show through

Appendages of the Skin

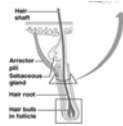
- Hair
 - Flexible strand of dead, keratinized cells
 - Hard keratin – tough and durable
 - Chief parts of a hair
 - Root – imbedded in the skin
 - Shaft – projects above skin's surface

Appendages of the Skin



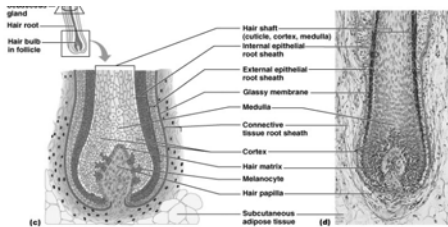
- Hair – three concentric layers keratinized cells

- Medulla – central core
- Cortex – surrounds medulla
- Cuticle – outermost layer



Appendages of the Skin

- Hair follicles – extend from epidermis into dermis
 - Hair bulb – deep, expanded end of the hair follicle
 - Root plexus – knot of sensory nerves around hair bulb



Appendages of the Skin

- Wall of hair follicle
 - Connective tissue root sheath
 - Epithelial root sheath
- Arrector pili muscle – bundle of smooth muscle
 - Hair stands erect when arrector pili contracts

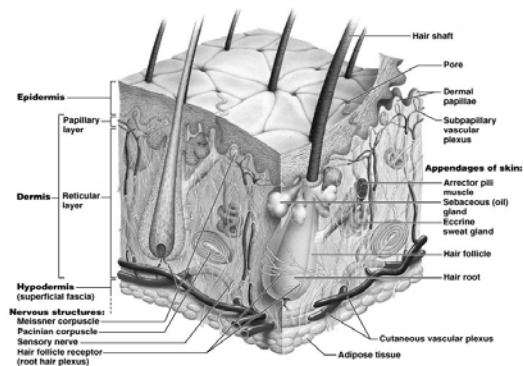
Types and Growth of Hair

- Vellus hairs – body hairs of women and children
- Terminal hairs – hair of scalp; axillary and pubic area (at puberty)
- Hair thinning and baldness
 - Due to aging
 - Male pattern baldness

Sebaceous Glands

- Occur over entire body, except palms and soles
- Secrete sebum – an oily substance
 - Simple alveolar glands
 - Holocrine secretion – entire cell breaks up to form secretion
- Most are associated with a hair follicle
- Functions of sebum
 - Collects dirt; softens and lubricates hair and skin

Sebaceous and Sweat Glands



Sweat Glands

- Sweat glands (sudoriferous/eccrine glands) are widely distributed on body
- Sweat – is a blood filtrate
 - 99% water with some salts
 - Contains traces of metabolic wastes

Sweat Glands

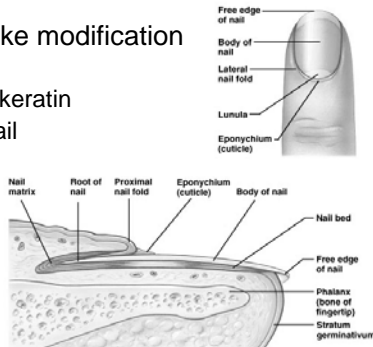
- Two types of sweat gland
 - Eccrine gland
 - Most numerous – produce true sweat (watery)
 - Coiled tubular gland
 - Controlled by the hypothalamus
 - Apocrine gland
 - Confined to axillary, anal, and genital areas
 - Produce a fatty secretion of sweat during periods of stress/anxiety
 - Even though they are called apocrine sweat glands they do not secrete in an apocrine fashion – rather in an eccrine or merocrine fashion as do the eccrine glands... the name has remained to avoid confusion of the two varieties of sweat glands!

Nails

- Nails – scale-like modification of epidermis

- Made of hard keratin
- Parts of the nail

- Free edge
- Body
- Root
- Nail folds
- Eponychium
 - cuticle



Burns

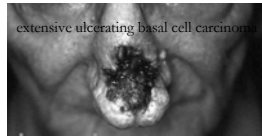
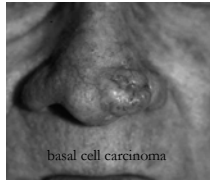
■ Classified by severity

- First degree burn – only epidermis is damaged
- Second degree burn – upper part of dermis is also damaged
 - Blisters appear
 - Skin heals with little scarring
- Third degree burn – consume thickness of skin
 - Burned area appears white, red, or blackened

Skin Cancer Types

■ Basal cell carcinoma

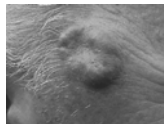
- least malignant and most common
- appears as a round lump or flattened scaly area
- red, pale or pearly in color
- grows slowly, usually on the head, neck and upper torso
- untreated can cause disfiguration



Skin Cancer Types

■ Squamous cell carcinoma

- less common, but more dangerous than basal cell carcinoma
- not as dangerous as melanoma
- appears as a thickened, red, scaly spot that may bleed easily, crust or ulcerate
- appears on skin most often exposed to the sun
- grows over weeks to months and may spread to other parts of the body if not treated promptly



Skin Cancer Types

- Melanoma – a cancer of melanocytes

- The most dangerous type of skin cancer

- *The ABCD'S of Melanoma*

- **Asymmetry**-- One half doesn't match the other half.

- **Border irregularity**-- The edges are ragged, notched or blurred.

- **Color**-- The pigmentation is not uniform. Shades of tan, brown and black are present. Dashes of red, white and blue add to the mottled appearance.

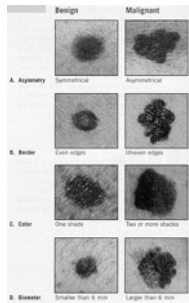
- **Diameter**-- greater than six millimeters (about the size of a pencil eraser). Any growth of a mole should be of concern.

- Men

- Often on head, neck (upper body) or between shoulders & hips

- Women

- Often shows up on the lower legs



The Skin Throughout Life

- At 5-6 months, the fetus is covered with lanugo (downy hairs)

- In middle to old age

- Skin thins and becomes less elastic

- Shows harmful effects of environmental damage

- Skin inflammations become more common
