Here’s the “skin”ny
Functions of the Integumentary System

• Protection
  – Chemical & Biological
    • Low pH of skin secretions (acid mantle)
    • Bactericidal substances in sebum
    • Human defensin- natural antibiotic produced by skin cells
    • Melanin to protect against UV damage
  – Mechanical
    • Keratinized cells to form a barrier
    • Glycolipids make a waterproof barrier
Functions of the Integumentary System

• Body Temperature Regulation
  – Evaporation of sweat cools the body
  – Constriction of dermal blood vessels causes skin to drop in temperature slowing passive heat loss to the environment

• Sensation
  – Meissner’s corpuscles & Merkel discs – a caress
  – Pacinian receptors – deep pressure receptors

• Metabolic Functions
  – Vitamin D production
  – Activation of steroid hormones

• Blood Reservoir

• Excretion
The skin has two distinct regions.
   A. epidermis – composed of epithelial cells (avascular)
   B. dermis – fibrous connective tissue

The hypodermis, composed of adipose and areolar connective tissue, is below the dermis.
   Functions as a shock absorber & insulator.
   Where one gains weight.
Characteristics
  - stratified squamous epithelia
  - four cell types
    - keratinocytes – produce keratin to give epidermis protective properties
    - melanocytes – spider shaped cells, produce melanin to protect nucleus from UV damage
      melanin collects in melanosomes
    - langerhans’ cells - merkel cells – star-shaped cells, arise from bone marrow to help activate the immune system
      aka: epidermal dendritic cells
    - merkel cells – spikey hemisphere, functions with a disc like sensory nerve ending to function as a sensory receptor
The Integument (skin)

The Epidermis

Characteristics

- four to five layers (deep to superficial)
  - stratum basale - aka: stratum geminativum – rapid cell division
  - stratum spinosum - web-like system of intermediate filaments
  - stratum granulosum - accumulate keratohyaline granules to help with keratin production and lamellated granules to help slow water loss
  - stratum lucidum (absent in thin skin) - rows of clear, flat dead keratinocytes
  - stratum corneum - keratin found in this layer; provides protection and a waterproof boundary; ¾ of the skin is made from this layer
Layers of the Epidermis

- Stratum Corneum
- Stratum Lucidum
- Stratum Granulosum
- Stratum Spinosum
- Stratum Basale
The Integument (skin)
The Dermis

Characteristics
- strong, flexible connective tissue; “your hide”
- cell types include: fibroblasts, WBC, & macrophages
- two layers: papillary layer and reticular layer

Papillary Layer
- collagen fibers provide strength & resiliency
- elastic fibers allow stretching
- dermal papillae indent the superior surface into the epidermis
- Meissner’s corpuscles-touch receptors

Reticular Layer
- dense irregular connective tissue
- Pacinian corpuscles- pressure receptors
The Integument (skin)

The Hypodermis

Characteristics
- lies deep to the dermis
- consists of adipose & areolar connective tissue
- anchors skin to underlying structures
- energy storage
The Integument (skin) | Skin Color

Three pigments contribute to skin color. - melanin, carotene and hemoglobin

Melanin is produced in the skin. It ranges from yellow to reddish-brown to black.

All people have the same number of melanocytes. Skin color is determined by the color of melanin produced, the amount produced and the retention rate.

  Black individuals produce more melanosomes than fair skinned individuals.
Three pigments contribute to skin color.
- melanin, carotene and hemoglobin

Carotene is yellow to orange. It accumulates in the hypodermis and the stratum corneum. It is found in carrots, sweet potatoes, broccoli, pumpkin, etc.

Hemoglobin is found in the RBC. Fair skinned people have little melanin, so oxygenated hemoglobin is seen and gives a pink hue to the skin.
Sweat Glands or Sudoriferous Glands
- Eccrine sweat glands
  - produces sweat, found throughout the skin surface
  - abundant on palms, soles of feet, and forehead

- Apocrine sweat glands
  - found in the axillary and groin areas
  - in addition to normal sweat components, contains fatty substances and protein
  - more viscous than sweat
  - when broken down by bacteria, it is responsible for body odor

The Integument
Skin Appendages
The Integument
Skin Appendages

Ceruminous Glands (holocrine)
- produce cerumen, earwax

Mammary Glands (merocrine)
- specialized sweat gland that produces milk

Sebaceous (Oil) Glands
- holocrine glands
- found all over the body except palms & soles of feet
- produce sebum
- lubricates hair & skin; keeps hair & skin soft
- seborrhea “cradle cap” – overactive sebaceous glands
The Integument
Skin Appendages

Hair
- composed of dead keratinized cells
- two regions: the shaft & the root

Shaft of the Hair
If the shaft is . . .
- flat & ribbonlike, the hair is kinky
- oval, the hair is silky and wavy
- round, the hair is straight & may be coarse

- 3 concentric layers of the hair shaft
  - medulla- central core; large cells and air spaces
  - cortex- several layers of flattened cells
  - cuticle- single layer of cells that overlap
Root of the Hair
Color comes from the production of melanin at the base of the hair follicle.

Hair Bulb - deep end of the follicle
Root Hair Plexus - sensory nerve endings wrapped around the hair bulb
Dermal Papilla - supplies nutrients
Wall of Hair Follicle - Outer Sheath - connective tissue
Glassy Membrane - thickened basement membrane
Inner Sheath - epithelial tissue
Hair Matrix - active growing region of a hair
Arrector Pili Muscle – smooth muscle associated with a hair; allows the hair to stand on end; responsible for goose bumps
Nails- scale-like modifications of the epidermis
Epidermal Wound Healing (Superficial)
Deep Wound Healing
(Deep Wound)

stratum basale

Monocyte when still in the bloodstream

Dead neutrophils & debris

Macrophage

Deep Wound
Types of White Blood Cells

- **Basophils** – make histamines
  - Dilate blood vessels
  - Make blood vessel wall more permeable
- **Neutrophils** – phagocytic
  - Attack the wound
- **Macrophages** – very phagocytic
  - Cleans up the would deprivs
- **Fibroblasts** – builds new dermis
  - Stratum basale layer
Skin Cancer

ABCD Rule

A – Asymmetry
B – Border
Irregularities
C – Color
D – Diameter
Rule of Nines

Burns

- Head = 9% (front and back)
- Back = 18%
- Chest = 18%
- Right arm = 9%
- Left arm = 9%
- Perineum = 1%
- Right leg = 18%
- Left leg = 18%

Adult

- Head = 18% (front and back)
- Back = 18%
- Chest = 18%
- Right arm = 9%
- Left arm = 9%
- Perineum = 1%
- Right leg = 13.5%
- Left leg = 13.5%

Child
First Degree-
only epidermis is damaged

Second Degree-
blistering; epidermis and upper part of dermis is damaged

Third Degree-
full thickness burns; involves the entire thickness of the skin; looks gray-white or cherry red to blackened
Burns

- First degree burn
- Second degree burn
- Third degree burn
**Diseases of the skin**

- **Albinism**
  - Melanocytes do not produce enough (or any) melanin
  - Albino skin is translucent white and eyes are pink

- **Vitilago**
  - Absence of melanocytes in patches (could be patch of white hair)
  - Wandering Vitilago – melanocytes start and stop working