Disorders of the integumentary system

- Burns
  - Threat to life
    - Catastrophic loss of body fluids
    - Dehydration and fatal circulatory shock
    - Infection
  - Types
    - First degree – epidermis: redness (e.g. sunburn)
    - Second degree – epidermis and upper dermis: blister
    - Third degree - full thickness

- Infections
- Skin cancer
Dendritic Cells [Greek for treelike]
Langerhans Cell

- Keratin layer
- Langerhans cells
- granulosa cells
- keratinocytes
- pigmented basal cells
- melanocytes
- Merkel cell/melanocyte
Functions of Skin

• Protects from injuries
• Acts as barrier and regulates what enters/leaves body.
• Regulates body temperature.
• Synthesizes, stores vitamins.
• Sensory functions
Disorders of the integumentary system

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Epithelium: layers (on left) and cell types (on right)

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

**Cell Types**
- **Keratinocytes**: Langerhans' cell
- **Melanocytes**: Melanin granules
- **Sensory nerve ending**
Cutaneous Membrane

Stratified squamous epithelium + CT + muscle + nervous tissue
**EPIDERMIS**

- **Stratum corneum**
- **Stratum lucidum**
- **Stratum granulosum**
- **Stratum spinosum**
- **Stratum basale (germinativum)**

**Thick skin only**
Stratum Basale

- Lowest epidermal layer, near dermis
- Good nutrient supply
- Reproduces by mitosis
- Cuboidal, columnar in shape
- Moves to upper epidermis in 27 days.
Stratum Basale
Stratum Spinosum

- Living cells
- Dividing
- 8-10 cells thick
- Polygonal in appearance
Stratum Spinosum
Stratus Granulosum, Lucidum

- Poor nutrient supply.
- Flatten layer of cells.
- 3-5 cells thick.
- No cell division.
- Keratin accumulates.

- Found only in very thick skin.
- Translucent.
- Highly keratinized.
- Dead cells
Stratum Corneum

- 25-30 cells thick.
- Cells are filled with keratin and hardened.
- Sloughed off.
- Outer most layer of epidermis.
- Keratinocytes
<table>
<thead>
<tr>
<th>Layer</th>
<th>Superficial or Deep Layer?</th>
<th>Characteristics</th>
<th>Are cells keratinized in this layer?</th>
<th>Seen in THIN skin too?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stratum Basale</td>
<td></td>
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<td></td>
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<tr>
<td>Stratum Spinosum</td>
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<td>Stratum Lucidum</td>
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<tr>
<td>Stratum Corneum</td>
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</tr>
</tbody>
</table>
DERMIS

Irregular Dense Connective Tissue
Collagenous fibers
Dermis

Sweat gland
Sebaceous gland
Arrector pili muscle
Blood vessels
Hair Follicle

- Hair shaft
- Epidermis
- Hair follicle
- Sebaceous gland
- Dermis
Sebaceous Gland

Exocrine gland
Associated with follicle
Secretes oily substance
Holocrine gland
Sebaceous Gland

- Sebaceous gland
- Hair follicle
- Hair
Hair Follicles

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Sweat Gland

Exocrine gland
Sudoriferous glands
Produces water, salts
Eccrine glands respond to temperature
Apocrine glands respond to pain, emotions

(a) Merocrine gland
Sweat Gland

- Pore
- Duct of eccrine sweat gland
- Dermal papilla
- Superficial portion of dermis
- Epidermis
Sweat Gland Exiting the Skin
Eccrine Gland
Types of Sweat Glands (Sudoriferous Glands)

- Merocrine glands: release fluid by exocytosis
- Eccrine
  - Most common
  - Secretion is mostly water with solutes
  - Cools body down
- Apocrine
  - Develops scent as bacteria metabolize secretion
  - Stimulated when frightened, during pain, during emotional upset
Hypodermis (Subcutaneous)

Recognized by adipose tissue.
Sensory Structures of Dermis

- Deep touch/pressure: Pacinian corpuscles
- Light touch/pressure: Meisner’s corpuscles
- Warm temperature: Free nerve endings
- Cold temperature: Free nerve endings
- Pain: Free nerve endings
Melanocyte

- Cellular extension of melanocyte
- Pigment granules
- Golgi apparatus
- Melanocyte nucleus
- Basement membrane

Epidermis

Dermis
Melanocyte

- Produces melanin for protection from UV radiation.
- Responsible for skin color.
- Melanoma.
Melanoma
Basal Cell Carcinoma
Untreated.....
Actinic Keratosis

Caused by sun damage. Can lead to squamous cell carcinoma.
PSORIASIS

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MAP SHOWING SKIN COLOR DISTRIBUTION
EVOLUTION OF SKIN COLOR

• Balance between
  – Need for protection against UV radiation which Causes skin cancer
  – Need for UV to produce vitamin D for calcium absorption
    Destroys folate (vitamin B)
THE INTEGUMENTARY SYSTEM

Skin and its Derivatives
TYPES OF MEMBRANES

Epithelial + Connective Tissue

- Serous
- Cutaneous
- Mucous

Connective Tissue

- Synovial
Serous Membranes

Line body cavities that have no openings to outside.
Secrete watery fluid.
Simple squamous epith + loose CT
Mucous Membranes

- Line cavities that lead to outside.
- Secrete mucus for protection.
- Epithelium + Loose CT
Serous, Mucous Membranes
Synovial Membrane

Lines joint cavities at articulations.
Loose CT + elastic fibers + adipose tissue
Epidermis
- Papillary layer

Dermis
- Reticular layer

Hypodermis
- (superficial fascia)

Nervous structures:
- Meissner corpuscle
- Pacinian corpuscle
- Sensory nerve
- Hair follicle receptor (root hair plexus)

Appendages of skin:
- Arrector pili muscle
- Sebaceous (oil) gland
- Eccrine sweat gland
- Hair follicle
- Hair root

Cutaneous vascular plexus

Adipose tissue
Nails

- Of hard keratin
- Corresponds to hooves and claws
- Grows from nail matrix
Hair and hair follicles: complex
Derived from epidermis and dermis
Everywhere but palms, soles, nipples, parts of genitalia

*“arrector pili” is smooth muscle

Hair bulb: epithelial cells surrounding papilla

Hair papilla is connective tissue
Burns

First-degree
(epidermis only; redness)

Second-degree
(epidermis and dermis, with blistering)

Third-degree
(full thickness, destroying epidermis, dermis, often part of hypodermis)
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