Integumentary System
All the Rest

What is “All the Rest”?
- Integumentary System
- Functions
- Homeostatic Imbalances
  - Skin Cancer
  - Burns
  - Development

WHERE are we going?
- Functions
  - Protection
  - Thermoregulation
  - Sensation
  - Metabolic Functions
  - Blood Storage
  - Excretion
- HI: Skin Cancer
  - Basal Cell Carcinoma
  - Squamous Cell Carcinoma
  - Melanoma
- Development
  - Fetal Stages
  - Adolescent to Adult
  - Old Age
- HI: Burns
  - Rule of Nines
  - 1st Degree
  - 2nd Degree
  - 3rd Degree

First are the FUNCTIONS
- Protection
  - Chemical, Physical/Mechanical, Biological
- Thermoregulation
- Sensation
- Metabolic Function
- Blood Reservoir
- Excretion

PROTECTION function
- Chemical
  - Secretions from glands
  - “Acid Mantle” - low pH of skin that keeps bacteria in check
  - Sebum - remember it is bactericidal
- Physical/Mechanical
  - Keratin strength
  - Lipid waterproofing
- Biological
  - Langerhans
  - Macrophages

THERMOREGULATION function
- Negative Feedback
- Temperature Rises
  - Dermal blood vessels DILATE (larger)
  - Sweat glands are stimulated
  - Sweat evaporation dissipates heat/cools body
- Temperature Drops
  - Dermal blood vessels CONstrict (smaller)
  - Warm blood bypasses the skin
  - Skin temperature drops
  - Blood temperature is conserved
SENSATION function
- **Exteroceptors**
  - Respond to stimuli outside the body
- Meissner’s Corpuscles & Merkel Discs
  - Light touch
- Pacinian Corpuscles
  - Bumps, deep pressure
- Hair Follicles
  - Insects, wind
- Free Nerve Endings
  - Chemicals, heat/cold

METABOLIC function
- Vitamin D Synthesis
  - Conversion of modified cholesterol molecules to a Vitamin D precursor stimulated by sunlight.
- And others

BLOOD STORAGE function
- Dermal vascular system can hold about 5% of the body’s blood
- Available when needed in other areas

EXCRETION function
- Some nitrogenous wastes
- Salt

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Skin CANCER
- Affects 1 in 5 Americans
- Most are benign and do not metastasize
  - Benign means not malignant
  - Malignant means can invade and spread
- Metastasize means spread
- Causes
  - Overexposure to UV radiation which damages DNA bases
Skin CANCER

- Three types
  - Basal Cell Carcinoma
  - Squamous Cell Carcinoma
  - Melanoma

BASAL CELL Carcinoma

- Least malignant, most common
  - Stratum basale cells proliferate (increase rapidly)
  - Invade dermis and hypodermis (remember they are supposed to be in the epidermis)

  - Usually the face
  - Slow growing, don’t often metastasize
  - Full cure with surgical removal in 99% of cases

Squamous Cell Carcinoma

- Comes from keratinocytes of stratum spinosa
  - Usually scalp, ears, lower lip
  - Grows rapidly and metastasizes if not removed
  - Good prognosis if surgically removed or treated with radiation therapy

MELANOMA

- Most dangerous
  - Highly metastatic and resistant to chemotherapy
  - Treated by surgical removal and immunotherapy
  - Chance of survival is poor if the lesion is over 4mm thick

ABCD RULE of MELANOMA

- A: Asymmetry
  - The two sides of pigmented area don’t match
- B: Border
  - Border is irregular and exhibits indentations
- C: Color
  - Pigmented areas is black, brown, tan and sometimes red or blue
- D: Diameter
  - Larger than 6 mm (size of a pencil eraser)

These pictures will NOT be on your test
Skin Cancer COMPARISONS

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Skin BURNS

- Tissue damage
  - Inflicted by intense heat, electricity, radiation or chemicals
  - Denature cell proteins / cause cell death
- Danger of burns
  - Catastrophic loss of fluids, electrolytes
  - Renal shutdown, circulatory shock
  - Rule of Nines calculates volume of fluid lost by estimating % of body surface burned

RULE OF NINES Burns

- Estimate the severity of burns
- Critical if:
  - More than 25% of body has 2nd degree burns
  - More than 10% of body has 3rd degree burns
  - There are 3rd degree burns on face, hands or feet

Skin BURNS

- Three types
  - 1st Degree
  - 2nd Degree
  - 3rd Degree

1st DEGREE Burns

- Only epidermis is damaged
- Symptoms
  - Localized redness
  - Swelling
  - Pain
2nd DEGREE Burns
- Epidermis and upper region of dermis are damaged
- Symptoms
  - Localized redness
  - Swelling
  - Pain
  - Blisters

3rd DEGREE Burns
- All of epidermis and dermis are damaged
- Burned area appears gray-white, cherry red, or black
- No initial edema (swelling) or pain
- Why?
  - Nerve endings have been destroyed

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Integumentary DEVELOPMENT
- Fetal
- Adolescent to Adult
- Old Age
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FETAL Development
- Integument develops from these embryonic layers:
  - Epidermis from ectoderm
  - Dermis from mesoderm
  - Hypodermis from mesoderm

FETAL Development
- 4th month: skin developed
  - Epidermal strata
  - Dermal papillae
  - Start of derivatives
- 5th/6th month: baby covered in lanugo
  - Downy coat of delicate hairs
- 7th month: lanugo replaced with vellus hairs
**FETAL Development**
- Birth: baby covered in vernix caseosa
- White, cheesy-looking
- Produced by sebaceous glands
- Protects baby’s skin

**ADOLESCENT – ADULT Development**
- Adolescence
  - Skin and hair become oilier
  - Acne may appear
- 20s-30s
  - Skin reaches optimal appearance

**ADOLESCENT – ADULT Development**
- Post 30s
  - Skin shows effects of environmental assaults
  - Dermatitis and scaling more common
  - 50s
  - Active hair follicles have decreased by two-thirds
  - Continue to decrease in everyone
  - Male pattern baldness genes activate

**OLD AGE Development**
- Skin shows effects of environmental assaults
- Dermatitis and scaling more common
- Post 30s
  - More susceptible to bruising and injury
  - Skin becomes thinner
- 50s
  - Elastic fibers clump, collagen fibers decrease and stiffen
  - Skin becomes wrinkled
- 60s
  - Active hair follicles have decreased by the two-thirds
  - Continue to decrease in everyone
  - Male pattern baldness genes activate

**OLD AGE Development**
- Subcutaneous fat layer diminishes
  - Decreased tolerance for cold
  - Melanocytes and Langerhans decrease
  - Increased risk of skin cancer

**OLD AGE Development**
- Epidermal replacement slows
- Skin becomes thinner
- More susceptible to bruising and injury
- Lubricating glands become deficient
  - Skin becomes dry and itchy
  - Elastic fibers clump, collagen fibers decrease and stiffen
  - Skin becomes wrinkled

**Where have you been?**
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