

Skin & the Integumentary System

6.3-6.4

September 12 & 13, 2012



6.3 Regulation of Body Temperature & Functions of the Skin

- Objectives
 - Describe how the skin contributes to the regulation of body temperature, storage of blood, protection, sensation, excretion and absorption, and synthesis of vitamin D

Thermoregulation

- The skin participates in thermoregulation by liberating sweat at its surface and by adjusting the flow of blood in the dermis
 - High temperatures lead to sweat production
 - Low temperatures cause a decrease in sweat production

Blood Reservoir

- The dermis contains an extensive networks of blood vessels (8-10% of the total blood flow)

Protection

- The skin provides physical, chemical, and biological barriers that help protect the body
 - Keratin protects underlying tissues from microbes, abrasion, heat, and chemicals
 - Guard against dehydration
 - Acidic pH of perspiration retards the growth of microbes
 - Melanin helps to shield against UV radiation

Cutaneous Sensations

- Cutaneous sensations include tactile sensations, thermal sensations, and pain
 - Indication of impending or actual tissue damage

Excretion & Absorption

- Small role in excretion (elimination of substances) and absorption (passage of materials from the external environment into the body)
- Certain lipid-soluble molecules can penetrate the skin
 - Vitamins
 - Gases
 - Toxic substances
 - Topical steroids and drugs

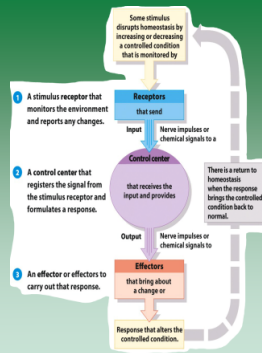
Synthesis of Vitamin D

- Synthesis of vitamin D requires the activation of a precursor molecule in the skin by UV rays from the sun
 - Enzymes in the liver and kidneys modify this molecule to produce calcitriol
 - Only need 10-15 minutes of exposure a day
 - Vitamin D is thought to enhance phagocytic activity, increase the production of antimicrobial substances, and reduce inflammation

6.4 Healing of Wounds

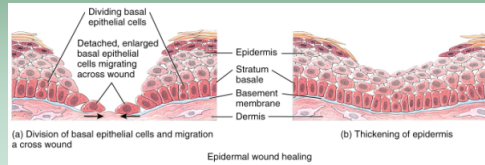
- Objective
 - Describe the events that are a part of wound healing

- Skin damage sets in motion a sequence of events that repairs the skin to its normal (or near-normal) structure and function



Epidermal Wound Healing

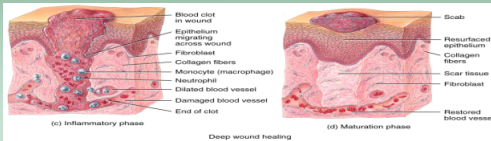
- Epidermal wound healing occurs following superficial wounds that affect only the epidermis
- Return to normal function is the rule



- In an epidermal wound, the central portion of the wound usually extends down to the dermis
 - The wound edges involve only superficial damage to the epidermal cells
- Epidermal wounds are repaired by enlargement and migration of basal cells, contact inhibition, and division of migrating and stationary basal cells

Deep Wound Healing

- Deep wound healing occurs when an injury extends to the dermis and subcutaneous layer.
 - Loss of some function and development of scar tissue is the rule



- During the inflammatory phase of deep wound healing, a blood clot unites the wound edges, epithelial cells migrate across the wound, vasodilation and increased permeability of blood vessels enhance delivery of phagocytes, and mesenchymal cells develop into fibroblasts
- During the migratory phase, fibroblasts migrate along fibrin threads and begin synthesizing collagen fibers and glycoproteins

- During the proliferative phase, epithelial cells grow extensively
- During the maturation phase, the scab sloughs off, the epidermis is restored to normal thickness, collagen fibers become more organized, fibroblasts begin to disappear, and blood vessels are restored to normal

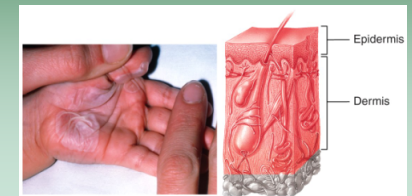
Burns

- A burn is tissue damage caused by excessive heat, electricity, radioactivity, or corrosive chemicals that denature (break down) the proteins in the skin cells
 - Burns destroy some of the skin's important contributions to homeostasis—protection against microbial invasion and desiccation, and thermoregulation
- Burns are graded according to their severity

- A first-degree burn involves only the epidermis
 - It is characterized by mild pain and erythema (redness) but no blisters and skin functions remain intact



- A second-degree burn destroys the epidermis and part of the dermis - some skin functions are lost
 - Redness, blister formation, edema, and pain result

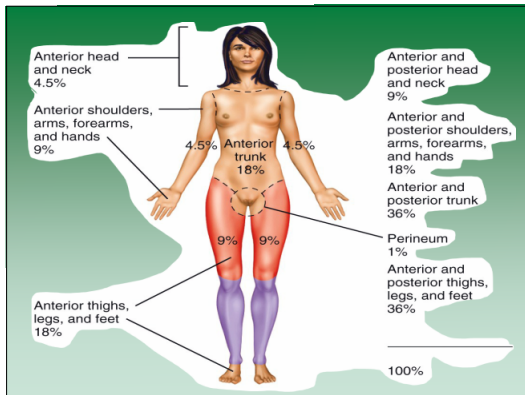


- A third-degree burn is a full-thickness burn (destroys the epidermis, dermis, and subcutaneous layer)
- Most skin functions are lost, and the region is numb because sensory nerve endings have been destroyed



- According to the American Burn Association's classification of burn injury, a major burn includes:
 - 3° burns over 10% of body surface area; or
 - 2° burns over 25% of body surface area; or
 - Any 3° burns on the face, hands, feet, or *perineum* (which includes the anal and urogenital regions)
- When the burn area exceeds 70%, more than half the victims die

- A quick means for estimating the surface area affected by a burn in an adult is the rule of nines:
 - Count 9% if both the anterior and posterior surfaces of the head and neck are affected
 - Count 9% for both the anterior and posterior surfaces of each upper limb (total of 18% for both upper limbs)
 - Count four times nine or 36% for both the anterior and posterior surfaces of the trunk, including the buttocks
 - Count 9% for the anterior and 9% for the posterior surfaces of each lower limb as far up as the buttocks (total of 36% for both lower limbs)



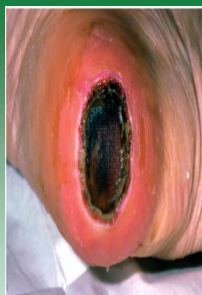
Aging & the Integumentary System

- Objectives
 - Describe the effects of aging on the integumentary system

- Most effects of aging begin to occur when people reach their late forties
 - Wrinkles develop
 - Atrophy of sebaceous glands
 - Dehydration and cracking occurs
 - Sweat production increases
 - A decrease in the numbers of functional melanocytes results in gray hair and atypical skin pigmentation
 - Subcutaneous fat is lost, and there is a general decrease in skin thickness
 - Nails may also become more brittle

- With age, there is also an increased susceptibility to pathological conditions (as demonstrated by this decubitus ulcer)

- These type of pressure ulcers ("bed sores") are an all-to-common occurrence in nursing homes



Pressure ulcer on heel