

Chapter 5 – Integumentary System – Stuff to Know

Objectives

The Skin

1. Discuss the location and functions of the hypodermis.
2. Describe the cells and layers that make up the epidermis.
3. Discuss the two layers of the dermis.
4. List the factors that contribute to skin color.

Appendages of the Skin

5. Compare and contrast eccrine and apocrine glands.
6. Describe the types of modified sweat glands found in the body.
7. Discuss sebaceous glands. How do they differ from sudoriferous glands?
8. Describe the structure of a nail.
9. List the parts of a hair follicle and explain their functions.
10. Name the regions of a hair. Describe the types of hairs, their locations, and the changes hair goes through throughout life.

Functions of the Integumentary System

11. Discuss the functions of the skin.

Homeostatic Imbalances of Skin

12. Name the characteristics of the three main types of skin cancer.
13. Explain why a burn is life threatening. Discuss the classifications of burns.

Outline

I. The Skin

- A. The hypodermis is subcutaneous tissue beneath the skin consisting mostly of adipose tissue that anchors the skin to underlying muscle, allows skin to slide over muscle, and acts as a shock absorber and insulator.
- B. Epidermis
 1. The epidermis is a keratinized stratified squamous epithelium.
 2. Cells of the Epidermis
 - a. The majority of epidermal cells are keratinocytes that produce a fibrous protective protein called keratin.
 - b. Melanocytes are epithelial cells that synthesize the pigment melanin.
 - c. Langerhans' cells are macrophages that help activate the immune system.
 - d. Merkel cells are associated with sensory nerve endings.
 3. Layers of the Epidermis
 - a. The stratum basale (basal layer) is the deepest epidermal layer and is the site of mitosis.

- b. The stratum spinosum (prickly layer) is several cell layers thick and contains keratinocytes, and melanin granules.
 - c. The stratum granulosum (granular layer) contains keratinocytes that are undergoing a great deal of physical changes, turning them into the tough outer cells of the epidermis.
 - d. The stratum lucidum (clear layer) won't be on the test.
 - e. The stratum corneum (horny layer) is the outermost protective layer of the epidermis composed of a thick layer of dead keratinocytes.
- C. Dermis
- 1. The dermis is composed of strong, flexible connective tissue.
 - 2. The dermis is made up of two layers, but they won't be on the test, and it's made of dense irregular connective tissue.
- D. Skin color is determined by three pigments: melanin, hemoglobin, and carotene.

II. Appendages of the Skin

- A. Sweat (Sudoriferous) Glands
- 1. Merocrine sweat glands, produce true sweat, are the most numerous of the sweat glands, and are particularly abundant on the palms of the hands, soles of the feet, and forehead.
 - 2. Apocrine sweat glands are confined to the axillary and anogenital areas and produce true sweat with the addition of fatty substances and proteins. Bacterial action on these fatty substances cause "body odor", mostly after puberty.
 - 3. Ceruminous glands are modified sweat glands found lining the ear canal that secrete ear wax, or cerumen.
 - 4. Mammary glands are modified sweat glands found in the breasts that secrete milk.
- B. Sebaceous (Oil) Glands
- 1. Sebaceous glands are simple alveolar glands found all over the body except the palms of the hands and soles of the feet (basically wherever there is hair) that secrete sebum, an oily secretion.
 - 2. The sebaceous glands secrete their product into a hair follicle or to a pore on the surface of the skin.
- C. Hairs and Hair Follicles
- 1. Hairs, or pili, are flexible strands produced by hair follicles that consist of dead, keratinized cells.
 - a. The main regions of a hair are the shaft and the root.
 - b. A hair has three layers of keratinized cells: the inner core is the medulla, the middle layer is the cortex, and the outer layer is the cuticle.
 - c. Hair pigments (melanin of different colors) are made by melanocytes at the base of the hair follicle.
 - 2. Structure of a Hair Follicle
 - a. Hair follicles fold down from the epidermis into the dermis .
 - b. The deep end of a hair follicle is expanded, forming a hair bulb, which is surrounded by a knot of sensory nerve endings called a hair follicle receptor, or root hair plexus.
 - c. The wall of a hair follicle is composed of an outer connective tissue root sheath, a thickened basement membrane called a glossy membrane, and an inner epithelial root sheath.

- d. Associated with each hair follicle is a bundle of smooth muscle cells called an arrector pili muscle.
- 3. Types and Growth of Hair
 - a. Hairs come in various sizes and shapes, but can be classified as vellus or terminal.
 - b. Hair growth and density are influenced by many factors, such as nutrition and hormones.
 - c. The rate of hair growth varies from one body region to another and with sex and age.
- 4. Hair Thinning and Baldness
 - a. After age 40 hair is not replaced as quickly as it is lost, which leads to hair thinning and some degree of balding, or alopecia, in both sexes.
 - b. Male pattern baldness, which is a type of true, or frank, balding, is a genetically determined, sex-influenced condition.
- D. Nails
 - 1. A nail is a scalelike modification of the epidermis that forms a clear, protective covering.
 - 2. Nails are made up of hard keratin and have a free edge, a body, and a proximal root.

III. Functions of the Integumentary System

- A. Protection
 - 1. Chemical barriers include skin secretions and melanin.
 - 2. Physical or mechanical barriers are provided by the continuity of the skin, and the hardness of the keratinized cells.
 - 3. Biological barriers include the Langerhans' cells of the epidermis, the macrophages of the dermis, and the DNA itself.
- B. The skin plays an important role in body temperature regulation by using the sweat glands of the skin to cool the body, and constriction of dermal capillaries to prevent heat loss.
- C. Cutaneous sensation is made possible by the placement of cutaneous sensory receptors, which are part of the nervous system, in the layers of the skin.
- D. The skin provides the metabolic function of making vitamin D when it is exposed to sunlight.
- E. The skin may act as a blood reservoir by holding up to 5% of the body's blood supply, which may be diverted to other areas of the body should the need arise.
- F. Limited amounts of nitrogenous wastes are excreted through the skin.

IV. Homeostatic Imbalances of Skin

- A. Skin Cancer
 - 1. Basal cell carcinoma is the least malignant and the most common skin cancer.
 - 2. Squamous cell carcinoma tends to grow rapidly and metastasize if not removed.
 - 3. Melanoma is the most dangerous of the skin cancers because it is highly metastatic and resistant to chemotherapy.
- B. Burns
 - 1. A burn is tissue damage inflicted by intense heat, electricity, radiation, or certain chemicals, all of which denature cell proteins and cause cell death to infected areas.
 - 2. The most immediate threat to a burn patient is dehydration and electrolyte imbalance due to fluid loss.
 - 3. After the first 24 hours has passed, the threat to a burn patient becomes infection to the wound site.
 - 4. Burns are classified according to their severity.

- a. First-degree burns involve damage only to the epidermis.
- b. Second-degree burns injure the epidermis and the upper region of the dermis.
- c. Third-degree burns involve the entire thickness of the skin.

V. Developmental Aspects of the Integumentary System

- A. - - - -
- B. By the end of the fourth month of development the skin is fairly well formed.
- C. During infancy and childhood, the skin thickens and more subcutaneous fat is deposited.
- D. During adolescence, the skin and hair become oilier as sebaceous glands are activated.
- E. The skin reaches its optimal appearance when we reach our 20s and 30s; after that time the skin starts to show the effects of cumulative environmental exposures.
- F. As old age approaches, the rate of epidermal cell replacement slows and the skin thins, becoming more prone to bruising and other types of injuries.