**Chapter 5**

1. **INTRODUCTION**
2. The skin and its accessory structures make up **integumentary system**.
3. The integumentary system functions...**to guard the body’s physical and biochemical integrity, maintain a constant body temperature, and provide sensory information about the surrounding environment.**
4. **STRUCTURE OF THE SKIN**
5. The skin consists of different tissues that are joined together to perform specific functions and is the **largest organ of the body**.
6. Structurally the skin consists of **two parts**.
7. The superficial portion of the skin is the **epidermis and is composed of the epithelial tissue**.
8. The deeper layer of the skin is the **dermis and is primarily composed of connective tissue**.
9. Deep to the dermis is the subcutaneous layer or hypodermis.
10. **It is not part of the skin**
11. It consists of areolar and adipose tissue.
12. **It serves as a fat storage area, an area for blood vessel passage, and an area of pressure nerve endings.**
13. Epidermis
14. The epidermis is composed of stratified squamous epithelium and **contains four principal types of cells**: keratinocytes, melanocytes, Langerhans cells, and Merkel cells.
15. Keratinocytes produce the…**protein keratin, which helps protect the skin and the underlying tissue from heat, microbes, and chemicals, and lamellar granules, which release a waterproof sealant.**
16. Melanocytes produce…**the pigment melanin which contributes to skin color and absorbs damaging ultraviolet light.**
17. Langerhans cells **participate in immune responses**.
18. Merkel cells contact a sensory structure called a tactile (Merkel) disc and **function in the sensation of touch**.
19. **There are four or five layers of the epidermis, depending upon the degree of friction and mechanical pressure applied to the skin**. From deepest to most superficial the layers of the epidermis are stratum basale (stratum germinativum), stratum spinosum, stratum granulosum, stratum lucidum (only in palms and soles), and stratum corneum.
20. The stratum basale is the...**deepest layer of the epidermis and contains some stem cells capable of undergoing cell division to form new cells.**
21. Keratinocytes with a cytoskeleton of tonofilaments are found in this layer.
22. This layer is sometimes called the stratum germinativum to indicate its role in the **formation of new cells**.
23. When the germinal portion of the epidermis is destroyed, **new skin cannot regenerate with a skin graft**.
24. The stratum spinosum provides **strength and flexibility to the skin.**
25. The stratum granulosum marks the transition between the deeper, metabolically active strata and the dead cells of the more superficial strata. This layer also **shows the formation of a water repellant sealant between the cells.**
26. This layer consists of keratinocytes that are undergoing apoptosis.
27. This layer is characterized by the presence of keratohyalin which converts tonofilaments into keratin.
28. The stratum lucidum is present...**only in the fingertips, palms of the hands, and soles of the feet.**
29. The stratum corneum is the most superficial layer and consists of dead cells.
30. Lamellar granules in this layer make **it water repellent.**
31. Constant exposure to friction will cause this layer to....**increase in depth with the formation of a callus, an abnormal thickening of the epidermis.**
32. Keratinization and Growth of the Epidermis
33. Keratinization, replacement of cell contents with the protein keratin, occurs as cells **move to the skin surface over 2 – 4 weeks.**
34. Epidermal growth factor and other **hormone-like proteins** play a role in epidermal growth.
35. Psoriasis is a chronic skin disorder characterized by...**a more rapid division and movement of keratinocytes through the epidermal strata.**
36. Dermis
37. The dermis is composed of **connective tissue containing collagen and elastic fibers and has two regions**.
38. The papillary layer is areolar connective tissue containing fine elastic fibers, dermal papillae, corpuscles of touch (Meissner’s corpuscles), and free nerve endings for **sensations of heat, cold, pain, tickle, and itch.**
39. The deeper part of the dermis is the reticular region consisting of dense, irregular connective tissue containing bundles of collagen fibers and some elastic fibers.
40. Spaces between the fibers may contain adipose cells, hair follicles, sebaceous glands, and sudoriferous glands.
41. **The collagen and elastic fibers provide strength, extensibility (ability to stretch), and elasticity (ability to return to original shape after stretching) to skin.**
42. Tattooing is a **permanent coloration of the skin in which a foreign pigment is injected into the dermis.**..
43. Epidermal ridges increase friction for better grasping ability and provide the basis **for fingerprints and foot prints.** The ridges typically reflect contours of the underlying dermis.
44. Lines of cleavage in the skin indicate the predominant direction of the underlying collagen fibers. Knowledge of these lines is especially **important to plastic surgeons**.
45. The Structural Basis of Skin Color
46. The wide variety of colors in skin is due to three pigments – **melanin, carotene, and hemoglobin** (**in blood in capillaries**) - in the dermis.
47. Albinism is the inherited inability of an individual to produce **melanin**. Vitiligo is the complete or partial loss of melanocytes from patches of the skin resulting in **irregular white spots**.
48. The color of skin and mucous membranes can provide **clues for diagnosing certain problems**, such as cyanosis, jaundice, and erythema.
49. **ACCESSORY STRUCTURES OF THE SKIN**
50. Accessory structures of the skin develop from the embryonic epidermis and include **hair, glands, and nails**.
51. Hairs, or pili, are present on most skin surfaces except the ­­**palms**, palmar surfaces of **digits, soles**, and plantar surfaces of **the digits**.
52. Anatomy of Hair
53. Hair consists of:

-**a shaft above the surface**

-**the cuticle**

-**a root that penetrates the dermis and subcutaneous layer**

-**a hair follicle**

1. New hairs develop from cell division of the matrix in the bulb.
2. Associated with hairs are **sebaceous (oil) glands, arrectores pilorum muscles, and root plexuses.**
3. Hair removal
4. Depilatories dissolve the **protein** in the hair shaft
5. Electrolysis uses an electric current to...**destroy the hair matrix**
6. Hair Growth
7. The hair growth cycle consists of a **growing stage and a resting stage.**
8. Both rate of growth and the replacement cycle can be altered...**by illness, diet, high fever, surgery, blood loss, severe emotional stress, and gender.**
9. Chemotherapeutic agents affect the rapidly dividing matrix hair cells resulting **in hair loss**.
10. Types of hair
11. Lanugo is a fine, nonpigmented hair that **covers the fetus.**
12. Vellus hair is a short, fine hair that **replaces lanugo**.
13. Course pigmented hair appears in response to **androgens**.
14. Hair that appears in response to androgens and hair of the head, eyelashes and eyebrows is known as **terminal hair**.
15. Hair Color
16. Hair color is due primarily to the amount and type of **melanin**.
17. Graying of hair occurs because of a progressive decline in **tyrosinase**.
18. Functions of hair include...**protection, decrease in hair loss, and sensing light tough.**
19. Hormones influence the **growth and loss of hair**.
20. Skin Glands
21. Sebaceous (oil) glands are usually connected to **hair follicles**; **they are absent in the palms and soles**.
22. Sebaceous glands produce sebum, **which moistens hair, waterproofs and softens the skin, and inhibits bacterial growth**.
23. **Acne** results when sebaceous glands become inflamed.
24. Sudoriferous (sweat) glands are divided into apocrine and eccrine types.
25. Eccrine sweat glands have an extensive distribution; their ducts terminate at pores at the surface of the epidermis.
26. The main function of eccrine sweat glands is to...**help regulate body temperate through evaporation.**
27. **They also help eliminate wastes such as urea.**
28. Apocrine sweat glands are limited in distribution to the skin of the axilla, pubis, and areolae; their duct open into hair follicles.
29. Ceruminous glands are modified sudoriferous glands that produce a waxy substance called cerumen.
30. These glands are found in the external auditory meatus.
31. An abnormal amount of cerumen in the external auditory meatus or canal can result in impaction and **prevent sound waves from reaching the eardrum.**
32. Nails
33. Nails are hard, kertainized epidermal cells over...**the dorsal surfaces of the terminal portions of the fingers and toes.**
34. The principal parts of a nail **are the body, free edge, root, lunula, eponychium, and matrix.**
35. Cell division of the matrix cells produces **new cells**.
36. Functionally, nails help in...**grasping and manipulating small objects in various ways and provide protection against trauma to the ends of the digits.**
37. Certain nail conditions may indicate **disease.**
38. TYPES OF SKIN
39. Thin skin covers all parts of the body except for the palms and palmar surfaces of the digits and toes.
40. Thin skin lacks **epidermal ridges**.
41. It has a sparser distribution of sensory receptors than thick skin.
42. Thick skin covers the **palms, palmar surfaces of the digits, and soles**
43. It features a stratum lucidum and thick epidermal ridges
44. It lacks **hair follicles**, arrector pili muscles, and sebaceous glands, and has more **sweat glands** than thin skin.
45. FUNCTIONS OF SKIN
46. Thermoregulation, **the homeostatic control of body temperature** is due to the skin liberating sweat at its surface and by **adjusting the flow of blood in the dermis.**
47. Because the shin has an extensive network of blood vessels, it functions as a **blood reservoir**.
48. The skin provides protection through **physical, chemical, and biological barriers.**
49. Cutaneous sensations, including **touch, pressure, vibration, tickle, heat, cold, and pain that arises in the skin.**
50. The skin plays minor roles in...**excretion, the elimination of wastes, from the body, the passage of material from the external environment into body cells.**
51. Synthesis of Vitamin D requires activation of a precursor molecule in the skin by UV light, with enzymes in the liver and kidneys modifying the activated molecule to produce calcitriol, the most active form of vitamin D.
52. Transdermal drug administration is a method of drug passage **across the epidermis and into blood vessels** of the dermis.
53. MAINTAINING HOMEOSTASIS: SKIN WOUND HEALING
54. Epidermal Wound Healing
55. In an epidermal wound (e.g. **an abrasion or a first degree or second degree burn**), the central portion of the wound usually extends deep down to the dermis, whereas the wound edges usually involve only superficial damage to the epidermal cells.
56. Epidermal wounds are repaired by...**enlargement and migration of basal cells, contract inhibition, and division of migrating and stationary basal cells.**
57. Epidermal growth factor stimulates basal cells to **divide and replace the ones that have moved into the wound.**
58. Deep Wound Healing
59. When an injury extends to tissues deep to the epidermis, the repair process is more complex than epidermal healing, and **scar formation results.**
60. Phases of Deep Wound Healing
61. During the inflammatory phase, **a blood clot unites with the wound edges, epithelial cells migrate across the wound, vasodilatation and increased permeability of blood vessels deliver phagocytes, and fibroblasts form.**
62. During the migratory phase, epithelial cells beneath the scab bridge… **fibroblasts begin scar tissue, and damaged blood vessels begin to grow. During this phase, tissue filling the wound is called granulation tissue.**
63. During the proliferative phase, the events of the migratory phase **intensify.**
64. During the maturation phase, the… **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.**
65. Scar tissue formation (fibrosis) can occur in **deep wound healing**.
66. DEVELOPMENT OF THE INTEGUMENTARY SYSTEM
67. The epidermis is derived from **the ectoderm**. Epidermal derivatives are **hair, nails, and skin glands.**
68. The dermis is derived from wandering mesenchymal cells.
69. The connective tissue and blood vessels associated with the gland develop from **the mesoderm**.
70. AGING AND THE INTEGUMENTARY SYSTEM
71. Most effects of aging of the skin do not occur until an individual **reached the late forties**. Most of the changes occur **in the dermis**.
72. Among the effects of aging on the integument are…**wrinkling, slower growth of nails and hair, dryness and cracking due to sebaceous gland atrophy, decrease in melanocytes (gray hair, blotching) and Langerhans cells (decreased immune responsiveness), and loss at subcutaneous fat (thinner skin).**
73. Certain anti-aging treatments diminish the effects of aging. Among them are: **microdermabrasion, chemical peel, laser resurfacing, dermal fillers, botulism toxin injection, and non surgical face lifts.**
74. Chronic ultraviolet exposure causes **photodamage of the skin. The use of sun screens and sun blocks help minimize damage from the sun.**
75. DISORDERS: HOMEOSTATIC IMBALANCES
76. Skin cancer can be caused by **exposure to sunlight**.
77. The three most common forms are basal cell carcinoma, squamous cell carcinoma, and malignant melanoma.
78. Among the risk factors for skin cancer are **skin type, sun exposure, family history, age, and malignant melanoma**.
79. Burns
80. Tissue damage from excessive heat, electricity, radioactivity, or corrosive chemicals that destroys (denatures) proteins in the exposed cells is called a **burn**.
81. Generally, the systemic effects...**of a burn are a greater threat to life than are the local effects.**
82. Depending on the depth of damage, skin burns are classified as **first-degree and second-degree (partial-thickness) and third-degree (full-thickness).**
83. The seriousness of a burn is determined by **its depth, extent, and area involved, as well as the person’s age and general health.** When the burn area exceeds 70%, **over half of the victims die**.
84. Two methods for determining the extent of a burn are the rule of nines and the Lund-Bowder method.
85. Pressure ulcers, also known as decubitus ulcers, are caused by a constant deficiency of blood to tissues overlying a bony projection that has been subjected to prolonged pressure against an object **such as a bed, cast, or splint**; the deficiency results in tissue ulceration.