


Slide 1

### Integumentary System

- **Introduction**
  - The organs of the integumentary system
  - skin and its accessory structures
    - hair, nails, glands, as well as muscles & nerves.



Region	Percentage
head and neck	9%
arms, hands, and shoulders	16%
perineum	1%
anterior trunk	18%
posterior trunk	18%
anterior legs and feet	10%
posterior legs and feet	10%

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Slide 2

### Integumentary System

#### Functions of the Skin

- regulation of body temperature
- blood reservoir
- protection
- cutaneous sensations
- excretion & absorption
- synthesis of vitamin D
  - Activated by UV
  - Liver and kidney modify production
  - Vit D helps Ca<sup>2+</sup> absorption in GI tract

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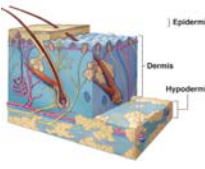
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Slide 3

### Integumentary System

- Skin
  - **cutaneous layer** covers the body
  - is the largest organ of the body 1.8 sqm
  - It consists of two major layers:
    - outer, thinner layer the **epidermis**
    - inner, thicker layer the **dermis**



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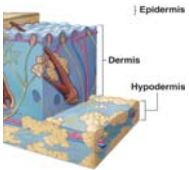
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Slide 4

### Integumentary System

- **Skin**
  - Beneath the dermis
    - **subcutaneous layer = hypodermis**
    - attaches the skin to the underlying tissues & organs



The diagram shows a cross-section of skin. The top layer is the epidermis, which is thin and multi-layered. Below it is the dermis, a thicker layer containing various structures like hair follicles and blood vessels. The bottom layer is the hypodermis, which is the subcutaneous layer and is primarily composed of adipose tissue. Labels on the right side of the diagram identify the Epidermis, Dermis, and Hypodermis.

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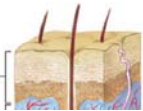
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Slide 5

### Integumentary System

- **epidermis**
  - Thinner outer layer of skin:
    - Type of tissue?
      - **stratified squamous epithelium**
  - Layers of cells
    - Text discusses 2
      - » Stratum Basale
      - » Stratum Corneum



The diagram shows a cross-section of the epidermis. It is the outermost layer of the skin and is composed of several layers of cells. The top layer is the stratum corneum, which is the thickest and most protective layer. Below it is the stratum basale, the deepest layer where new cells are produced. Labels on the left side of the diagram identify the Epidermis.

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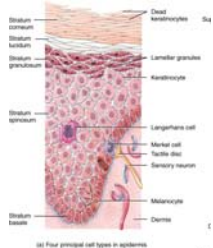
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Slide 6

### Integumentary System

- **epidermis**
  - 4-5 major layers
    - **stratum basale**
    - stratum spinosum
    - stratum granulosum
    - stratum lucidum
    - **stratum corneum**



The diagram shows a detailed cross-section of the epidermis. It is divided into several layers: Stratum corneum (outermost), Stratum lucidum, Stratum granulosum, Stratum spinosum, and Stratum basale (deepest). Various cell types are labeled, including Keratinocytes, Langerhans cell, Merkel cell, Tactile disc, Sensory neuron, and Melanocyte. Labels on the left side of the diagram identify the Stratum corneum, Stratum lucidum, Stratum granulosum, Stratum spinosum, and Stratum basale. Labels on the right side identify Dendritic keratinocytes, Langerhans cell, Merkel cell, Tactile disc, Sensory neuron, and Melanocyte. A caption at the bottom reads: (a) Four principal cell types in epidermis.

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Slide 7

### Integumentary System

- **stratum basale**
  - » deepest layer
  - » Superior to dermis
  - » continuous cell division
  - » produces all the other layers

(a) Four principal cell types in epidermis

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Slide 8

### Integumentary System

- **Langerhans cells**
  - » involved in immune responses
  - » Phagocytizes bacteria

(c) Langerhans cell

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Slide 9

### Integumentary System

- **Melanocytes**
  - » produce the skin color pigment **melanin**
  - » Protects from UV
  - » Color due to production of melanin not cytes
  - » Tanning or freckles
  - » Albinism = lack of melanin
  - » Carotene = yellow hue
  - » Hemoglobin = pinkish hue

(b) Melanocyte

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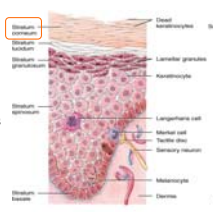
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Slide 10

### Integumentary System

- **stratum corneum**
  - » surface layer
  - » composed of many sublayers of flat, dead keratinocytes
  - » continuously shed and replaced by cells from deeper strata



The diagram shows a cross-section of the epidermis. From top to bottom, the layers are: Stratum corneum (thick, multi-layered), Stratum granulosum (thin, dark-staining), Stratum spinosum (thick, multi-layered), Stratum basale (single layer), and Dermis (underneath). Labels include: Dead keratinocytes, Langerhans cell, Merkel cell, Tactile disc, Sensory neuron, Melanocyte, and Dermis. A note at the bottom says 'See Four principal cell types in epidermis'.

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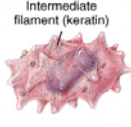
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Slide 11

### Integumentary System

- **keratinocytes**,
  - » 90% of the cells
  - » produce **keratin**
  - » **Waterproof featu**
  - » **Thicker in callus :**



The image shows a single keratinocyte with a central nucleus and a network of intermediate filaments (keratin) extending throughout the cytoplasm. Labels include: Intermediate filament (keratin) and (a) Keratinocyte.

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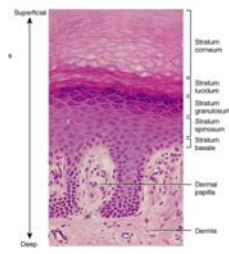
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Slide 12



The image shows a histological section of the epidermis. Labels on the right side include: Stratum corneum, Stratum lucidum, Stratum granulosum, Stratum spinosum, Stratum basale, Dermal papilla, and Dermis. A vertical arrow on the left indicates the direction from Superficial to Deep.

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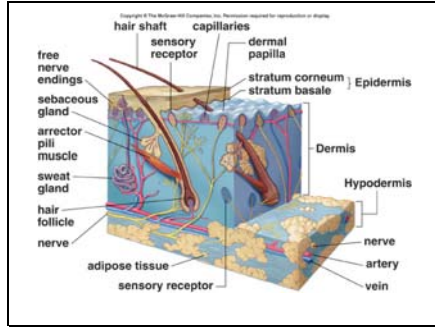
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Slide 13



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Slide 14

### Integumentary System

- Dermis
  - Dense irregular connective tissue collagen & elastic fibers
  - Dermal papillae
    - Extensions into the epidermis

Labels in the diagram include: Epidermis, Dermis, Hypodermis.

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Slide 15

### Integumentary System

- **Epidermal ridges**
  - reflect contours of the underlying **dermal papillae**
  - form the basis for fingerprints
  - increase firmness of grip by increasing friction

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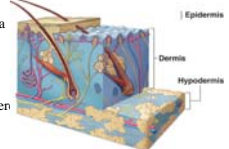
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Slide 16

### Integumentary System

- **Hypodermis**
  - Subcutaneous tissue
  - Injections in this area
  - Fat storage
  - Insulation
  - Padding
  - Excessive adipose hen = obesity



The diagram shows a cross-section of the skin. The top layer is the Epidermis, the middle layer is the Dermis, and the bottom layer is the Hypodermis. A hair is shown growing from the epidermis into the dermis. A needle is shown injecting into the hypodermis.

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Slide 17

### Integumentary System

- **Accessory Structures of the Skin**
  - Accessory structures of the skin are organs that develop from the embryonic epidermis
    - Hair
    - Nails
    - Skin glands



The image shows a microscopic view of skin cells. Labels include 'keratinized cells of hair shaft' and 'squamous epithelial cells of epidermis'. A small label 'b. Hair shaft' is also present.

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Slide 18

### Integumentary System

- **Hair (pili)**
  - Found on all parts except palms, soles etc.
  - Puberty ↑ its appearance
  - Functions:
    - **protection**
    - **reduction of heat loss**
    - **sensing light touch**



The diagram shows a cross-section of a hair follicle. Labels include 'hair shaft', 'pore of sweat gland', 'hair root', 'sebaceous gland', 'arrector pili muscle', 'dermal blood vessels', 'region of cell division', and 'a. Hair follicle'. The diagram shows the hair shaft extending from the epidermis into the dermis, where the hair root is located. The hair root is surrounded by the arrector pili muscle and the sebaceous gland. The hair root is attached to the dermal blood vessels. The hair shaft is made of keratinized cells. The hair shaft is shown in two parts: 'a. Hair follicle' and 'b. Hair shaft'.

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Slide 19

**Integumentary System**

- **Hair (pili)**
  - **shaft**
    - » projects above the surface of the skin
  - **root**
    - » into the dermis
  - **hair follicle**
    - » surrounds the root



The diagram shows a cross-section of a hair follicle. The hair shaft is visible above the skin surface. Below the surface, the hair root is embedded in the dermis. The hair root is surrounded by the hair follicle. Labels include: hair shaft, pore of sweat gland, hair root, sebaceous gland, arrector pili muscle, dermal blood vessels, region of cell division, a. Hair follicle, Epidermis, and Dermis.

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Slide 20

**Integumentary System**

- **Hair (pili)**
  - associated with hairs
    - **sebaceous (oil) glands**
    - **arrector pili muscles**
      - » Goose-bumps



The diagram shows a cross-section of a hair follicle. The hair shaft is visible above the skin surface. Below the surface, the hair root is embedded in the dermis. The hair root is surrounded by the hair follicle. Labels include: hair shaft, pore of sweat gland, hair root, sebaceous gland, arrector pili muscle, dermal blood vessels, region of cell division, a. Hair follicle, Epidermis, and Dermis.

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Slide 21

**Integumentary System**

- **Hair (pili) Conditions**
  - Hirsutism
    - Excessive body hair
    - Treatments = electrolysis or hormones
  - Alopecia
    - Loss of hair
      - » Androgenic = male patterned baldness
      - » Areata = sudden onset of patched hair loss

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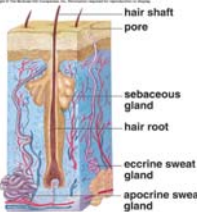
Slide 22

**Integumentary System**

- **Sebaceous (oil) glands**

Characteristics:

- typically connected to hair follicles
- secrete an oily substance called **sebum** which:
  - prevents dehydration of hair & skin
  - inhibits growth of certain bacteria
- Acne vulgaris



The diagram illustrates a cross-section of the skin. At the top, a hair shaft extends from a pore on the surface. Below the surface, the hair root is embedded in the dermis. A sebaceous gland is attached to the hair root. Two types of sweat glands are shown: eccrine sweat glands, which have a long, straight duct leading to a pore on the surface, and apocrine sweat glands, which have a coiled duct that opens into a hair follicle.

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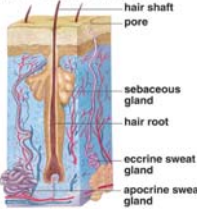
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Slide 23

**Integumentary System**

- **Sudoriferous (sweat) glands**

- produce sweat (perspiration)
  - helps to cool the body by evaporation
  - eliminates small amounts of wastes



The diagram illustrates a cross-section of the skin. At the top, a hair shaft extends from a pore on the surface. Below the surface, the hair root is embedded in the dermis. A sebaceous gland is attached to the hair root. Two types of sweat glands are shown: eccrine sweat glands, which have a long, straight duct leading to a pore on the surface, and apocrine sweat glands, which have a coiled duct that opens into a hair follicle.

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Slide 24

**Integumentary System**

- **Sudoriferous (sweat) glands**
  - there are 2 types of sweat glands
    - » **eccrine sweat glands**
      - numerous
      - opening at a pore on the surface
    - » **apocrine sweat glands**
      - mainly in the skin of the anal, groin, areolae, & bearded facial regions of adult males
      - open into hair follicles

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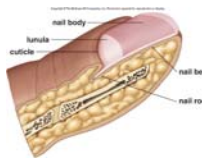
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Slide 25

### Integumentary System

- **Nails**
  - hard, keratinized epidermal cells
  - over dorsal surfaces of the ends of fingers & toes.
- Each nail consists of:
  - » **free edge**
  - » transparent **nail body** with a whitish **lunula** at its base (thick)
  - » **nail root** embedded in a fold of skin



Labels in diagram: nail body, lunula, cuticle, nail root, nail bed

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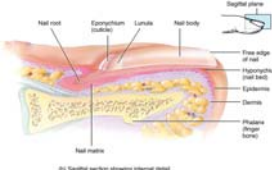
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Slide 26

### Integumentary System

- **Nail functions**
  - helping to grasp & manipulate objects
  - providing protection against trauma to the ends of the digits
  - scratching



Labels in diagram: nail root, Epidermal cuticle, Lunula, Nail body, nail matrix, Free edge of nail, Hyponychium (soft part), Epidermis, Phalanx (finger bone)

01 Sagittal section showing internal detail 05 05

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Slide 27

### Integumentary System

#### Epidermal Wounds

- Do Not go as deep as the dermis



Labels in diagram: Dividing basal epithelial cells, Healing with migration across wound, Epidermis, Dermal papillae, Basement membrane, Dermis

01 Division of basal epithelial cells and migration across wound 05 06 02 Thickening of epidermis

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Slide 28

**Integumentary System**

**Deep wounds**

- Inflammatory phase
  - Clean up
- Migratory phase
  - Scab
  - Cover
- Scar formation
  - Within dermis
  - Collagen fibers

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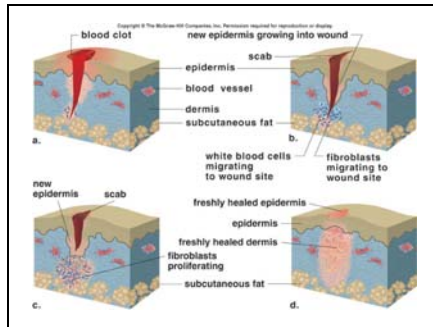
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Slide 29



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Slide 30

**Integumentary System**

**Burns**

- Tissue damage due to:
  - Heat
  - Radioactivity
  - Chemicals etc
- Thermoregulation problems

- 1<sup>st</sup> Degree
  - Epidermis only
  - No blisters
- 2<sup>nd</sup> Degree
  - Some of the dermis is involved
  - Blisters
- 3<sup>rd</sup> Degree
  - Dermis
  - Nerve endings
  - Grafts needed
- 4<sup>th</sup> Degree
  - To the Bone

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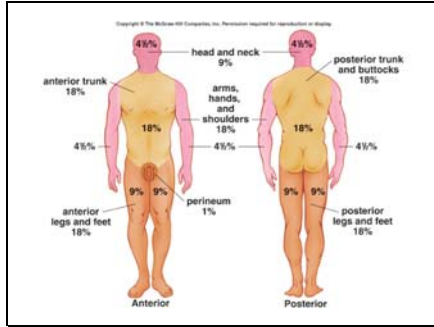
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Slide 31



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Slide 32

### Integumentary System

**Skin Cancer**

- Melanoma
  - Increases with # of sun exp
  - Linked to sun exp
- Non-Melanoma
  - Basal cell carcinoma
    - Most common
    - Due to UV
  - Squamous cell carcinoma
    - Less likely to metastasize



a. Basal cell carcinoma

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Slide 33

### Integumentary System

**Skin Cancer**

- Non-Melanoma
  - Basal cell carcinoma
    - Most common
    - Due to UV



a. Basal cell carcinoma

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Slide 34

**Integumentary System**

**Skin Cancer**

- Non-Melanoma
  - Squamous cell carcinoma
    - Less likely to spread



b. Squamous cell carcinoma

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Slide 35

**Integumentary System**

**Skin Cancer**

- Melanoma
  - Increases with # of moles
  - Linked to sun exposure



c. Melanoma

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Slide 36

**Integumentary System**

**Aging and the Integumentary System**

- Adolescents may develop **acne**.
- Pronounced aging effects do not typically occur until people reach their late 40s.
- The effects of aging
  - Wrinkling
  - Decrease of skin's immune responsiveness
  - Dehydration and cracking of the skin
  - Decreased sweat production
  - Decreased numbers of functional melanocytes
    - resulting in gray hair and atypical skin pigmentation
  - Loss of subcutaneous fat
  - General decrease in skin thickness
  - Increased susceptibility to pathological conditions.
- Growth of hair and nails decreases during the second and third decades of life; nails may also become more brittle with age.

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Slide 37

### Integumentary System

- On your own
  - Review Human Systems Working Together!

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