Chapter 4
The Integumentary System

Introduction
The integumentary system is composed of:
Skin
Hair
Nails
Sweat glands
Oil glands
Mammary glands

Integumentary Structure and Function
Cutaneous membrane
Epidermis
Dermis
Accessory structures
Hair follicles
Exocrine glands
Nails

Integumentary Structure and Function
Functions include:
Physical protection
Regulation of body temperature
Excretion of products
Synthesis of products
Sensation
Immune defense

Integumentary Structure and Function
Skin (cutaneous membrane) is made of two divisions
Epidermis
Dermis
Hypodermis (subcutaneous layer) is deep to the dermis
Accessory structures
Hair, nails, exocrine glands

The Epidermis
Thick and thin skin
Thick skin
Found on palms and soles
Made of five layers of cells
Thin skin
Found on the rest of the body
Made of four layers of cells
The Epidermis
There are four cell types found in the epidermis
Keratinocytes
Produces a tough protein called keratin
Melanocytes
Pigment cells located deep in the epidermis
Produce melanin (skin color)
Merkel cells
Sensory cells
Langerhans cells
Fixed macrophages

The Epidermis
Layers of the Epidermis
Stratum basale (stratum germinativum)
Deepest layer
Stratum spinosum
Stratum granulosum
Stratum lucidum
Stratum corneum
Most superficial layer

The Epidermis
Layers of the Epidermis
Stratum basale
Location of melanocytes
Cells in this area are undergoing active reproduction
Stratum spinosum
Keratinocytes are bound together by desmosomes

The Epidermis
Layers of the Epidermis
Stratum granulosum
Keratinocytes produce lots of keratin
Stratum corneum
Superficial layer
Consists of interlocking, dehydrated, dead cells

The Epidermis
Epidermal ridges
Stratum germinativum forms epidermal ridges
Ridges (dermal papillae) extend into the dermis
Creates ridges we call fingerprints
Skin color
Due to:
Dermal blood supply
Thickness of stratum corneum
Various concentrations of carotene and melanin

The Dermis
The dermis consists of two layers
Papillary layer
Superficial dermis
Reticular layer
Deep dermis
The Dermis
Papillary layer (details)
Consists of:
Dermal papillae
Capillaries
Nerve axons

The Dermis
Reticular layer (details)
Consists of:
Interwoven network of dense irregular connective tissue
Hair follicles
Sweat glands
Sebaceous glands

The Dermis
Wrinkles
Under normal circumstances, the fibers of the reticular layer of the skin stretch and recoil.
Skin wrinkles are due to:
Age
UV light
The Dermis
Stretch Marks
Extensive stretching during pregnancy causes reticular fibers to break
The skin does not recoil
The skin wrinkles and creases resulting in stretch marks

The Dermis
Lines of Cleavage
Fibers have a tendency to organize themselves in a parallel fashion
In certain areas of the body, there is a pattern
To reduce scar formation (extensive damage to the fibers), surgeons try to cut parallel to the lines of cleavage
The Subcutaneous Layer
The subcutaneous layer is deep to the dermis
Also called the hypodermis layer
Not technically considered a part of the integument
Helps stabilize the integument

The Subcutaneous Layer
Consists of:
- Adipose tissue
- Major blood vessels
Due to the location of the vessels, we have terms such as:
- Hypodermic needles
- Subcutaneous injections

Accessory Structures
Hair
Made of keratin
Hair follicles
Cells are layered in concentric rings

Accessory Structures
Types of Hair
- Vellus
  Covers most of the body
- Intermediate
  Covers arms and legs
- Terminal
  Covers the head

Accessory Structures
Functions of Hair
- Protection from UV light
- Insulation
- Guards entrance to nose and ears
- Movement of the hair sends impulses via nerves to the brain
  Such as when a bug is crawling on your arm
- Contraction of the arrector pili muscles
  Results in goose bumps

Accessory Structures
Hair color
Due to:
- Variation in melanin production by the melanocytes
  Melanin production decreases with age
- Influenced by:
  Genetics
Hormones
Environmental factors

Accessory Structures
Hair growth
Active phase
Regression phase
Resting phase
Reactivation phase

Accessory Structures
Glands in the skin
Sebaceous glands
Sweat glands
Apocrine glands
Ceruminous glands (a type of apocrine gland)
Mammary glands (a type of apocrine gland)
Merocrine glands
Gland function:
Lubricates the epidermis, excretes waste, assists in thermoregulation

Accessory Structures
Sebaceous glands
Secrete sebum to lubricate the skin
Found all over the body except for the palms and soles
Found in high concentrations on the forehead, face, and upper back
If the ducts become blocked, acne may occur

Accessory Structures
Sweat glands
Apocrine glands
High concentration in the armpit and nipple regions
Produce an odorous secretion
Secretions may contain pheromones
These are the secretions that babies smell in order to detect and “feel safe” with mom
Males have these secretions as well

Accessory Structures
Sweat glands
Merocrine glands
Also known as eccrine glands
Found all over the body
Found in high concentrations on the palms and soles
Produce sweat for cooling purposes

Accessory Structures
Sweat glands
Mammary glands
A special type of apocrine gland
Produce milk under the control of hormones from the pituitary gland

Ceruminous glands
A special type of apocrine gland
Found only in the ear canal
Produce cerumen (ear wax)
Provide minimal protection associated with the ear

Aging and the Integumentary System
Epidermis becomes thinner
Dermis becomes thinner
Number of Langerhans’ cells decreases
Vitamin D production declines
Melanocyte activity declines
Glandular activity declines
Hair follicles stop functioning
Skin repair slows down