6.1: Introduction

• Two or more kinds of tissues grouped together and performing specialized functions constitutes an **organ**.
• The skin and its various structures make up the **integumentary system**.
• Composed of several tissue types

**Maintains** homeostasis

• Protective covering—prevents harmful substance from entering
• **Retards water loss**—by diffusion from deeper tissues
• **Regulates body temperature**—helped by fluid balance
• **Houses sensory receptors**
• **Contains immune system cells**—epidermal dendritic cells
• **Synthesizes chemicals** --
• **Excretes small amounts of wastes**
6.2: Skin and Its Tissues

- **Epidermis**
  - Outer layer
  - Stratified squamous epithelium

- **Dermis**
  - Inner layer
  - Contains collagenous and elastic fibers

- **Subcutaneous layer (hypodermis)**
  - Beneath dermis
  - Areolar and adipose C. T.
Intradermal Injection
(*injection in the dermis*)
Subcutaneous injection into the adipose tissue
# Locating Intramuscular Injection Sites

## Procedure Steps
- Palpate the landmarks and the muscle mass to ensure correct location and muscle adequacy.

## Deltoid Site
1. Use this site for small amounts of medication or when the ventrogluteal or vastus lateralis sites are contraindicated.
2. Completely expose the patient’s upper arm, removing the garment if necessary.
3. Locate the lower edge of the acromion process and go two fingerbreadths down.
4. Draw an imaginary line out from the axillary crease. The resulting inverted triangle is the deltoid site.
5. An alternative approach is to place four fingerbreadths across the deltoid muscle with the top finger on the acromion process. The injection goes three fingerbreadths below the process.

## Dorsogluteal Site
1. Use this site only if no other sites are available.
2. Have the patient lie prone.
3. Locate the greater trochanter and the posterior superior iliac spine.
4. Draw an imaginary line between the greater trochanter and the posterior superior iliac spine.
5. In the middle of the line, go superior (up) approximately 1" to locate the site.

## Vastus Lateralis Site
1. Have patient assume supine or sitting position.
2. Locate the greater trochanter and the lateral femoral condyle.
3. Place hands on patient’s thigh with one hand against the greater trochanter and the edge of the other hand against the lateral femoral condyle.
4. Visualize a rectangle between the hands across the anterolateral thigh. The index fingers of the hands form the smaller ends of the rectangle. The long sides of the rectangle are formed by (a) drawing an imaginary line down the center of the anterior thigh, and (b) drawing another line along the side of the leg, halfway between the bed and the front of the thigh. This box marks the middle third of the anterolateral thigh, which is the injection site.

## Ventrogluteal Site
1. Have patient assume a side-lying position, if possible.
2. Locate the greater trochanter, anterior superior iliac spine, and the iliac crest.
3. Place palm of hand on the greater trochanter. Index finger on the anterior superior iliac spine, and the middle finger pointing toward the iliac crest. (Use right hand on the patient’s left hip; use left hand on the patient’s right hip.)
4. The middle of the triangle between the middle and index fingers is the injection site.
Intramuscular injections

How to Give an Intramuscular Injection

1. Use an alcohol swab to clean the skin where you will give yourself the shot.
2. Hold the muscle firmly and insert the needle into the muscle at a 90° angle (straight up and down) with a quick firm motion.
3. After you insert the needle completely, release your grasp of the muscle.
4. Gently pull back on the plunger of the syringe to check for blood. (If blood appears, withdraw the needle and gently press the alcohol swab on the injection site. Start over with a fresh needle.)
5. If no blood appears, inject all of the solution by gently and steadily pushing down on the plunger.
6. Withdraw the needle and syringe and press an alcohol swab on the spot where the shot was given.
Skin produces vitamin D precursor (dehydrocholesterol), that changes to an inactive form of vitamin D when exposed to sunlight. In the liver and kidneys the inactive form is modified and becomes active vitamin D.
Epidermis

• Lacks blood vessels
• Keratinized
• Thickest on palms and soles (0.8-1.4mm)
• Melanocytes provide melanin
• Rests on basement membrane
• Stratified squamous epithelium

Five layers: (top to bottom)
• Stratum corneum (dead, keratinized cells)
• Stratum lucidum (only in thick skin – palms, soles)
• Stratum granulosum
• Stratum spinosum
• Stratum basale (mitotic layer) page 182
Epidermis

- **Page 183**
- **Melanocytes** located in the stratum basale produce the dark pigment *melanin*
- Melanin gives skin color and also absorbs UV light
Epidermis

- Heredity and environment determine skin color

**Genetic Factors**
- Varying amounts of melanin
- Varying size of melanin granules
- Albinos lack melanin

**Environmental Factors**
- Sunlight
- UV light from sunlamps
- X-rays

**Physiological Factors**
- Dilation of dermal blood vessels
- Constriction of dermal blood vessels
- Accumulation of carotene
- Jaundice—a consequence of liver malfunction that leads to too much bilirubin in the blood that leads to too much in the skin making it look “yellow”
6.1 Clinical Application

Indoor Tanning and Skin Cancer
• On average 1.0-2.0mm thick
• Contains dermal papillae - the friction ridges form fingerprints
• Binds epidermis to underlying tissues
• Dense irregular connective tissue
• Muscle cells
• Nerve cell processes
• Specialized sensory receptors
• Blood vessels
• Hair follicles
• Glands
Layers of the Skin

ClearSkinAcne.com
Dermis

- There are actually two (2) layers to the dermis:
  - Papillary layer—increases the surface area under the epidermis
    - Areolar
    - Thin
    - Superficial
    - Dermal papillae here
  - Reticular layer
    - Dense irregular C. T.-provides Toughness and elasticity
    - Most of dermis
Accessory structures of the skin originate from the epidermis and include:

- **Nails**—protects the ends of our fingers and toes
- **Hair follicles**—forms the hair that is pushed out from the hair shaft and is composed of dead epidermal cells. Each hair grows for 2 to 6 yrs. Then rests 3-4 months. Then new hair begins and the old is pushed out and drops off. A healthy person loses 20-100 hairs a day.
- **Skin glands**—sebaceous produce sebum—sweat (eccrine, apocrine, ceruminous, mammary)
Nails

• Protective coverings
  Three (3) parts:
    • Nail plate
    • Lunula
    • Nail bed
The nails can tell a lot about your health

With yellow nail syndrome, nails thicken and new growth slows. This results in a yellowish discoloration of the nails. Nails affected by yellow nail syndrome might lack a cuticle and detach from the nail bed in places. Yellow nail syndrome is often a sign of respiratory disease, such as chronic bronchitis. Yellow nail syndrome can also be related to swelling of the hands (lymphedema).
Nail pitting is small depressions in the nails. Nail pitting is most common in people who have psoriasis — a condition characterized by scaly patches on the skin. Nail pitting can also be related to connective tissue disorders, such as Reiter's syndrome, and alopecia areata — an autoimmune disease that causes hair loss.
Nail clubbing occurs when the tips of the fingers enlarge and the nails curve around the fingertips, usually over the course of years. Nail clubbing is sometimes the result of low oxygen in the blood and could be a sign of various types of lung disease. Nail clubbing is also associated with inflammatory bowel disease, cardiovascular disease, liver disease and AIDS.
Spoon nails (koilonychia) are soft nails that look scooped out. The depression usually is large enough to hold a drop of liquid. Often, spoon nails are a sign of iron deficiency anemia or a liver condition known as hemochromatosis, in which your body absorbs too much iron from the food you eat. Spoon nails can also be associated with heart disease and hypothyroidism.
With the condition known as Terry's nails, the tip of each nail has a dark band. Sometimes this can be attributed to aging. In other cases, it can be a sign of a serious underlying condition, such as liver disease, congestive heart failure or diabetes.
With a condition known as onycholysis, the fingernails become loose and can separate from the nail bed. Sometimes detached nails are associated with injury or infection. In other cases nail separation is a reaction to a particular drug or consumer product, such as nail hardeners or adhesives. Thyroid disease and psoriasis — a condition characterized by scaly patches on the skin — also can cause nail separation.
Beau's lines are indentations that run across the nails. The indentations can appear when growth at the area under the cuticle is interrupted by injury or severe illness. Conditions associated with Beau's lines include uncontrolled diabetes and peripheral vascular disease, as well as illnesses associated with a high fever, such as scarlet fever, measles, mumps and pneumonia. Beau's lines can also be a sign of zinc deficiency
Hair Follicles

- Epidermal cells
- Tube-like depression
- Extends into dermis
- Three parts:
  - Hair root
  - Hair bulb
  - Hair shaft (dead, epidermal cells)
- Hair papilla contains nourishing blood vessels
- Hair color is due to type and amount of melanin
- Arrector pili muscle
6.2 Clinical Application

Hair Loss
Sebaceous Glands

- Usually associated with hair follicles
- Holocrine glands
- Secrete sebum (fatty material and cellular debris)
- Absent on palms and soles
Sweat Glands

• Also called sudoriferous glands
• Widespread in skin
• Originates in deeper dermis or hypodermis
• Eccrine glands
• Apocrine glands (scent)
• Ceruminous glands
• Mammary glands
6.3 Clinical Application

Acne
6.4: Regulation of Body Temperature

• Regulation of body temperature is vitally important because even slight shifts can disrupt rates of metabolic reactions.

• Skin plays a key role in the homeostatic mechanism that regulates body temperature.
Heat Production and Loss

- Heat is a product of cellular metabolism
  - The most active body cells are the heat producers and include:
    - Skeletal muscle
    - Cardiac muscle
    - Cells of certain glands such as the liver
- The primary means of heat loss is radiation
  - Also there is conduction, convection and evaporation
Regulation of Body Temperature

If body temperature continues to drop, control center signals muscles to contract involuntarily.

Receptors
Thermoreceptors send signals to the control center.

Stimulus
Body temperature drops below normal.

Normal body temperature
37°C (98.6°F)

Control center
Hypothalamus detects the deviation from the set point and signals effector organs.

Effectors
Dermal blood vessels constrict and sweat glands remain inactive.

Response
Body heat is conserved, temperature rises toward normal.

Stimulus
Body temperature rises above normal.

Effectors
Dermal blood vessels dilate and sweat glands secrete.

Response
Body heat is lost to surroundings, temperature drops toward normal.

Receptors
Thermoreceptors send signals to the control center.
Problems in Temperature Regulation

**Hyperthermia** – abnormally high body temperature
A core body temp = or > 106°F

**Hypothermia** – abnormally low body temperature
Hypothermia is a medical emergency that occurs when your body loses heat faster than it can produce heat, causing a dangerously low body temperature.

Normal body temperature is around 98.6°F (37°C).

Hypothermia (hi-poe-THUR-me-uh) occurs as your body temperature passes below 95°F (35°C). (Mayo Clinic)
6.4 Clinical Application

Elevated Body Temperature

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6.5: Healing of Wounds and Burns

• Inflammation is a normal response to injury or stress.
• Blood vessels in affected tissues dilate and become more permeable, allowing fluids to leak into the damaged tissues.
• Inflamed skin may become:
  • Reddened
  • Swollen
  • Warm
  • Painful
Cuts

- A shallow cut results in epidermal cells along its margin to divide more rapidly than usual.

- A deep cut results in blood vessels breaking which causes a clot to form.
  - Clot and dried tissue fluid form scab.
  - *Growth factors* stimulate new tissue formation.
    (growth factor production slows with age)
  - Phagocytic cells remove dead cells and debris.
  - Excess collagenous fibers may form scar.

The following slide shows examples of each
Blood cells

Site of injury

Blood clot

Scab

Scar tissue

Fibroblasts

Scab

Scar tissue
In large open wounds, healing may be accompanied by formation of small, rounded masses called granulations that develop in the exposed tissue. A granulation consists of a new branch of a blood vessel and a cluster of collagen secreting fibroblasts that the vessel nourishes. In time, some of the blood vessels are resorbed, and the fibroblasts move away leaving a scar largely composed of collagenous fibers.
Burns

• **First degree** burn – superficial, partial-thickness
  Example: sunburn

• **Second degree** burn – deep, partial-thickness
  Example: blisters

• **Third degree** burn – full-thickness
  • Autograft
  • Homograft
  • Various skin substitutes
Epidermis
Dermis
Hypodermis

First degree burn

Second degree burn

Third degree burn
Rule of Nines for Adults

Anterior head and neck 4 1/2%

Anterior upper extremities 9%

Anterior trunk 18%

Perineum 1%

Anterior and posterior head and neck 9%

Anterior and posterior upper extremities 18%

Anterior and posterior trunk 36%

Anterior and posterior lower extremities 36%

Posterior head and neck 4 1/2%

Posterior trunk 18%

Posterior upper extremities 9%

Posterior lower extremities 18%
Rule of Nines
The body surface is divided into areas representing 9% or multiples of 9%.

Anterior 18%
Posterior 18%

The child's palm represents 1% of his or her body.
6.6: Lifespan Changes

- Skin becomes scaly
- Age spots appear
- Epidermis thins
- Dermis becomes reduced
- Loss of fat
- Wrinkling
- Sagging
- Sebaceous glands secrete less oil
- Melanin production slows
- Hair thins
- Number of hair follicles decreases
- Nail growth becomes impaired
- Sensory receptors decline
- Body temperature unable to be controlled
- Diminished ability to activate Vitamin D
WHY SKIN DETERIORATES WITH AGE

Collagen
Protein that gives skin its structure and strength. The 40 genes that cause it to degrade become more active as you age.

Inflammation
The 400 genes involved in inflammation become more active with age, triggering wrinkles.

Skin growth
Aging slows down the production of new skin cells.

Photo-ageing
Ultraviolet light from the Sun speeds up the natural ageing process, damaging genes involved in keeping skin healthy.

Antioxidants
Around 200 genes control the skin’s defences against free radicals – molecules that roam the body harming DNA. Age weakens those defences.

Hydration
Skin loses its ability to retain water. Without moisture, skin will become wrinkled.
Important Points in Chapter 6:
Outcomes to be Assessed

6.1: Introduction
✓ Describe what constitutes an organ, and name the large organ of the integumentary system.
✓ Discuss the functions of skin.

6.2: Skin and Its Tissues
✓ Describe the structure of the layers of the skin.
✓ Summarize the factors that determine skin color.

6.3: Accessory Structures of the Skin
✓ Describe the accessory structures associated with the skin.
✓ Explain the functions of each accessory structure of the skin.
Important Points in Chapter 6: Outcomes to be Assessed

6.4: Regulation of Body Temperature
✓ Explain how the skin helps regulate body temperature.

6.5: Healing of Wounds and Burns
✓ Describe the events that are part of wound healing.
✓ Distinguish among the types of burns, including a description of healing with each type.

6.6: Lifespan Changes
✓ Summarize lifespan changes in the integumentary system.
Quiz 6

Complete Quiz 6 now!

Read Chapter 7.