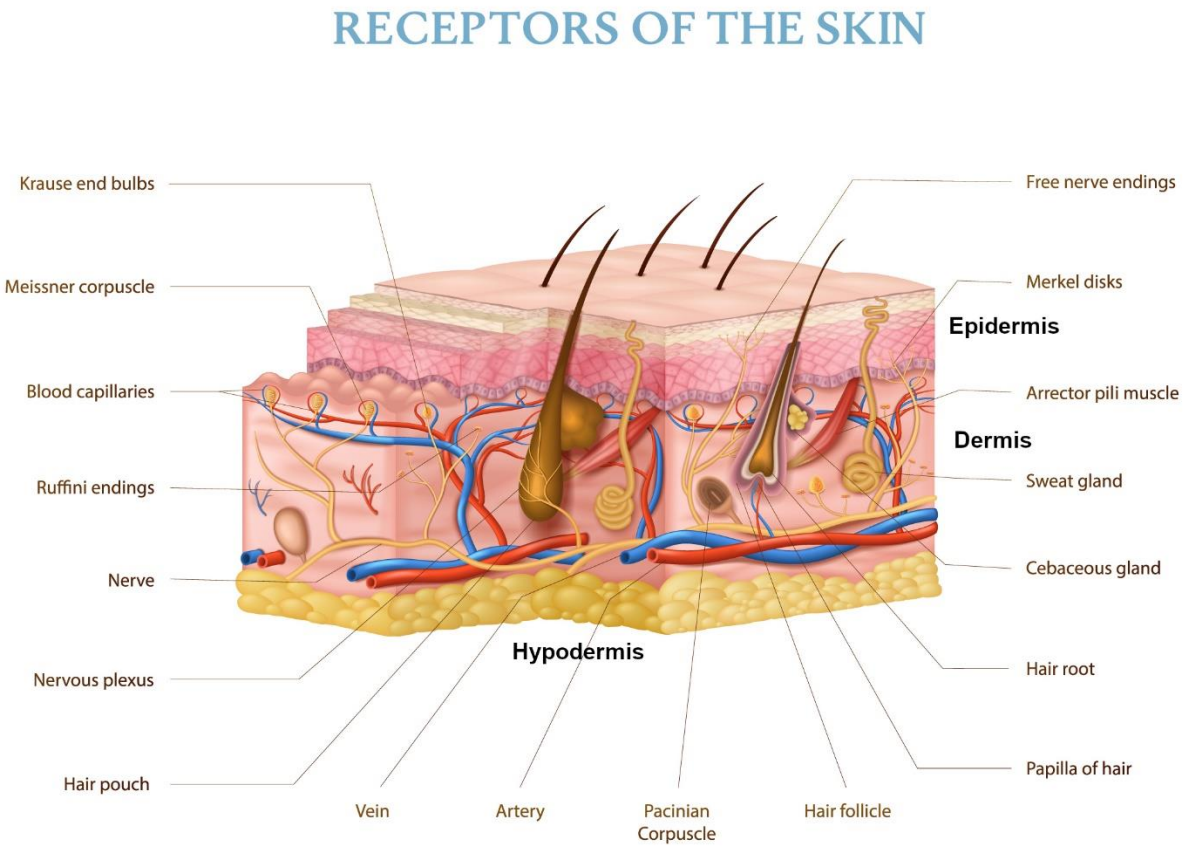
Integumentary System



Free nerve endings

Pain sensitivity receptors

Meissner corpuscle

Touch receptor

Merkel disks

Pressure receptors

Ruffini endings

Heat receptors

Krause end bulbs

Cold receptors

Pacinian Corpuscle

High-frequency receptor

The integumentary system is the body's outer layer, consisting of the skin and its associated structures, such as hair, nails, and glands. It forms a critical physical barrier that protects the body from the external environment and works with other organ systems to maintain overall balance.

Structure and components

Skin

As the largest and heaviest organ, the skin is composed of three primary layers.

- **Epidermis:** The outermost, visible, and waterproof layer. It contains melanocytes, which provide skin color, and is made of keratinocytes that continuously shed and are replaced.
    - Thick skin, found on the palms and soles, has five sub-layers, while thin skin has four.
- **Dermis:** The thick middle layer of the skin. It is made of connective tissue containing collagen for strength and elastin for flexibility.
    - This layer houses nerves, hair follicles, and glands.
- **Hypodermis (Subcutaneous tissue):** The bottom, fatty layer that connects the skin to the underlying muscles and bones. It provides insulation and cushions the body.

Accessory structures

These are all derived from the epidermis, though their roots extend into the dermis.

- **Hair:** Protects the head from UV radiation and insulation. Hair in the nose, ears, and eyelashes also filters out dust and other particles.
- **Nails:** Composed of hardened keratinocytes, nails protect the tips of fingers and toes and assist in picking up small objects.
- **Glands:** The skin contains several glands that excrete substances.
    - **Sudoriferous (sweat) glands:** Include eccrine glands for thermoregulation and apocrine glands, which are responsible for body odor.
    - **Sebaceous (oil) glands:** Produce an oily secretion called sebum, which waterproofs and lubricates the skin and hair, and has antibacterial properties.

Key functions

The integumentary system performs several critical functions to maintain homeostasis.

- **Protection:** Acts as the body's first line of defense against invasion by microorganisms, chemicals, and UV radiation. It also prevents dehydration through a waterproof barrier.
- **Thermoregulation:** Helps maintain stable body temperature through blood vessel dilation and constriction, as well as sweat production.

- **Sensation:** Specialized sensory nerve structures in the skin detect touch, pressure, pain, and temperature, allowing the body to interact with its environment.
- **Vitamin D synthesis:** The skin's epidermal layer produces vitamin D when exposed to UV light. This vitamin is essential for calcium absorption and overall bone health.
- **Immunity:** The skin acts as an immune barrier. Immune cells within the skin identify and fight invading pathogens.
- **Excretion:** Waste materials are excreted from the body through sweat.

Pharmacological classifications for the integumentary system include therapeutic categories like antimicrobials, antiparasitics, anti-inflammatories, and corticosteroids, and also by drug action, such as antihistamines for allergies and anesthetics for pain. Other important categories include immunomodulators, hormones, and vitamins/minerals.

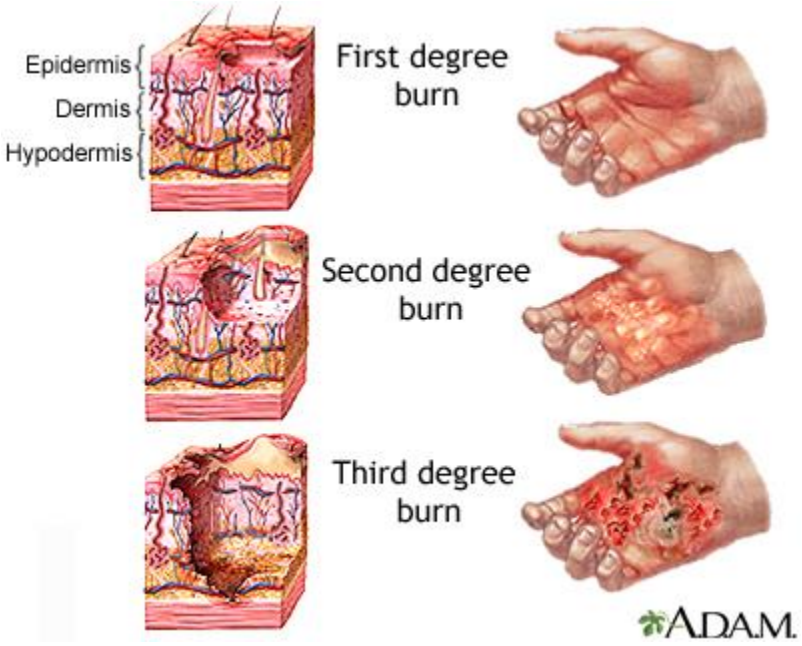
By therapeutic use

- **Antimicrobials:** Drugs that kill or inhibit the growth of microorganisms. These drugs can be topical or injectable.
    - **Antibiotics:** Fight bacterial infections.
    - **Antifungals:** Combat fungal infections.
- **Antiparasitics:** Treat parasitic infestations.
- **Anti-inflammatories:** Reduce inflammation.
- **Anesthetics:** Temporarily block nerve conduction to relieve pain or loss of sensation.
- **Antipruritics:** Relieve itching.
- **Antihistamines:** Block the effects of histamine, which is released during allergic reactions and causes symptoms like swelling and itching.
- **Antiseptics:** Inhibit the growth of infectious microorganisms on the skin.

Other categories

- **Immunomodulators:** Affect the immune system.
- **Hormones:** Regulate various bodily functions and are used to treat certain skin conditions.
- **Vitamins and Minerals:** Nutritional supplements that can be crucial for skin health.
- **Psychotropic agents:** Medications that affect mental state, sometimes used for conditions with a psychological component, such as trichotillomania.

Burns



First-degree burns (Superficial)

- **Affected layers:** Outer layer of skin (epidermis)
- **Appearance:** Redness, swelling, no blisters
- **Sensation:** Painful

Second-degree burns (Partial Thickness)

- **Affected layers:** Epidermis and inner layer (dermis)
- **Appearance:** Red, swollen, and blistered; may appear moist
- **Sensation:** Very painful
- **Note:** Deep second-degree burns may look white or splotchy

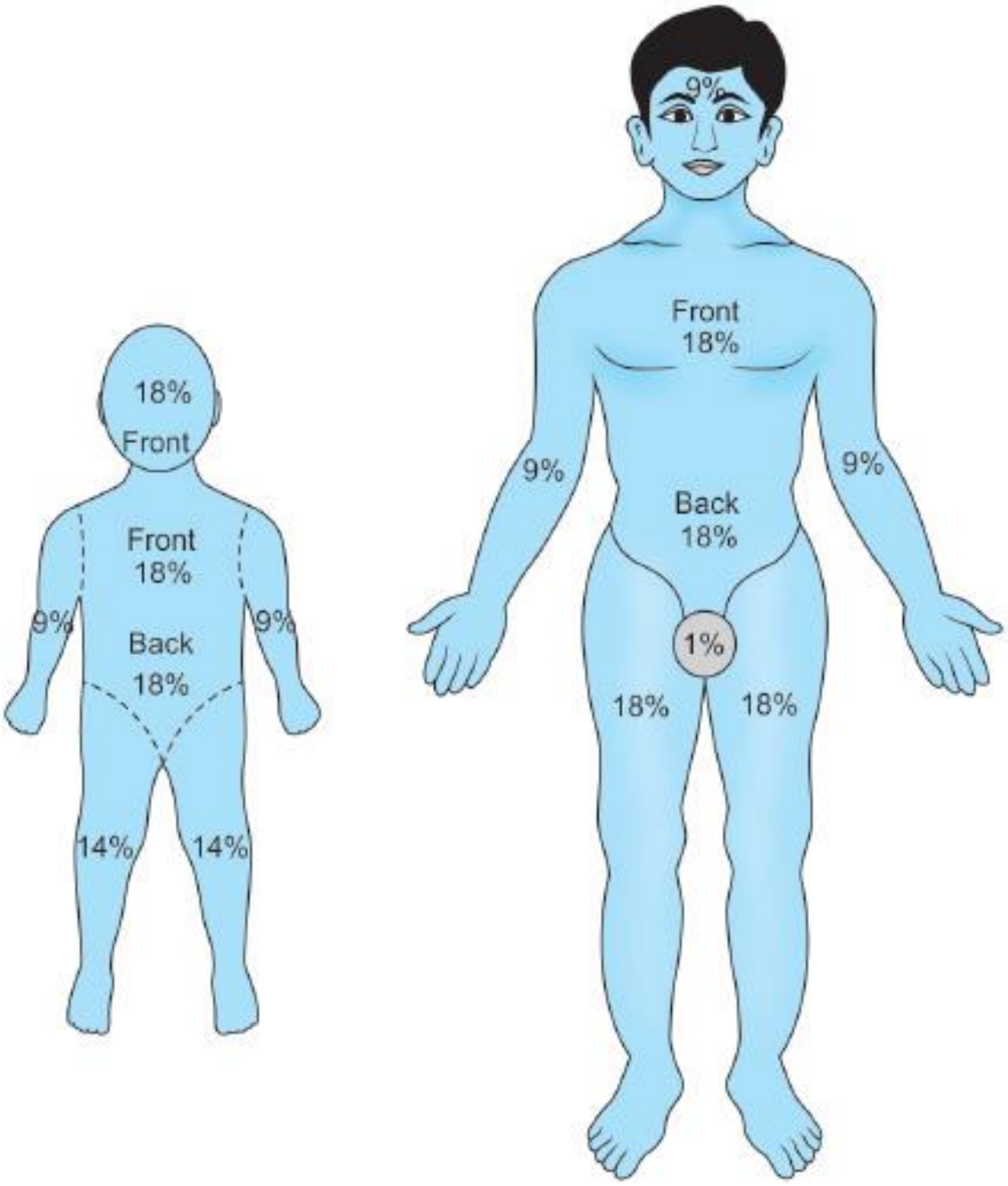
Third-degree burns (Full Thickness)

- **Affected layers:** All layers of skin and possibly underlying tissue
- **Appearance:** White, black, brown, or leathery
- **Sensation:** May have little to no pain because nerve endings are destroyed

Fourth-degree burns

- **Affected layers:** Extend through all skin layers to underlying fat, muscle, and bone
- **Appearance:** May appear black or charred
- **Sensation:** Insensate
- **Note:** These are life-threatening and often require amputation or skin grafting

Rule Of Nines



Parkland Burn Formula

The Parkland formula is used to calculate the volume of intravenous crystalloid fluids needed for adult burn victims:

$$4mL \times \text{body weight (kg)} \times \% \text{ Total Body Surface Area (TBSA) burned}$$

$4mL$×body weight (kg)×% Total Body Surface Area (TBSA) burned

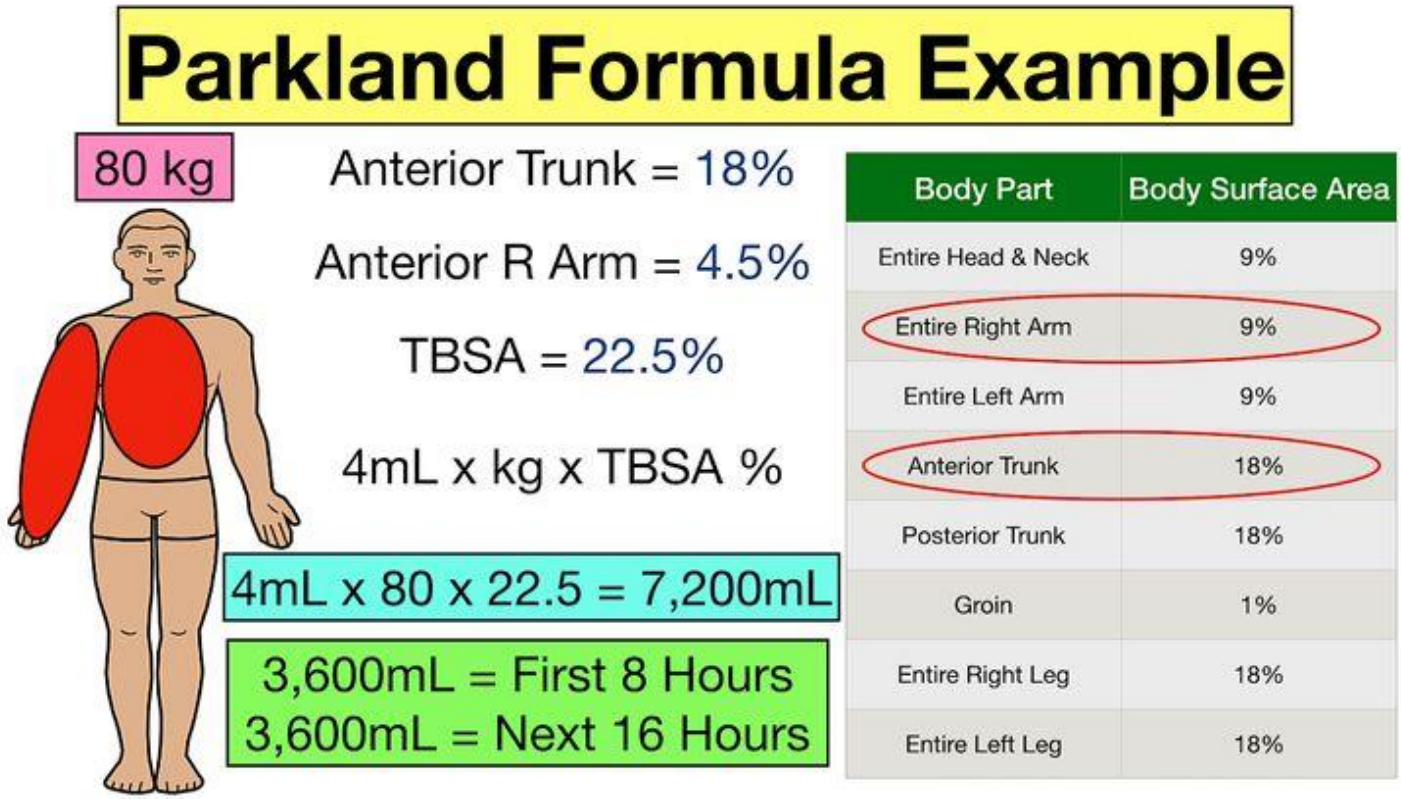
. Half of this total volume is administered in the first 8 hours after the burn, and the remaining half is given over the next 16 hours. To estimate the TBSA percentage, medical professionals use methods like the Rule of Nines.

Parkland formula breakdown

- **Formula:**

  $4mL/kg/\%TBSA$

- **Total 24-hour fluid volume:**
  - Calculate the total amount of fluid needed in mL using the formula.
  - **Administer the first half**: of the total volume over the first 8 hours from the time of the burn.
  - **Administer the second half**: of the total volume over the next 16 hours.



Youtube Channel: @PassNCLEXToday

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Type Of Burns + Rule of 9's + Burn Calculations #Parkland Formula Video:
https://www.youtube.com/watch?v=OPQlYj5wr7Q