Body Systems

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Learning Objectives

1) List down the human body organization
2) Describe the major body systems and their specific functions
3) List down possible problems or injuries related to body system
4) Define Homeostasis .

Learning Unit Content

1) Learning outcome
2) Introduction to human body systems
3) General definitions
4) Organization of the Human Body
5) Human Body Systems; structures, Functions, injuries or sudden illnesses
6) Homeostasis

Introduction

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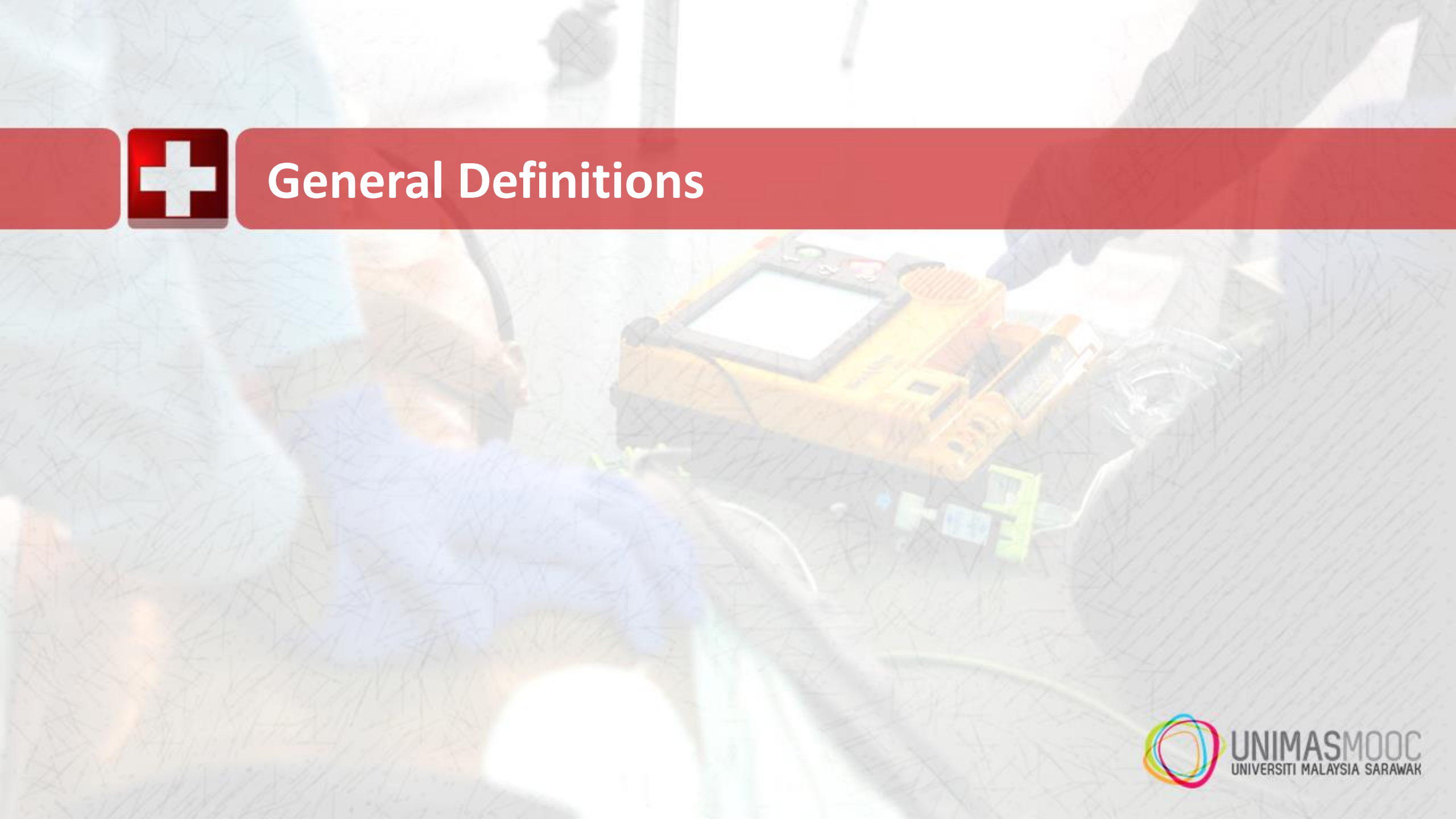
Introduction

- Human Body is highly technical and complicated “machine”.
- It is composed of a number of ‘systems’, each with a specific role in the function of the body as a whole.
- It is important that first aiders have a basic awareness of the major systems and their functions.
- Knowledge of human anatomy and physiology will assist in understanding key topics in First Aid , and will also provide a firm basis for the care and treatment of a casualty.

General Definitions



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General Definitions

Anatomy

- Ancient Greek – *ana*: “separate, apart from” and *temnein*: “to cut up, cut open”
- The study of the body and physical relationships involved between the body systems

Physiology

- The study of how the systems of the body work.
- The ways in which their integration between the systems maintains life and health of an individual

Pathology

- The study of abnormalities
- How they affect body functions, causing illness

Organization of the Human Body

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Organization of the Human Body

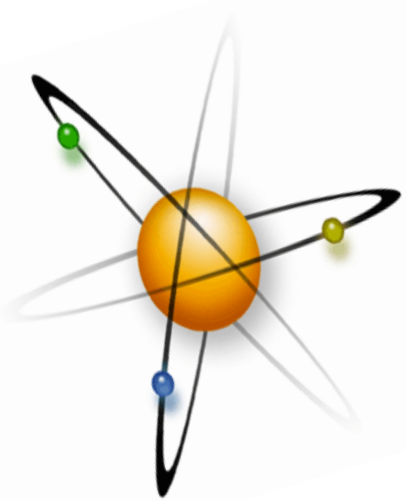
The human body is organized in several levels, from the simplest to the most complex. . .

- **Chemicals**
- **Cells** – the basic unit of life
- **Tissues** – clusters of cells performing a similar function
- **Organs** – made of tissues that perform one specific function
- **Systems** – groups of organs that specific purpose in the human body

Organization of the Human Body

Chemical

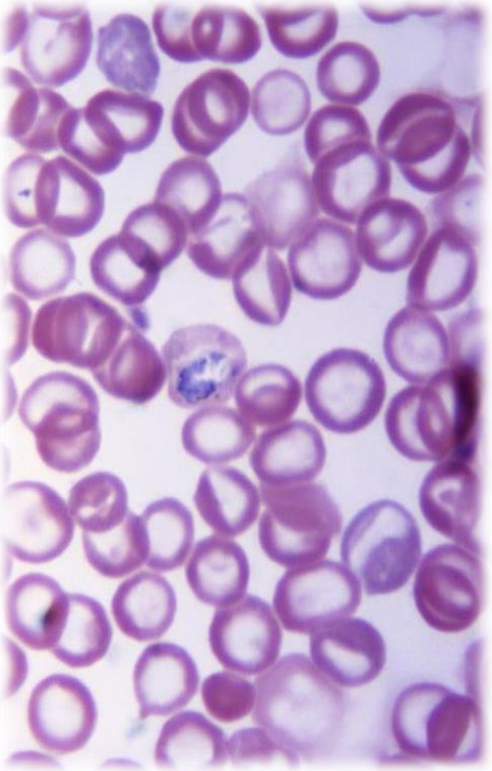
- **Atoms -** all living and non-living (solid, liquid, gas) matter is composed of atoms.
- Atoms combine to form molecules.
- There are a vast range of molecules on the body.
- **Elements** – fundamental units of matter
  - 96% of the body is made from four elements
    - Carbon (C) Oxygen (O) Hydrogen (H) Nitrogen (N)



Organization of the Human Body

2. Cells

- The smallest independent unit of living matter.
- Trillions of them within the body.
- Can be distinguished by their characteristics (size, shape, structure).
- Every cell has a specialized function that contributes to special body needs.



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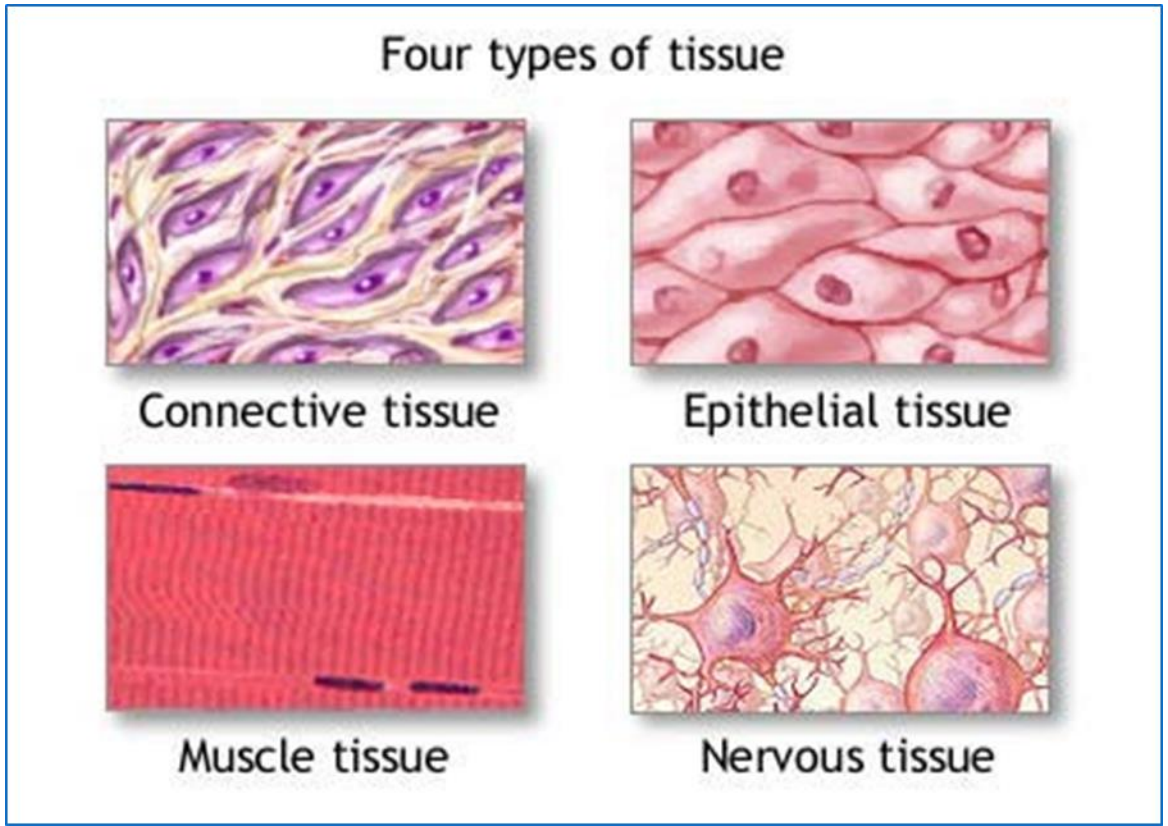
Organization of the Human Body

. Tissues

- Cells are bound together as tissues.

- FOUR primary types of tissues:
  - Epithelial;
  - Connective;
  - Muscle and;
  - Nervous.



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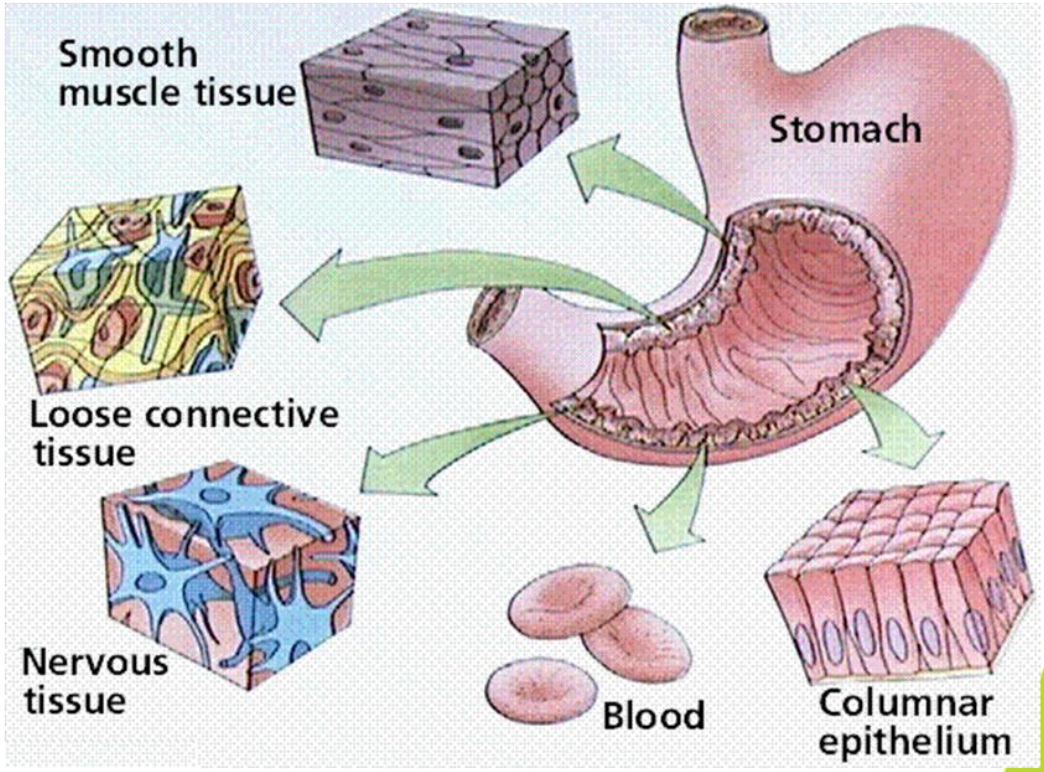
Organization of the Human Body

4. Organs

- Are made up of different types of tissues evolved to carry out specific tasks

(e.g. heart to pump blood, stomach for digestive functions)

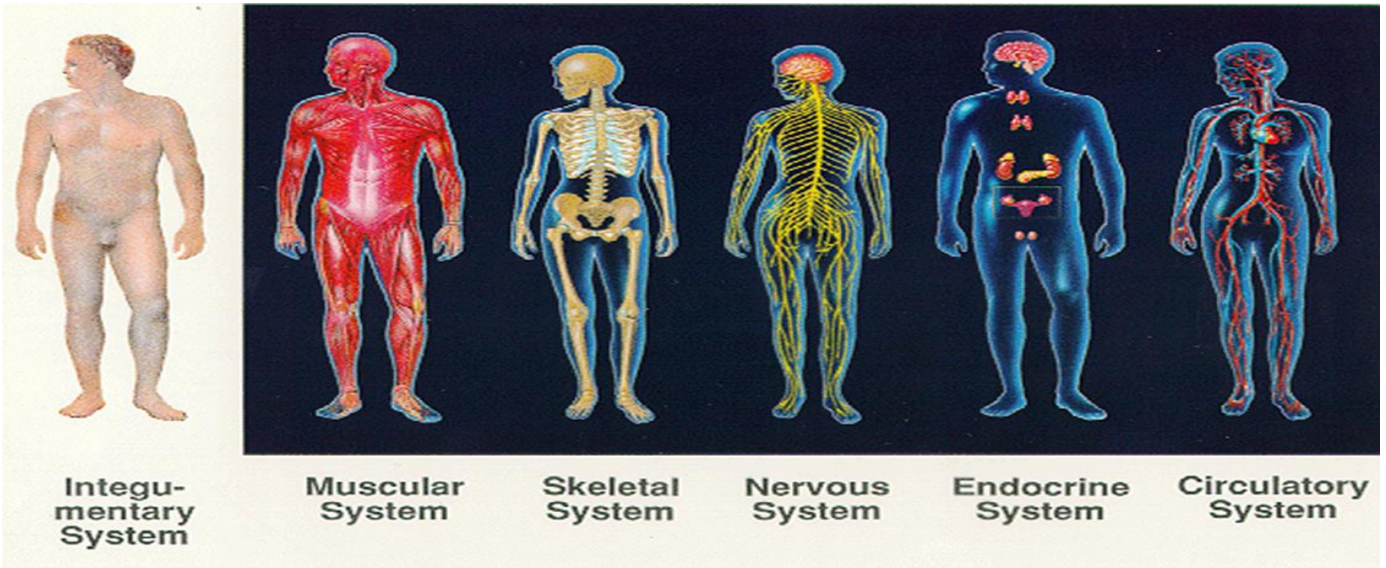
Eg. Tissues which make up the stomach



Organization of the Human Body

5. Systems

- Consists of a number of organs that carry out a common function or a coordinated set of functions.



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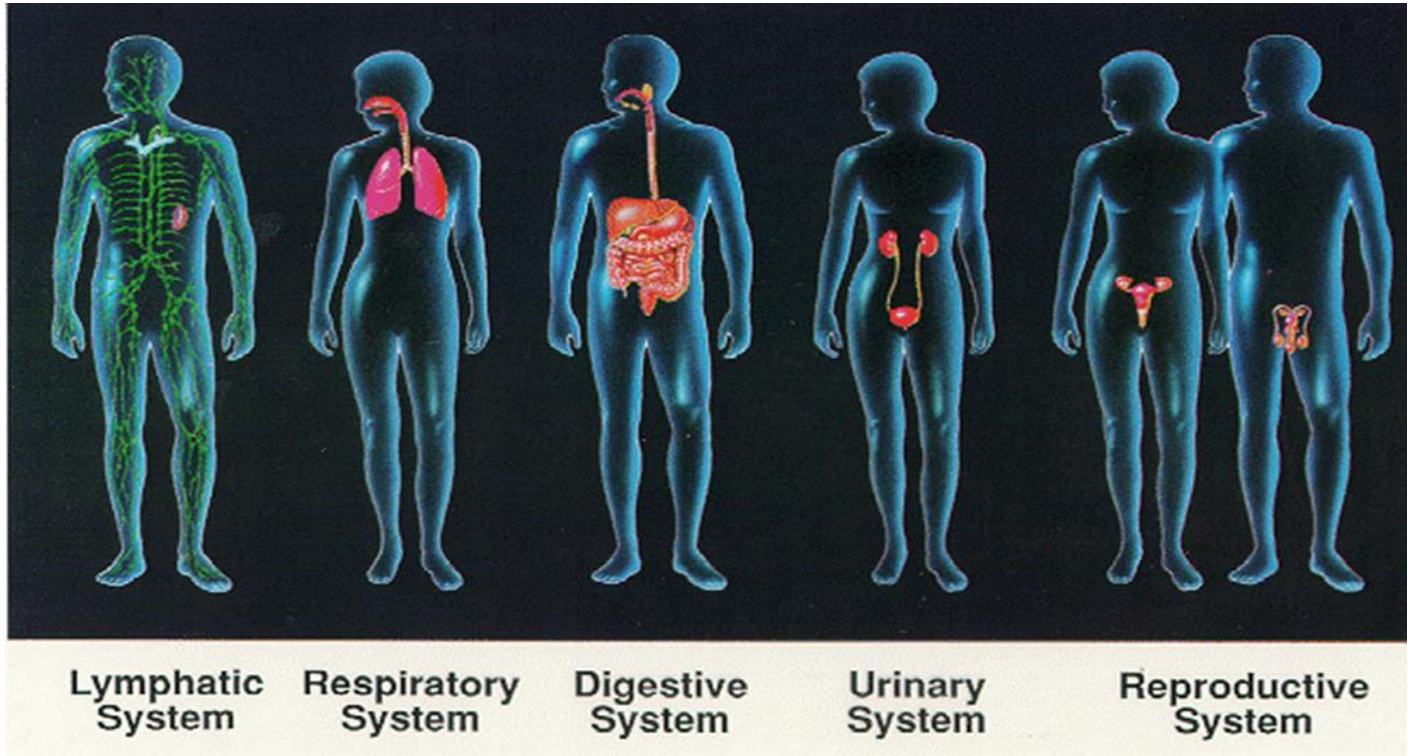
Organization of the Human Body

5. Systems (Con't …)

- May work independently to carry out specific functions for health requirements and survival needs of the body



The Human Body – in Brief

- Made up of a number of systems that work independently.
- Body systems coordinate and integrate with one another to ensure survival of an individual.
- Should one system fail,

  the consequences are likely to extend to other systems.
- Complex in both structure and function.

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Overview of body Systems

- There are 11 human body systems and they are as follows:
  - -- nervous system
  - -- respiratory system
  - -- excretory system
  - -- muscular system
  - -- endocrine system
  - -- lymphatic (immune) system
  - -- integumentary system
  - -- digestive system
  - -- skeletal system
  - -- circulatory system
  - -- reproductive system

Overview of body Systems

Body systems communicate, integrate, support and move, maintain and regulate, defend, reproduce the body.

✓Communicate outside environment changes:

-Three organ systems detect external stimuli and coordinate the body's responses

- Nervous, sensory and endocrine systems

✓Support and movement:

-The musculoskeletal system consists of two interrelated organ systems

Overview of body Systems

✓Regulation and maintenance:

-Four organ systems regulate and maintain the body's chemistry; called *HOMEOSTASIS.*

Digestive, circulatory, respiratory and excretory systems.

✓Defense:

-The body defends itself with two organ systems:

Integumentary and immune.

✓Reproduction and development

-The **R**eproductive system.

Human Body Systems

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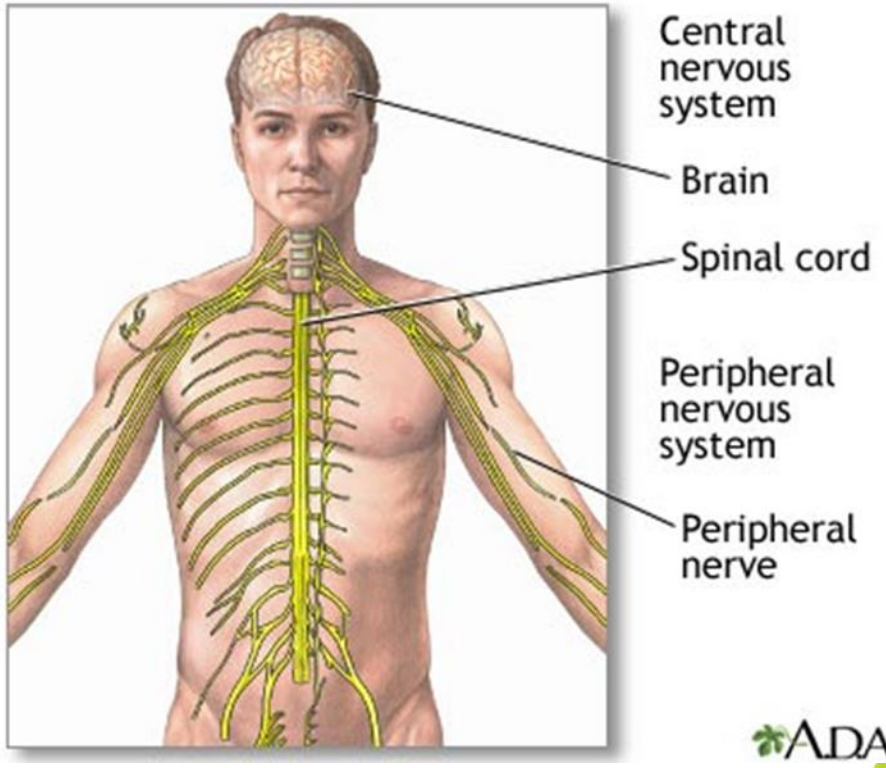
1. Nervous System

- Consists of brain, spinal cord and nerves.
- Central nervous system (CNS) – Brain and spinal cord.
- Peripheral nervous system (PNS) – cranial nerves and spinal nerves.
- <u>Functions:</u>
  - Detects and responds to changes in the internal and external environment.
  - Enables higher order mentality – reasoning, memory, affection etc.
  - Regulates body activities.

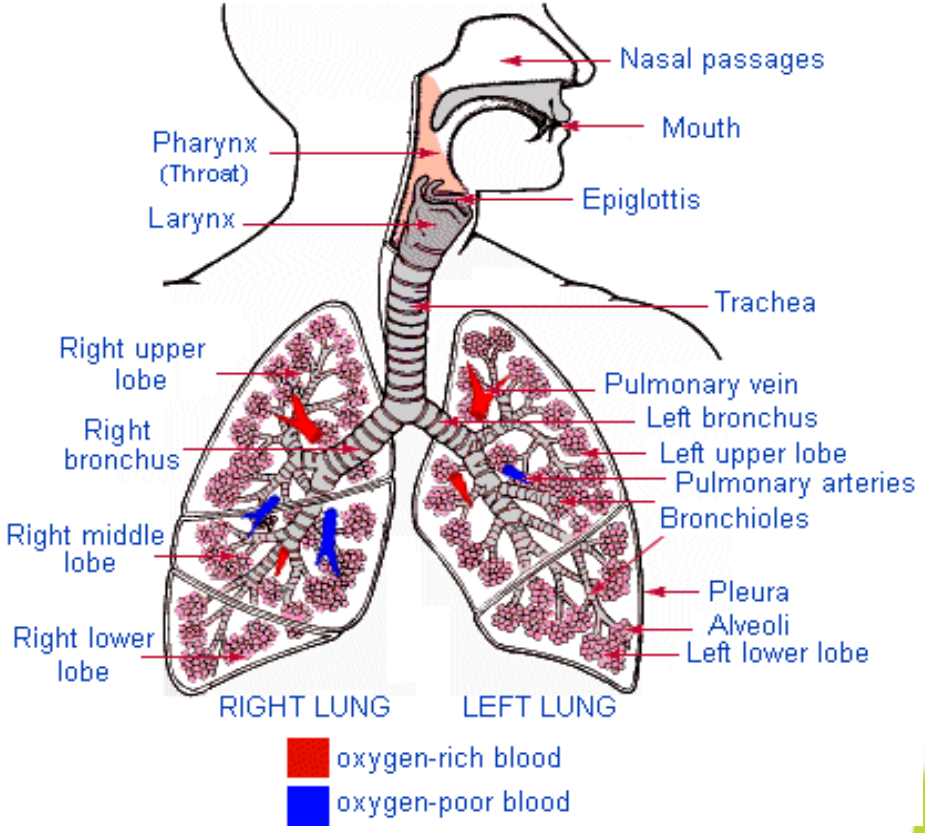


Injuries/Sudden Illness Associated With The Nervous System

- Strokes
- Fainting
- Seizures
- Head, neck and spine injuries

2. Respiratory System

- Consists of nasal cavity, pharynx, trachea, lungs, bronchioles, alveoli.
- These organs are concerned with movement of respiratory gasses – O^2 and CO^2.
- **Functions:**
  - Draws O^2 from the atmosphere into the body.
  - Excretes CO^2 from the body.
  - Supplies oxygen to blood.
  - Helps regulate acid-base balance.



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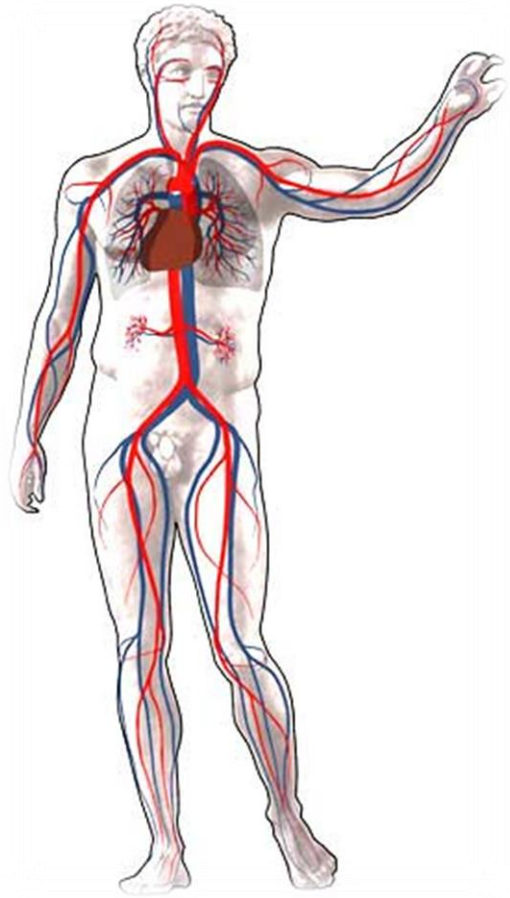
Injuries/Sudden Illness Associated With The Respiratory System

- Asthma
- Allergic reactions
- Blunt chest injury
- Penetrating chest injury
- Foreign body airway obstruction (FBAO)

3. Cardiovascular System



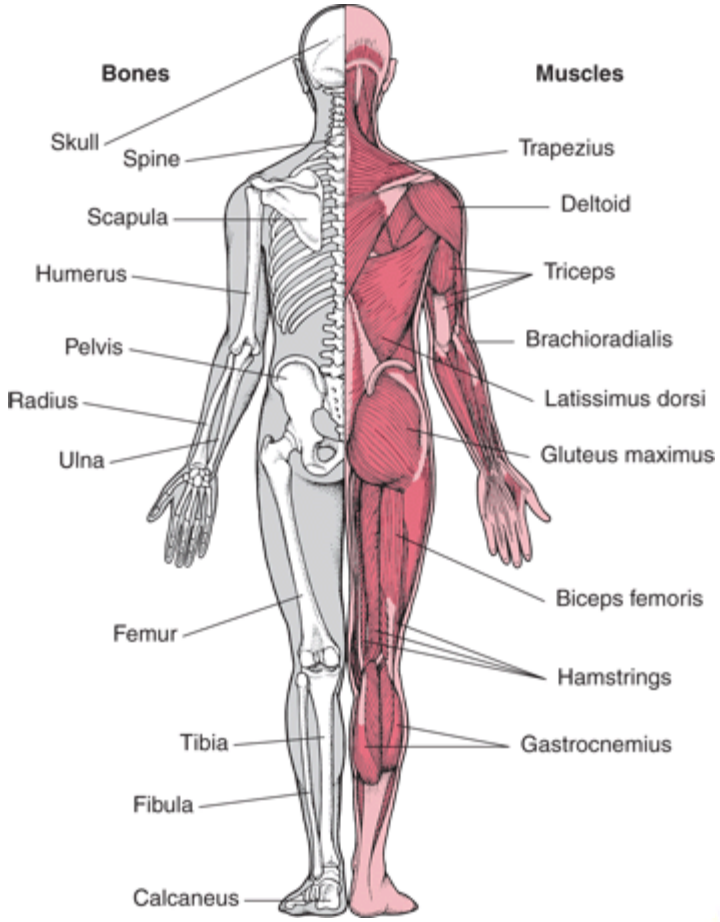
- Consists of heart and blood vessels.
- **Functions:**
  - The heart pumps blood and blood vessels carry and supplies bloods to essential body parts.
  - Transports respiratory gasses, nutrients, wastes and hormones.
  - Protects the body from fluid loss.
  - Helps to regulate body temperature.

Injuries/Sudden Illness Associated With The Cardiovascular System

- Heart attacks / Acute Myocardial Infarctions
- Blunt cardiac injuries
- Vascular disruption
- Hemorrhage
- Shock

4. Musculoskeletal System

- Consists of muscles, bones, tendons, ligaments and joints.
- **Functions:**
  - Permit body movements
  - Provide body support and protection
  - Maintains posture
  - Produces body heat
  - Produces blood cells (bone marrow)
  - Stores minerals



Injuries/Sudden Illness Associated With The Musculoskeletal System

- Fractures
- Dislocations
- Crush injuries
- Amputations

Partial Amputation

Crushed injury

Fracture

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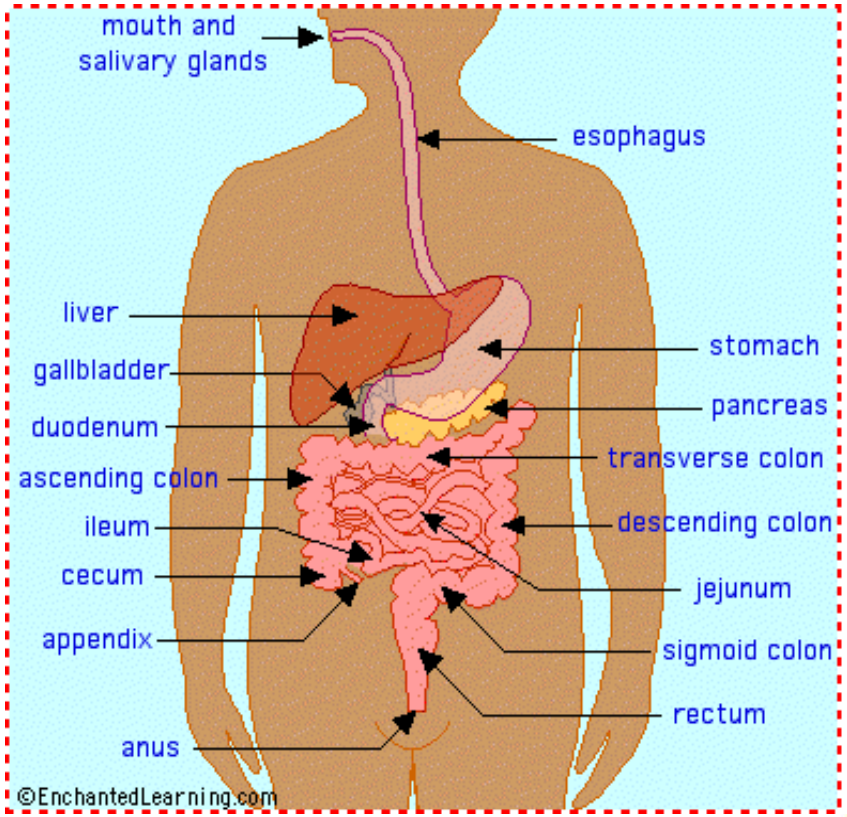
5. Digestive System

- Consists of oral cavity, salivary glands, pharynx , esophagus, stomach, small and large intestines, liver, pancreas and gall bladder.
- **Functions:**
  - Breaks down food – mechanically and chemically.
  - Eliminates undigested wastes (excretion).
  - Absorbs needed nutrients.



Injuries/Sudden Illness Associated With The Digestive System

Blunt Trauma

Penetrating injury

6. Integumentary System

- The skin.
- 2 upper layers – dermis, epidermis.
- **<u>Functions:</u>**
  - Protection from external environment.
  - Temperature regulation.
  - Eliminate waste.
  - Receives stimuli (e.g. pain, heat, cold, touch).

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Injuries/Sudden Illness Associated With The Integumentary System

BURN

WOUND

- Thermal injuries
  - Burns
  - Scalds
- Wounds
  - Incision
  - Laceration
  - Abrasion
  - Contusion
  - Puncture
  - Gunshot

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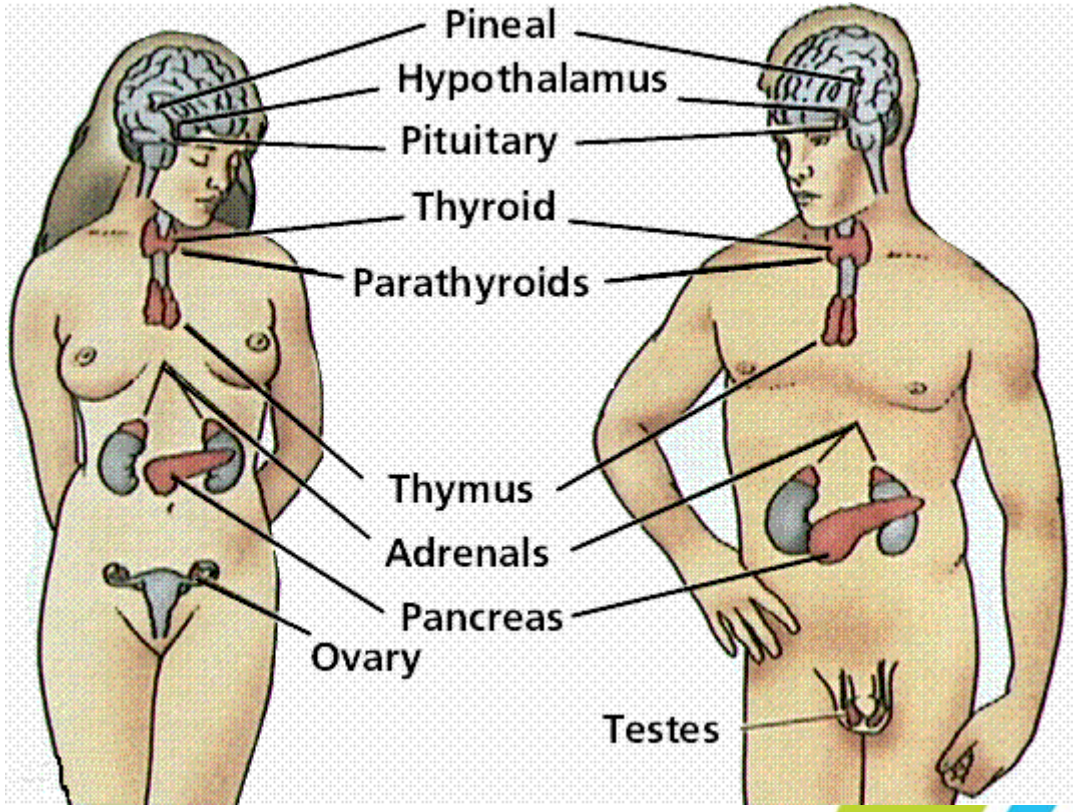
7. Endocrine System

- Consists of SEVEN major endocrine glands
  - Pituitary gland
  - Adrenal glands
  - Thyroid gland
  - Parathyroid glands
  - Pancreas
  - Ovary and testes (gonads)
- **<u>Functions:</u>**
  - Produce hormones and secreting them into the blood stream.
  - Controls and integrates body functions.



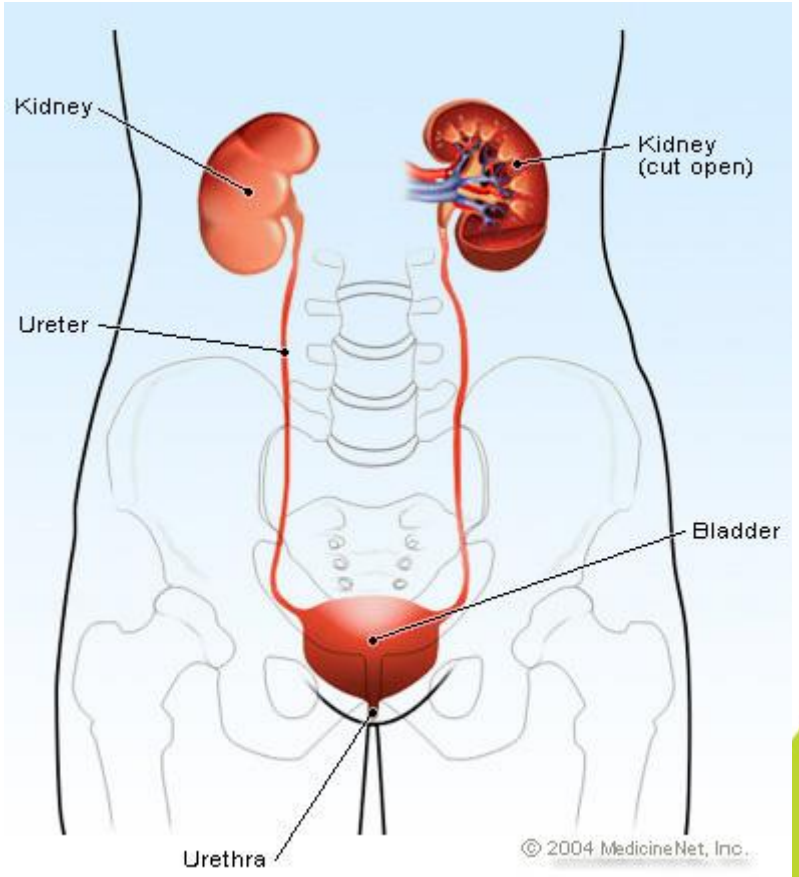
Injuries/Sudden Illness Associated With The Endocrine System

- Diabetes and low blood sugar (hypoglycemia)

Unconscious Call 999

9. Excretory (Urinary) System

- Consists of kidneys, ureters, bladder and urethra.
- **Functions:**
  - Removal of waste products such as urea and uric acid from the blood.
  - Form and eliminate urine from the body (excretion).
  - Regulate electrolytes and water.
  - Helps to maintain acid-base balance.
  - Help to regulate production of red blood cells (erythropoietin produced by kidneys)

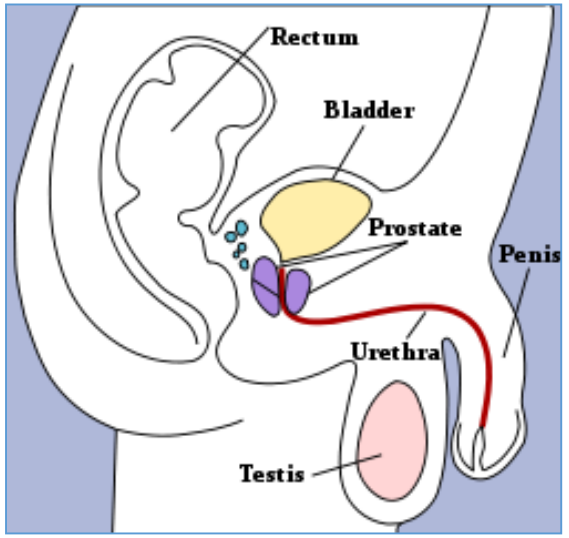


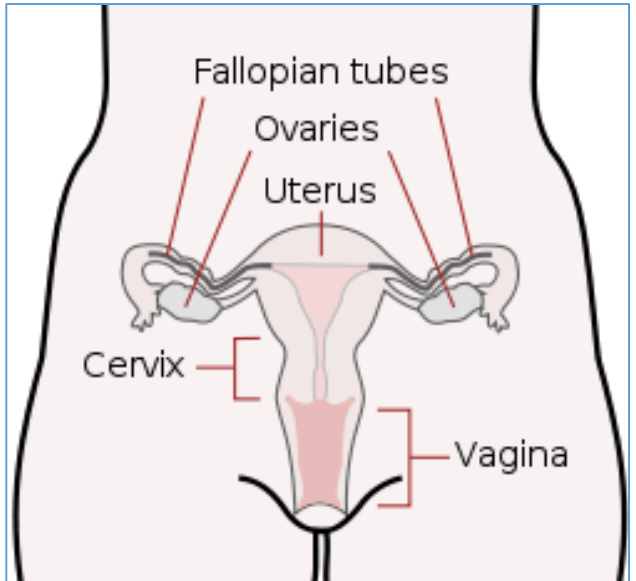
Injuries/Sudden Illness Associated With The Excretory (Urinary) System

- End Stage Renal Failure which warrant dialysis
- Trauma

10. Reproductive System

- Consists of ovary, uterus, fallopian tubes and vagina for the female.
- Consists of testes, seminal vesicle and penis for the male.
- **<u>Functions:</u>**
  - Produces gametes – sperm (male) and ovum (female).
  - Stores and transport gametes.
  - Produces sex hormones.





Injuries/Sudden Illness Associated With The Reproductive System

*** Pelvic trauma and associated injuries**

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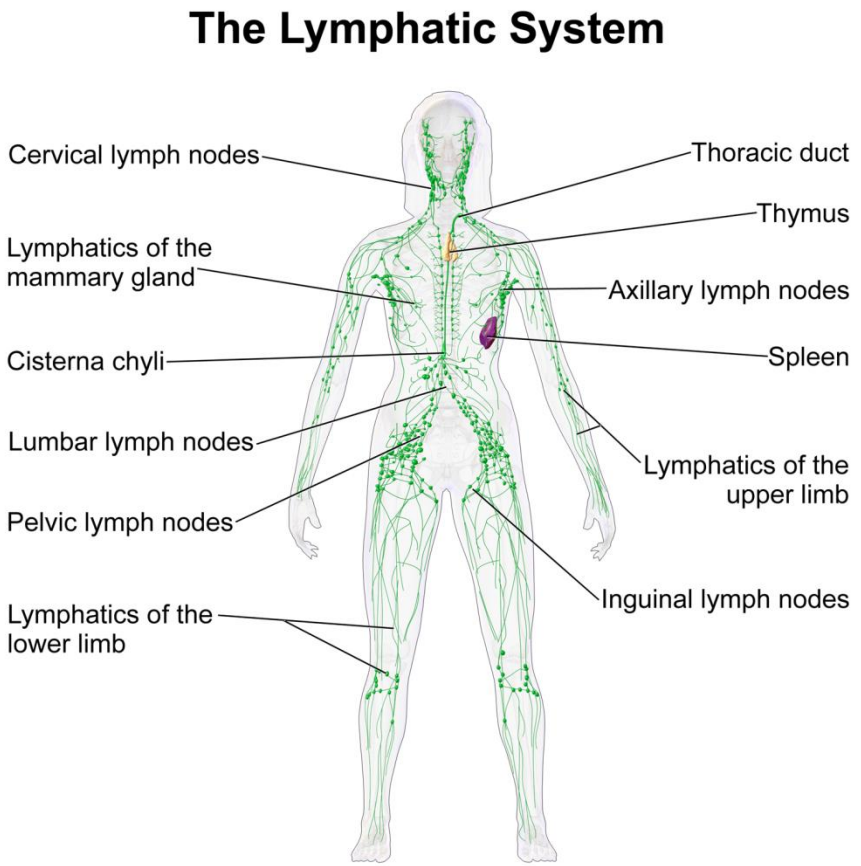
11. The lymphatic (immune) system

- Consists of lymph nodes in the armpits, neck and groin.
- **Function:**

1) provides lymphatic fluid that drains from the body's tissues
2) This is important as a 'flushing' mechanism, and most toxins and infections absorbed or injected into the tissues are collected by the lymphatic system and 'strained' through lymph nodes



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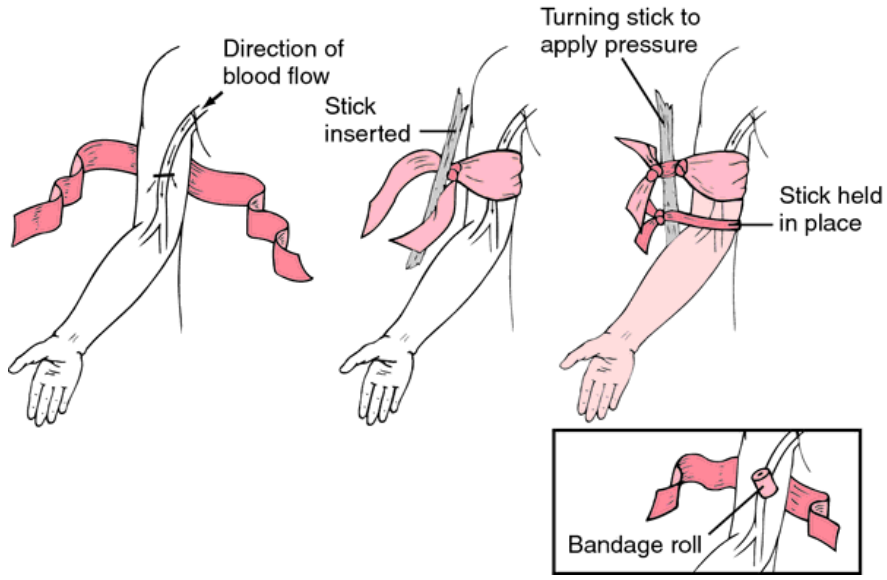
Injuries/Sudden Illness Associated With The lymphatic System

- The lymphatic system is a slow moving system, and is where toxins like snake venom tend to accumulate after the bite has occurred. By applying a pressure immobilization bandage it is possible to slow or even stop the lymphatic system, and therefore reduce the movement of toxins entering into the circulation.



Homeostasis

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Homeostasis

- Literally means “ same state”
- Refers to the process of keeping the internal body environment is a steady state , when the external environment is changed
- Ability of the human being to maintain a relative stable internal environment , involving continuous monitoring and regulating multiple parameters and coordinating the process to minimize disturbance to human being

Homeostasis

The External Environment

- The external environment (atmosphere) surrounds the body.
- provides oxygen and nutrients required by all the body cells.
- Waste produces of cellular activity are excreted into the external environment.
- The skin provides a barrier between the dry external environment (atmosphere) and the aqueous (water based) internal environment of most body cells

Homeostasis

The Internal Environment

- The internal environment is the water based medium in which body cells exist.
- Cells are surrounded by *interstitial fluid*.
- Oxygen and other required substances must pass from the internal transport systems through the interstitial fluid to reach the cells.
- Similarly waste products from the cells must move through the interstitial fluid to the transport systems to be excreted.

Homeostasis

- Systems regulate the internal environment to maintain a stable and relatively constant (unchanging) condition.
- Changes do occur, but the magnitude of the changes must be small and stay within narrow limits
- When this balance is not maintained – well being is compromised.

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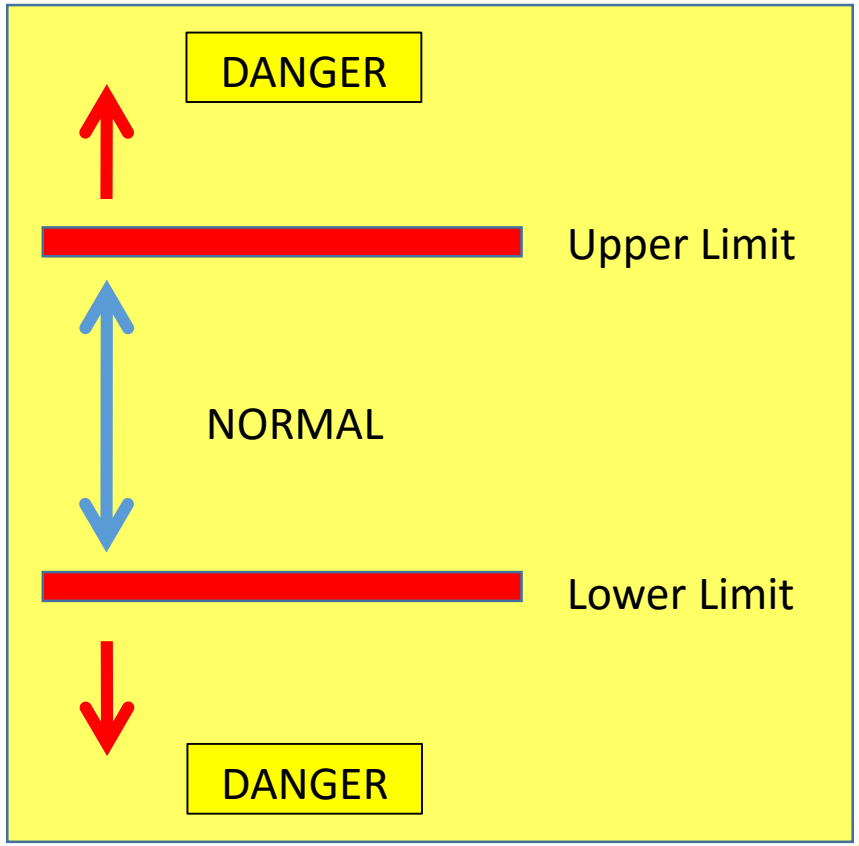
Homeostasis

- *Examples:*
  - Temperature (36 to 37.5°C)
  - Water and electrolyte concentrations
    - Sodium, Na^+ (135-145 mmol/L)
    - Potassium, K^+ (3.5-5.0 mmol/L)
  - Arterial blood pH (7.35 to 7.45)
  - Blood glucose levels
    (3.6 to 5.8 mmol/L)
  - O2 and Co2 levels
  - Blood pressure
  - Heart rate etc.



In Summary

- Human body is complicated
- The organization of human body consists of ; Chemicals, Cells, Organs and Systems
- Essentially, there are eleven (11) anatomical systems, that first aiders have to know; Nervous system, Respiratory system, Circulatory system, Musculoskeletal system, Integumentary system, Digestive system, Excretory system, Endocrine system, Reproductive system & Lymphatic (immune) system
- Homeostasis is very important to maintain well being.