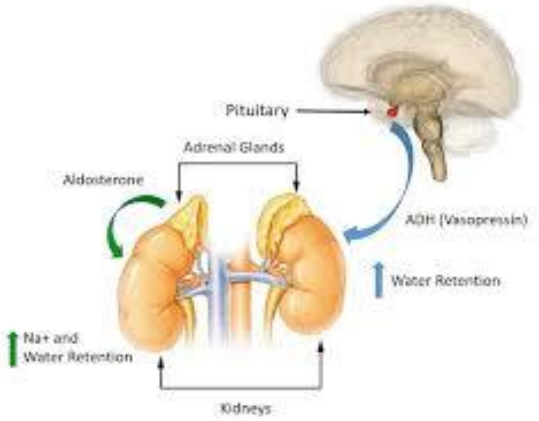
LESSON NOTE 8

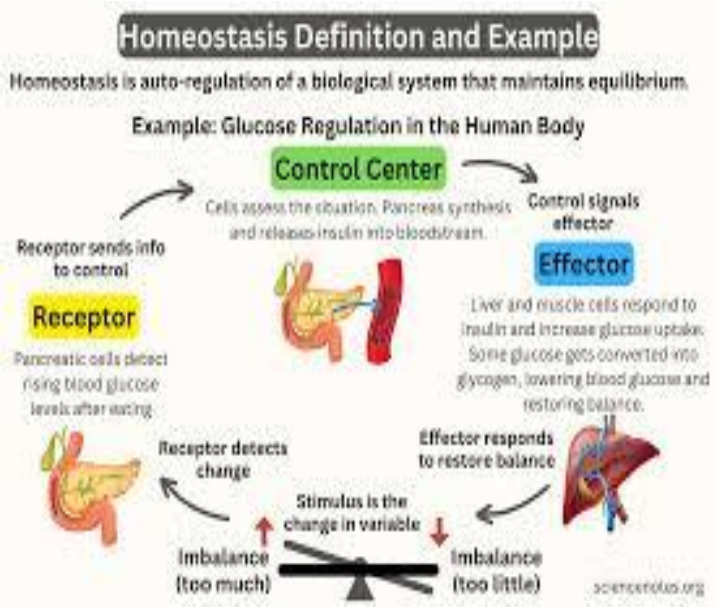
REGULATION OF INTERNAL ENVIRONMENT



HOMEOSTASIS

Homeostasis is the physiological process through which an organism maintains a stable internal environment despite external changes. It involves a series of mechanisms and feedback loops that regulate various physiological parameters such as temperature, pH and concentration of ions and gases within a narrow range, conducive to the proper functioning of cells and tissues.

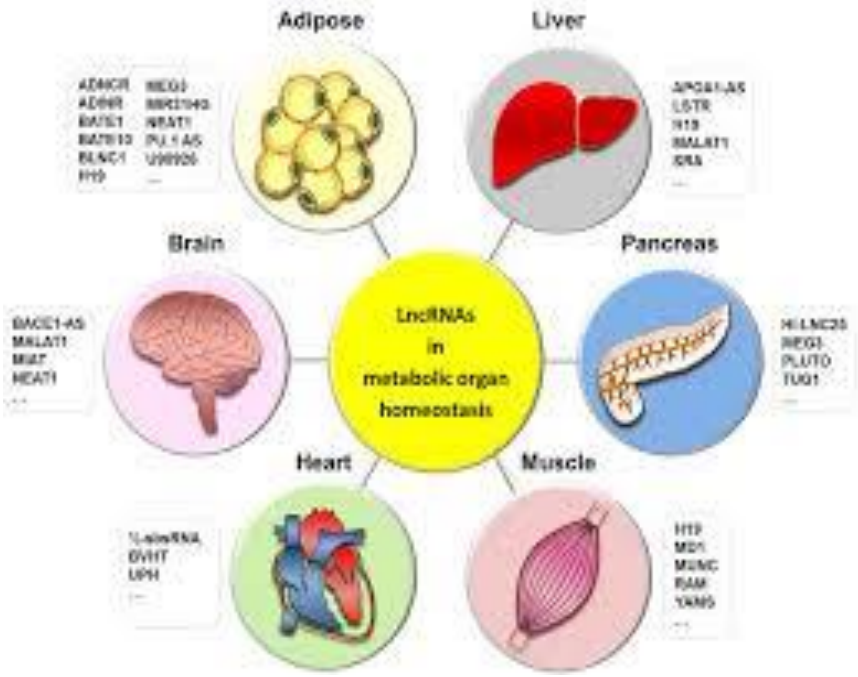
Mechanism of Homeostasis



The control mechanisms used to detect and adjust to changes in the internal environment of the organism includes;

- Sensory detectors that recognize a change in a given condition and stimulate the relevan body parts
- Effector organs or glands that react to restore the normal state.

ORGANS AND PROCESSES INVOLVED IN HOMEOSTASIS



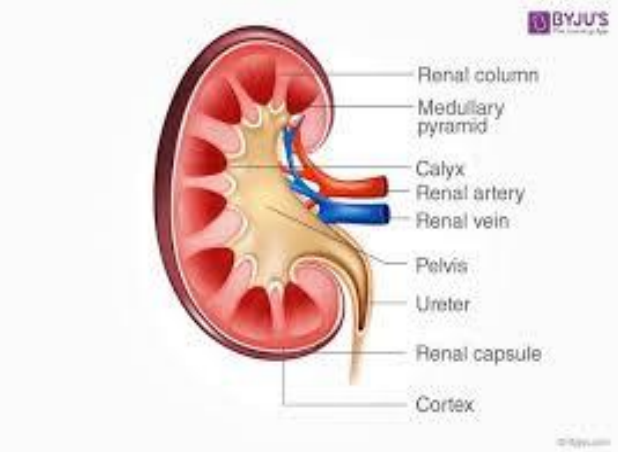
Osmoregulation (homeostasis) in unicellular organisms is ensured by the use of contractile vacuole, the organs and processes of homeostasis in multicellular organisms include;

1. Brain (Hypothalamus): acts as control center for homeostasis by receiving and processing information from the body.
- Processes: regulates body temperature, thirst, hunger and circadian rhythms
2. Endocrine system (Hormones): organs like the pituitary, thyroid and adrenal glands
- Processes: release hormones that regulate metabolism, blood sugar, salt balance and stress responses.
3. Nervous system: organs here are brain and peripheral nerves.
- Processes: nerve impulses transmit information quickly for rapid responses e.g. reflex actions
4. Kidney: regulate water and ion balance and remove waste products from the blood.
- Processes: filtration, reabsorption and secretion to maintain proper blood composition.
5. Liver: metabolic regulation and detoxification.
- Processes: controls blood glucose levels, stores and releases nutrients, detoxifies harmful substances.
6. Lungs: regulate oxygen and carbon dioxide levels in the blood.

- Processes: breathing (respiration) control gas exchange

Other organs include skin, pancreas and blood.

STRUCTURE OF THE KIDNEY

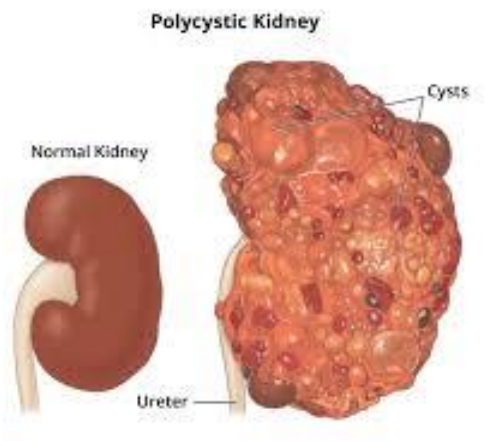


Kidneys are bean-shaped organs located in the back of abdominal cavity one on each side of the spine. The main regions of the kidney are: **the renal cortex** (outer region) **renal medulla** (middle region) and **renal pelvis** (inner region). The functional unit of the kidney is the *Nephron*, which is responsible for filtering blood and forming urine.

Function of the Kidney

1. Filtration of blood and removal of waste products, excess ions and water
2. Reabsorption of essential substances like water, glucose and ions into the blood streams
3. Secretion of waste product into urine
4. Regulation of blood pressure by adjusting the volume of blood and release of the enzyme renin
5. Erythropoiesis regulation as it produces and releases erythropoietin and stimulate red blood cell production

Disease of the kidney



1. Chronic kidney disease (CKD) gradual loss of kidney function over time
2. Acute Kidney Injury (AKI) sudden and temporary loss of kidney function due to severe dehydration or other underlying conditions
3. Kidney stone: hard deposit of minerals and salts that form in the kidney and cause pain and blockage
4. Polycystic Kidney Disease: genetic disorder leading to the formation of fluid filled cysts in the kidneys
5. Urinary Tract Infections (UTIs): affects kidney, ureters bladder or urethra.

Effects of kidney Diseases

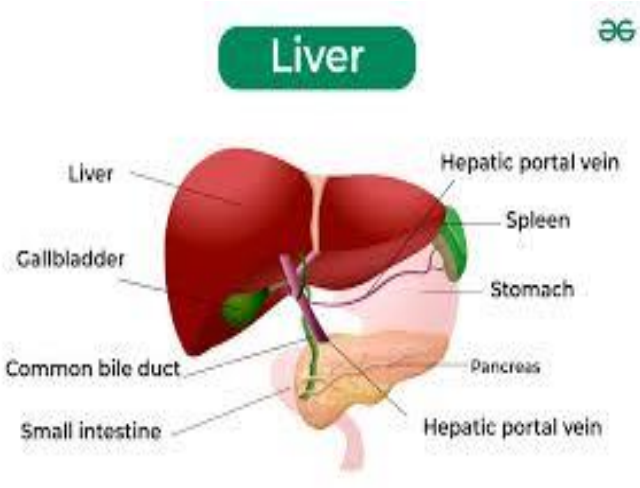
1. Decreased filtration leading to buildup of toxins
2. Fluid and Electrolyte Imbalance which disrupts water and electrolyte regulation
3. Hypertension as a result of high blood pressure
4. Anemia as production of red blood cells is affected b reduced production of erythropoietin
5. Bone Disorders as an imbalance of calcium and phosphorus occurs
6. Cardiovascular Complications

Remedies and treatment of Kidney Diseases

1. Medication
2. Dietary changes may help to manage conditions like hypertension, diabetes and kidney stones
3. Fluid management and proper hydration depending on the nature of the kidney disease
4. Dialysis to artificially perform the function of the kidney in case of advanced kidney failure
5. Kidney transplant in cases of severe damage.

LESSON NOTE 9

THE LIVER

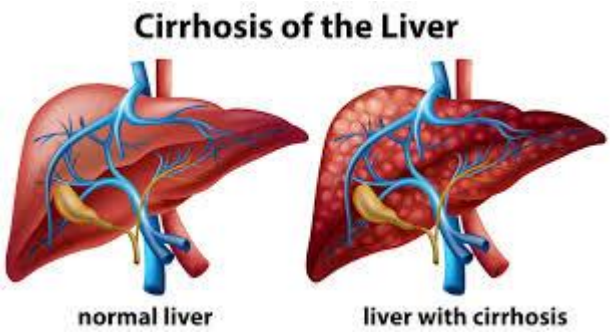


This is the largest organ in the body of a mammals with a weight of about 1.25kg. it is reddish brown, soft with two lobes and located below the diaphragm on the right side of the abdomen. It has a bile duct connecting to the duodenum attached to the gall bladder. The liver gets blood supply from **hepatic artery** and **hepatic portal** vein making the liver the only organ that receives blood from two sources.

Functions of The Liver

1. Regulation of blood glucose level.
2. Regulation of blood protein releasing the required amount of amino acid by the body into the blood
3. Manufactures essential blood proteins like fibrinogen, prohtombin, globulus which are involved in blood clothing
4. Metabolism of lipid
5. Production of bile for fat emulsification of fats.
6. Storage of vitamins A,B,D, E and K and released into the blood streams as required by the body
7. Detoxification, storage of blood etc.

Diseases of the Liver



1. Hepatitis: inflammation and destruction of the liver cells caused by a virus and spread through contaminated food, objects and infected blood
2. Liver cirrhosis a condition in which the liver becomes hard and stiff. It may be caused by viral infection, untreated hepatitis, excess alcohol consumption and prolong consumption of toxic substances.
3. Gall Stones which are precipitation of cholesterol formed in the gall bladder or bile duct.
4. Amoebic liver abscess caused by *Entamoeba histolytica* a parasitic amoeba that causes amoebic dysentery.
5. Cancer of the Liver also called **carcinoma** which is a malignant growth of the liver that prevents it from carrying out its normal functions
6. Jaundice caused by increase in the blood bilirubin level from excessive breakdown of red blood cells

Effects of Liver diseases

1. Weakness
2. Jaundice
3. Slight fever
4. Oedema
5. High blood pressure

Remedies and Treatment of Liver Diseases

1. Dietary changes by eating low fat controlled diet
2. Long period of bed rest
3. Avoidance of alcohol consumption
4. Liver transplant.

LESSON NOTE 10

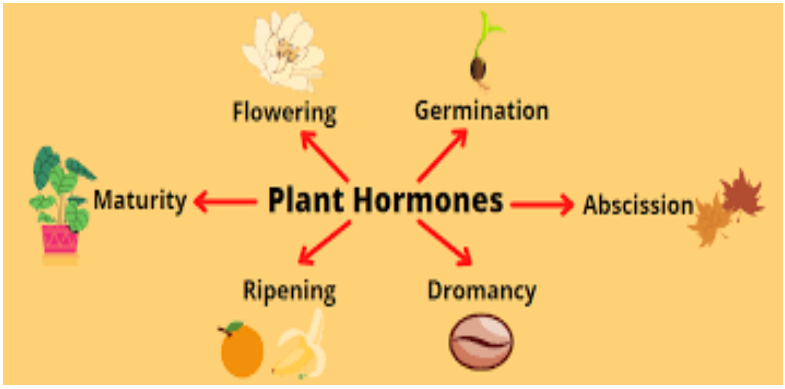
PLANTS HORMONES

Hormones are organic chemicals or biochemical substances produced in minute quantities in one part of an organism and transported to the site of action where they exact specific effect to control body metabolism.

Plant hormones also known as phytohormones are chemical messengers that regulate various physiological processes in plants. They play a crucial role in plant growth, development and response to environmental stimuli. Plant hormones include

1. Auxins: stimulate cell elongation, participate in formation of roots and fruits
2. Gibberellins: responsible for promoting stem elongation, germination and flowering
3. Cytokinins: stimulate cell division
4. Abscisc Acid (ABA): inhibits growth, induces seed dormancy and promotes stomatal closure during water stress
5. Ethylene: regulates fruit ripening and responses to stress
6. Salicylic Acid: involved in plant defense against pathogens and triggers systemic acquired resistance.

FUNCTIONS OF PLANT HORMONES



i. Cell elongation and division
ii. Promote the growth of main shoot over lateral buds (apical dominance)

iii. Seed germination and growth
iv. Root development and branching
v. Stress response such as in flooding or drought
vi. Fruit ripening
vii. Defense against herbivores and pathogens

Effects of Auxin on Plant Processes

1. Lateral development and growth stimulation evident in the inhibition of apical dominance allowing lateral buds to grow
2. Inhibition of leaf fall (abscission) by maintaining leaves on the plant done by inhibiting the formation of the region where lead detaches
3. Initiation of adventitious roots applicable in stem cutting or wounded plant parts, auxin encourage the formation of roots.

Modern Application of Plant Hormones

1. AUXIN: used in horticulture for root cutting to propagate plants, also applied to reduce fruit load by thinning the fruits hence promoting larger and healthier fruits.
2. GIBBERLLINS: applied to induce seedless fruit development, also used in brewery to promote the growth of barley for malting
3. CYTOKININS: used to extend the shelf life of certain fruits and vegetable, also applied in tissue culture for rapid multiplication of plants
4. ABSCISIC ACID: applied in enhancement of drought tolerance in crops and also to induce and maintain seed dormancy for synchronized germination
5. ETHYLENE: applied in artificial ripening of fruit during transportation and storage and also accelerate senescence in flowers to extend vase life of cut flowers
6. SALICYLIC ACID: used to induce systemic acquired resistance against pathogens and also to maintain post-harvest quality in fruits and vegetable

Other application include weed control, synthetic auxin herbicides