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Q.:- Write Notes on PHYSIOLOGY OF OSMOREGULATION ?

Ans:- Osmoregulation:-

Osmoregulation is the active regulation of the osmotic pressure of an organism's body fluids, detected by osmoreceptors, to maintain the homeostasis of the organism's water content; that is, it maintains the fluid balance and the concentration of electrolytes (salts in solution) which in this case is represented by body fluid) to keep the body fluids from becoming too diluted or concentrated. Osmotic pressure is a measure of the tendency of water to move into one solution from another by osmosis

The higher the osmotic pressure of a solution, the more water tends to move into it. Pressure must be exerted on the hypertonic side of a selectively permeable membrane to prevent diffusion of water by osmosis from the side containing pure water.

Organisms in aquatic and terrestrial environments must maintain the right concentration of solutes and amount of water in their body fluids; this involves excretion (getting rid of metabolic nitrogen wastes and other substances such as hormones that would be toxic if allowed to accumulate in the blood) through organs such as the skin and the kidneys

Regulators and Conformers

Two major types

of osmoregulation are osmoconformers and osmoregulators. Osmoconformers match their body osmolarity to their environment actively or passively. Most marine invertebrates are osmo-conformers, although their ionic composition may be different from that of seawater.

Some marine fish, like sharks, have adopted a different, efficient mechanism to conserve water, i.e., osmoregulation. They retain urea in their blood in relatively higher concentration. Urea damages living tissues so, to cope with this problem, some fish retain trimethylamine oxide. This provides a better solution to urea's toxicity. Sharks, having slightly higher solute concentration (i.e., above 1000 mOsm which is sea solute concentration), do not drink water like fresh water fish.

In plants :-

While there are no specific osmoregulatory organs in higher plants the stomata are important in regulating water loss through evapotranspiration, and on the cellular level the vacuole is crucial in regulating the concentration of solutes in the cytoplasm. Strong winds, low humidity and high temperatures all increase evaporation from leaves. Abscisic acid is an important hormone in helping plants to conserve water - it causes stomata to close and stimulates root growth so that more water can be absorbed.

In animals :-

Humans

Kedneys play a very large role in human osmoregulation by regulating the amount of water reabsorbed from glomerular filtrate in kidney

tubules, which is controlled by hormones such as antidiuretic hormone (ADH), aldosterone, and angiotensin II. For example, a decrease in water potential is detected by osmoreceptors in the hypothalamus, which stimulates ADH release from the pituitary gland to increase the permeability of the walls of the collecting ducts in the kidneys. Therefore, a large proportion of water is reabsorbed from fluid in the kidneys to prevent too much water from being excreted.

See also :-

- Euryhaline
- Halotolerance
- Osmoconformer
- Osmotic concentration
- salt gland
- Stenohaline
- Tissue hydration