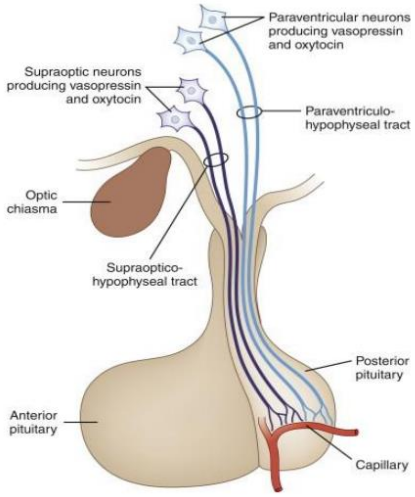
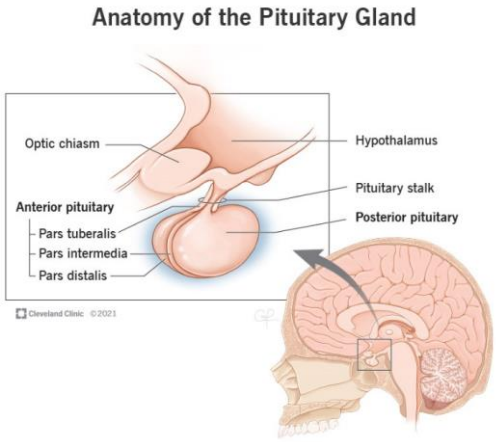
Posterior Pituitary

Pituitary gland is made of two lobes: the anterior (front) lobe and posterior (back) lobe.

posterior pituitary is one of two lobes that make up our pituitary gland, which is a small, pea-sized endocrine gland located at the base of the brain. Posterior pituitary's main functions are to store and release the hormones oxytocin and vasopressin (antidiuretic hormone (ADH)).

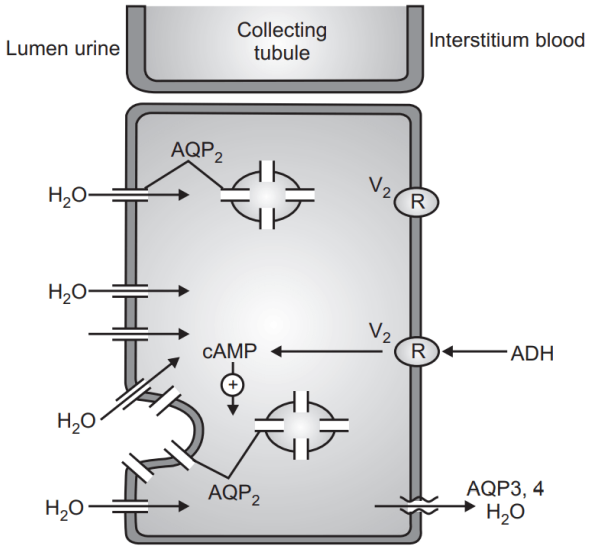




Upon receiving nerve signals from the hypothalamus, hormones like ADH and oxytocin are released into the bloodstream from the axon terminals in the posterior pituitary. These hormones are initially stored in vesicles and transported within axons until needed.

Antidiuretic hormone (ADH), also called vasopressin, is synthesized by the neurons in the hypothalamus and stored in the posterior pituitary until released upon neural stimulation.

Vasopressin (antidiuretic hormone) regulates water conservation and is directly linked to serum osmolality.



The mechanism of action of Antidiuretic Hormone (ADH) involves antidiuresis, which is the retention of water to prevent excessive loss in urine and sweating.

1. ADH binds to V2 receptors located in the principal cells of the distal convoluted tubule and collecting ducts in the kidneys.

2. Activation of V2 receptors triggers intracellular signaling pathways leading to the formation of cyclic AMP (cAMP), which activates protein kinase A. The activated protein kinase A phosphorylates specific proteins, facilitating the production and insertion of aquaporin-2 channels into the luminal membrane.

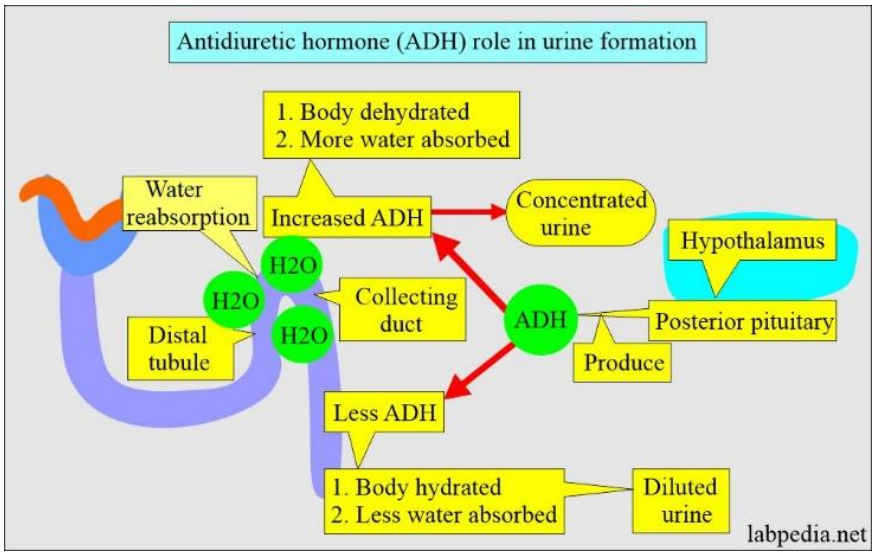
3. Aquaporin-2 channels allow water to move more freely through the tubular cells, increasing the permeability of the renal tubules to water.

4. As a result, water is reabsorbed from the renal tubules back into the bloodstream, reducing the amount of water excreted in urine.

5. The reabsorption of water concentrates the urine, preventing excessive loss and promoting water conservation in the body.

This mechanism helps regulate water balance by ensuring that the body retains water when needed, preventing dehydration and maintaining appropriate fluid levels.

Reduced secretion of ADH by the posterior pituitary can lead to diabetes insipidus (DI), a condition associated with polyuria, or frequent urination. This is because those with DI cannot concentrate their urine and large volumes of urine are subsequently produced daily



Oral administration of drugs to laboratory rodents typically is achieved by using the gavage technique. Although highly effective, this method occasionally can cause esophageal injury.

Tolvaptan is a vasopressin receptor antagonist. Vasopressin (ADH or antidiuretic hormone) helps to regulate water retention by absorbing water in the collecting ducts of the nephron. Blocking this receptor will allow water to be excreted more readily.

The experiment investigates the impact of an ADH antagonist on urine volume using rats. The rats are divided into two groups:

Procedure

Group one Experimental group

Rats in this group are orally administered an ADH antagonist.

Group two control group

Serves as the control group without ADH antagonist administration

Following administration, both groups of rats are placed in metabolic cages to facilitate urine collection. After approximately 24 hours, the collected urine is measured to assess the effect of the ADH antagonist on urine volume