

HUMAN ANATOMY & PHYSIOLOGY-II- BP201T

UNIT: 4 (ENDOCRINE SYSTEM)

CLASS: 3

TOPIC: POSTERIOR PITUITARY OR NEUROHYPOPHYSIS

Posterior pituitary consists of three parts:

1. Pars nervosa or infundibular process
2. Neural stalk or infundibular stem
3. Median eminence.

Pars tuberalis of anterior pituitary and the neural stalk of posterior pituitary together form the hypophyseal stalk.

Posterior pituitary is made up of neural type of cells called **pituicytes** and **unmyelinated nerve fibers**.

Pituicytes are the fusiform cells derived from glial cells. Pituicytes act as supporting cells and do not secrete any hormone. Unmyelinated nerve fibers come from supraoptic and paraventricular nuclei of the hypothalamus through the pituitary stalk.

Posterior pituitary hormones are:

1. Antidiuretic hormone (ADH) or vasopressin
2. Oxytocin.

Source of Secretion of Posterior Pituitary Hormones

Actually, the posterior pituitary does not secrete any hormone. ADH and oxytocin are synthesized in the hypothalamus. From hypothalamus, these two hormones are transported to the posterior pituitary through the nerve fibers of hypothalamo-hypophyseal tract by means of axonic flow. Proteins involved in transport of these hormones are called neurophysins.

Neurophysins are the binding proteins which transport ADH and oxytocin from hypothalamus to posterior pituitary via hypothalamo-hypophyseal tract and storage of these hormones in posterior pituitary. Neurophysin I or oxytocin-neurophysin is the binding protein for oxytocin and neurophysin II or ADH-neurophysin is the binding protein for ADH.

ANTIDIURETIC HORMONE**Source of Secretion**

Antidiuretic hormone (ADH) is secreted mainly by supraoptic nucleus of hypothalamus. It is also secreted by paraventricular nucleus in small quantity. From here, this hormone is transported to posterior pituitary through the nerve fibers of hypothalamo-hypophyseal tract, by means of axonic flow.

Antidiuretic hormone has two actions:

1. Retention of water
2. Vasopressor action.

1. Retention of water

Major function of ADH is retention of water by acting on kidneys. It increases the facultative reabsorption of water from distal convoluted tubule and collecting duct in the kidneys. In the absence of ADH, the distal convoluted tubule and collecting duct are totally impermeable to water. So, reabsorption of water does not occur in the renal tubules and dilute urine is excreted. This leads to loss of large amount of water through urine. This condition is called diabetes insipidus and the excretion of large amount of water is called diuresis.

Mode of action on renal tubules:

ADH increases water reabsorption in tubular epithelial membrane by regulating the water channel proteins called aquaporins through V₂ receptors.

2. Vasopressor action

In large amount, ADH shows vasoconstrictor action. Particularly, causes constriction of the arteries in all parts of the body. Due to vasoconstriction, the blood pressure increases. ADH acts on blood vessels through V_{1A} receptors. However, the amount of ADH required to cause the vasopressor effect is greater than the amount required to cause the antidiuretic effect.

OXYTOCIN

Source of Secretion

Oxytocin is secreted mainly by paraventricular nucleus of hypothalamus. It is also secreted by supraoptic nucleus in small quantity and it is transported from hypothalamus to posterior pituitary through the nerve fibers of hypothalamo-hypophyseal tract. In the posterior pituitary, the oxytocin is stored in the nerve endings of hypothalamo-hypophyseal tract. When suitable stimuli reach the posterior pituitary from hypothalamus, oxytocin is released into the blood.

Oxytocin is secreted in both males and females.

Actions in Females

In females, oxytocin acts on mammary glands and uterus. Action of oxytocin on mammary glands Oxytocin causes ejection of milk from the mammary glands. Ducts of the mammary glands are lined by myo-epithelial cells. Oxytocin causes contraction of the myo-epithelial cells and flow of milk from alveoli of mammary glands to the exterior through duct system and nipple. The process by which the milk is ejected from alveoli of mammary glands is called milk ejection reflex or milk let-down reflex. It is one of the neuroendocrine reflexes.

Action on uterus

Oxytocin acts on pregnant uterus and also non-pregnant uterus.

On pregnant uterus

Throughout the period of pregnancy, oxytocin secretion is inhibited by estrogen and progesterone. At the end of pregnancy, the secretion of these two hormones decreases suddenly and the secretion of oxytocin increases. Oxytocin causes contraction of uterus and helps in the expulsion of fetus. During the later stages of pregnancy, the number of receptors for oxytocin increases in the wall of the uterus. Because of this, the uterus becomes more sensitive to oxytocin.

Oxytocin secretion increases during labor. At the onset of labor, the cervix dilates and the fetus descends through the birth canal.

Throughout labor, large quantity of oxytocin is released by means of positive feedback mechanism, i.e. oxytocin induces contraction of uterus, which in turn causes release of more amount of oxytocin.

On non-pregnant uterus

The action of oxytocin on non-pregnant uterus is to facilitate the transport of sperms through female genital tract up to the fallopian tube, by producing the uterine contraction during sexual intercourse.

Action in Males

In males, the release of oxytocin increases during ejaculation. It facilitates release of sperm into urethra by causing contraction of smooth muscle fibers in reproductive tract, particularly vas deferens.

Mode of Action of Oxytocin

Oxytocin acts on mammary glands and uterus by activating G-protein coupled oxytocin receptor.

DISORDERS OF PITUITARY GLAND:

HYPERACTIVITY OF ANTERIOR PITUITARY

1. Gigantism
2. Acromegaly
3. Acromegalic Gigantism
4. Cushing Disease

HYPOACTIVITY OF ANTERIOR PITUITARY

1. Dwarfism
2. Acromicria
3. Simmond Disease

HYPERACTIVITY OF POSTERIOR PITUITARY

Syndrome of Inappropriate Hypersecretion of Antidiuretic Hormone (SIADH)

HYPOACTIVITY OF POSTERIOR PITUITARY

Diabetes Insipidus

HYPOACTIVITY OF ANTERIOR AND POSTERIOR PITUITARY

Dystrophia Adiposogenitalis

Dystrophia adiposogenitalis is a disease characterized by obesity and hypogonadism, affecting mainly the adolescent boys. It is also called Fröhlich syndrome or hypothalamic eunuchism.