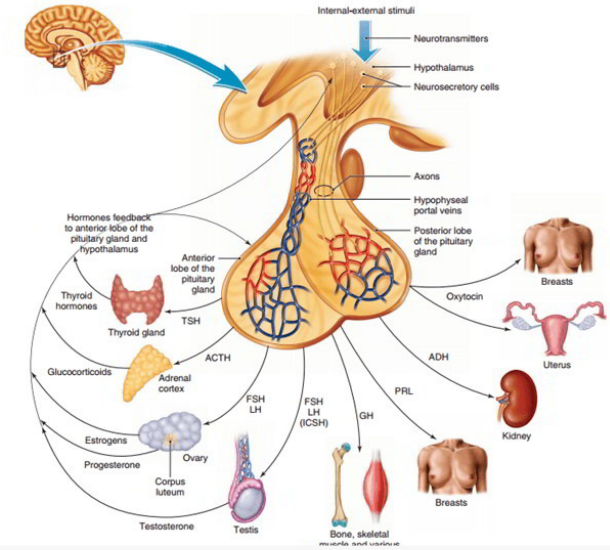
PITUITARY GLAND
ANTERIOR PITUITARY

The anterior pituitary, or adenohypophysis, plays a central role in the regulation of endocrine function through the production and release of **tropic hormones** . The function of the anterior pituitary, and thereby the production of tropic hormones, is under hypothalamic regulation by the hypophysiotropic neuropeptides released in the median eminence. The tropic hormones produced by the anterior pituitary are released into the systemic circulation, from where they reach their target organs to produce a physiologic response, most frequently involving the release of a target organ hormone. The hormones produced by the target organs affect anterior pituitary function as well as the release of hypophysiotropic neuropeptides, maintaining an integrated feedback control system of endocrine function



Anterior pituitary hormones, target organs, and physiologic effects. Thyroid-stimulating hormone (TSH) stimulates the thyroid gland to produce and release thyroid hormones that regulate growth, differentiation, and energy balance. Luteinizing hormone (LH) and follicle-stimulating hormone (FSH) stimulate gonadal production of sex steroids, which mediate reproductive function and behavior. Adrenocorticotropic hormone (ACTH) stimulates the adrenal glands to produce steroid hormones, which regulate water and sodium balance, inflammation, and metabolism. Prolactin (Prl) stimulates breast development and milk production. Growth hormone (GH) exerts direct effects on tissue growth and differentiation and indirect effects through the stimulation of insulin-like growth factor 1 production, which mediates some of the growth and differentiation effects of GH.

Structure

The pituitary gland sits in a protective bony enclosure called the sellaturcica (Turkish chair/saddle). It is composed of three lobes: the anterior, intermediate, and posterior lobes. In many animals, these lobes are

distinct. However, in humans, the intermediate lobe is but a few cell layers thick and indistinct; as a result, it is often considered part of the anterior pituitary. In all animals, the fleshy, glandular anterior pituitary is distinct from the neural composition of the posterior pituitary.

The anterior pituitary is composed of three regions:

Pars distalis

Microanatomy of the pars distalis showing chromophobes, basophils, and acidophils

The pars distalis (distal part) comprises the majority of the anterior pituitary and is where the bulk of pituitary hormone production occurs. The pars distalis contains two types of cells, including chromophobe cells and chromophilcells.Thechromophils can be further divided into acidophils (alpha cells) and basophils (beta cells). These cells all together produce hormones of the anterior pituitary and release them into the blood stream.

The terms "basophil" and "acidophil" are used by some books, whereas others prefer not to use these terms. This is due to the possible confusion with white blood cells, where one may also find basophils and acidophils.

Pars tuberalis

The pars tuberalis (tubular part) forms a part of the sheath extending up from the pars distalis, which joins with the pituitary stalk (also known as the infundibular stalk or infundibulum), arising from the posterior lobe. (The pituitary stalk connects the hypothalamus to the posterior pituitary.) The function of the pars tuberalis is poorly understood. However, it has been seen to be important in receiving the endocrine signal in the form of TSHB (a β subunit of TSH), informing the pars tuberalis of the photoperiod (length of day). The expression of this subunit is regulated by the secretion of melatonin in response to light information transmitted to the pineal gland. Earlier studies have shown localization of melatonin receptors in this region.

Pars intermedia

The pars intermedia (intermediate part) sits between the pars distalis and the posterior pituitary, forming the boundary between the anterior and posterior pituitaries. It is very small and indistinct in humans.

Hormone	Other names	Symbol(s)	Structure	Secretory cells	Staining	Target	Effect	
Adrenocorticotropic hormone	Corticotropin	ACTH	Polypeptide	Corticotrophs	Basophil	Adrenal gland	Secretion of glucocorticoid, mineralocorticoid and androgens	
Thyroid-stimulating hormone	Thyrotropin	TSH	Glycoprotein	Thyrotrophs	Basophil	Thyroid gland	Secretion of thyroid hormones	
Follicle-stimulating hormone	-	FSH	Glycoprotein	Gonadotrophs	Basophil	Gonads	Growth of reproductive system	
Luteinizing hormone	Lutropin	LH, ICSH	Glycoprotein	Gonadotrophs	Basophil	Gonads	Sex hormone production	
Growth hormone	Somatotropin	GH, STH	Polypeptide	Somatotrophs	Acidophil	Liver, adipose tissue	Promotes growth; lipid and carbohydrate metabolism	
Prolactin	Lactotropin	PRL	Polypeptide	Lactotrophs	Acidophil	Ovaries, mammary glands, testes, prostate	Secretion of estrogens/progesterone; lactation; spermatogenesis; prostatic hyperplasia	TSH and ACTH secretion

The anterior pituitary is the glandular portion and release hormones that regulate growth, reproduction, lactation, and stress. There are about five types of hormone-secreting cells in the anterior pituitary classified based on the hormones that they produce and secrete: (1) somatotrophs, (2) corticotrophs, (3) thyrotrophs, (4) gonadotrophs, and (5) lactotrophs.

Somatotrophs are the cells in the anterior pituitary that release pituitary growth hormone (also called somatotropin). They constitute about 30-40% of the anterior pituitary cells. They are stimulated to release pituitary growth hormone (GH) in response to somatocrinin (also called growth hormone releasing hormone, GHRH). Their GH secretion is inhibited by somatostatin (or growth hormone inhibiting hormone, GHIH). Both GHRH and GHIH are released by the hypothalamus via the secondary plexus and the vein of the hypophyseal portal system.

lactotropic cell (also known as prolactin cell, epsilon acidophil, lactotrope, lactotroph, mammatroph, mammotroph) is a cell in the anterior pituitary which produces prolactin in response to hormonal signals including dopamine which is inhibitory and thyrotropin-releasing hormone which is stimulatory. Other regulators include oxytocin, estrogen and progesterone.Prolactin is involved in the maturation of mammary glands and their secretion of milk in association with oxytocin, estrogen, progesterone, glucocorticoids, and others. Prolactin has numerous other effects in both sexes.

Prolactin cells are acidophilic by hematoxylin& eosin stains and comprise about 20% of all cells in the anterior pituitary gland.

Gonadotrophs, cells that constitute about 10 percent of the pituitary gland, secrete two primary gonadotropins: luteinizing hormone (LH) and follicle-stimulating hormone (FSH). The amount and rate of secretion of these hormones vary widely at different ages and at different times during the menstrual cycle in women. Secretion of LH and FSH is low in both males and females prior to puberty. Following puberty, more LH than FSH is secreted. During the menstrual cycle there is a dramatic increase in the serum concentrations of both hormones at the time of ovulation, and the secretion of both hormones increases 10- to 15-fold in postmenopausal women. Another type of gonadotropin found in women is human chorionic gonadotropin (HCG), which is produced by the placenta during pregnancy.

Thyrotrophsare the cells in the anterior pituitary that release thyroid-stimulating hormone (TSH). They constitute about 3 to 5 % of the anterior pituitary cells. Thyrotrophs release TSH in response to thyrotropin releasing hormone (TRH) produced by the hypothalamus. TSH is a glycoprotein hormone that works by stimulating the thyroid to produce and release thyroid hormones, particularly thyroxine. One of the functions of thyroxine is to serve as a precursor of triiodothyronine, the active form of thyroid hormone.

Corticotropes (or corticotrophs) are basophilic cells in the anterior pituitary that produce pro-opiomelanocortin (POMC) which undergoes cleavage to adrenocorticotropin (ACTH), β-lipotropin (β-LPH), and melanocyte-stimulating hormone (MSH). These cells are stimulated by corticotropin releasing hormone (CRH) and make up 15–20% of the cells in the anterior pituitary.The release of ACTH from the

corticotropiccells is controlled by CRH, which is formed in the cell bodies of parvocellularneurosecretory cells within the paraventricular nucleus of the hypothalamus and passes to the corticotropes in the anterior pituitary via the hypophyseal portal system. Adrenocorticotropin hormone stimulates the adrenal cortex to release glucocorticoids and plays an important role in the stress response.

POSTERIOR PITUITARY

The posterior pituitary (or neurohypophysis) is the posterior lobe of the pituitary gland which is part of the endocrine system. The posterior pituitary is not glandular as is the anterior pituitary. Instead, it is largely a collection of axonal projections from the hypothalamus that terminate behind the anterior pituitary, and serve as a site for the secretion of neurohypophysial hormones (oxytocin and vasopressin) directly into the blood. The hypothalamic–neurohypophyseal system is composed of the hypothalamus (the paraventricular nucleus and supraoptic nucleus), posterior pituitary, and these axonal projections.

Structure

The posterior pituitary consists mainly of neuronal projections (axons) of magnocellularneurosecretory cells extending from the supraoptic and paraventricular nuclei of the hypothalamus. These axons store and release neurohypophysial hormones oxytocin and vasopressin into the neurohypophyseal capillaries, from there they get into the systemic circulation (and partly back into the hypophyseal portal system). In addition to axons, the posterior pituitary also contains pituicytes, specialized glial cells resembling astrocytes assisting in the storage and release of the hormones.

Classification of the posterior pituitary varies, but most sources include the two regions below:

Pars nervosa

Also called the neural lobe or posterior lobe, this region constitutes the majority of the posterior pituitary and is the storage site of oxytocin and vasopressin. Sometimes (incorrectly) considered synonymous with the posterior pituitary, the pars nervosa includes Herring bodies and pituicytes.[4]

Infundibular stalk

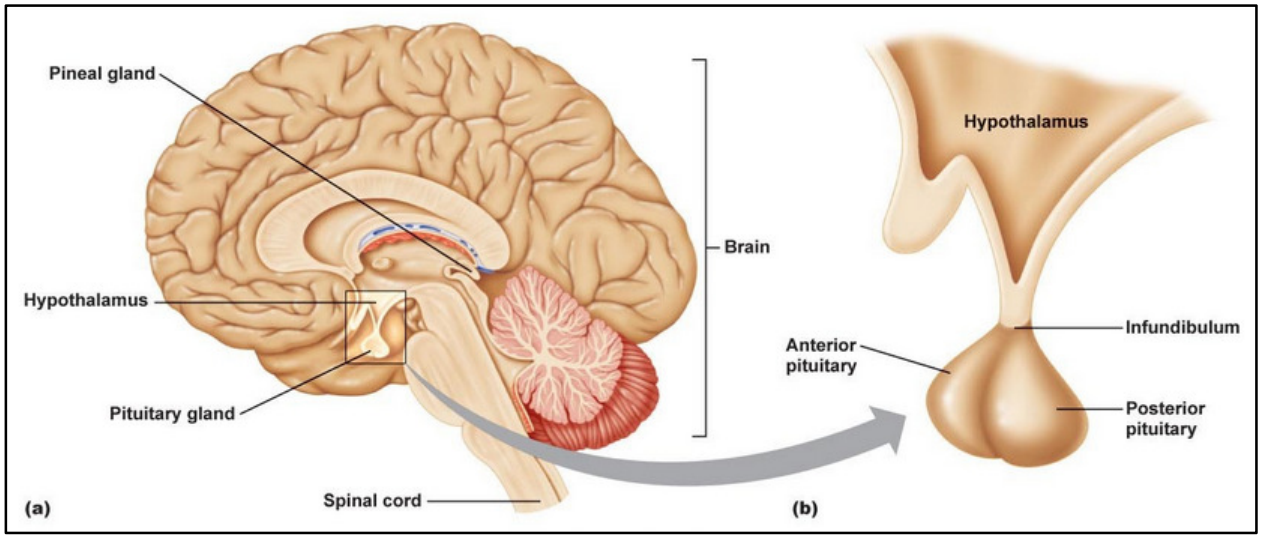
Also known as the infundibulum or pituitary stalk, the infundibular stalk bridges the hypothalamic and hypophyseal systems.

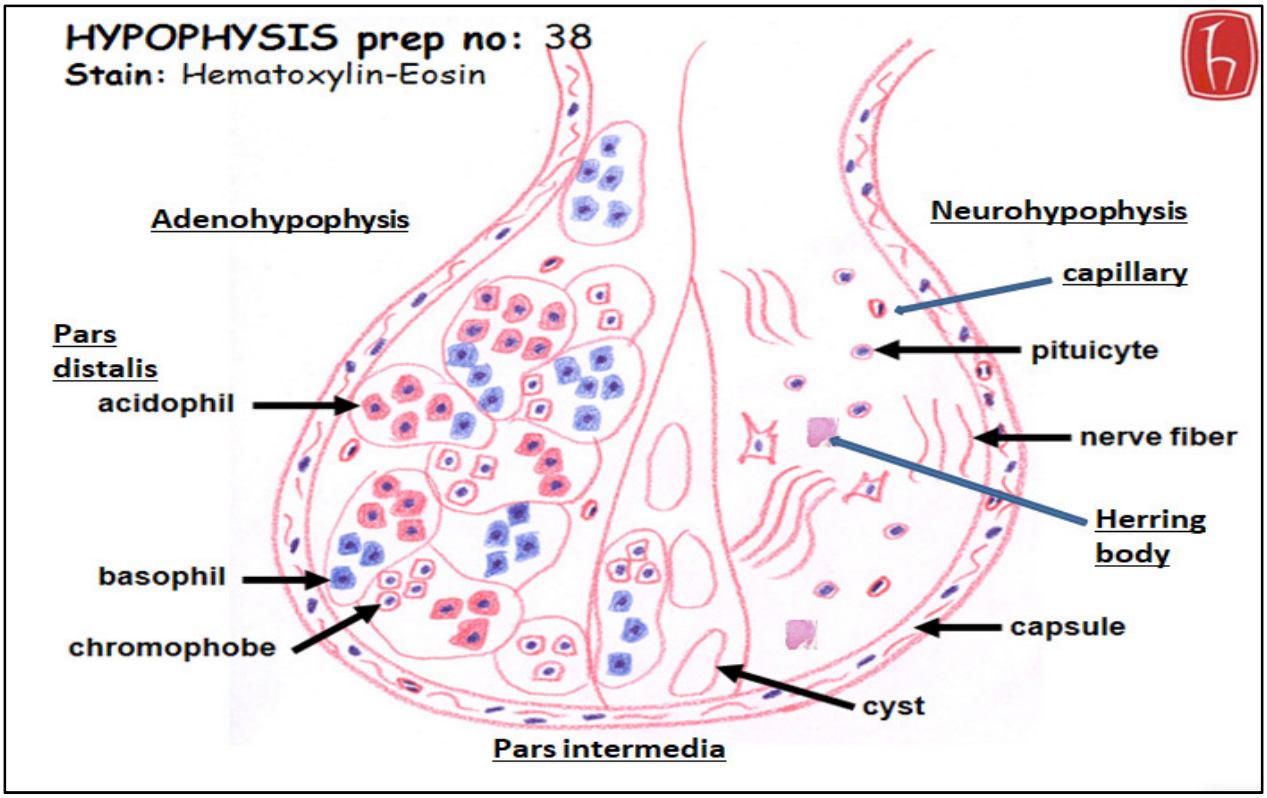
The median eminence is only occasionally included as part of the posterior pituitary. Other sources specifically exclude it from the pituitary.

A few sources include the pars intermedia as part of the posterior lobe, but this is a minority view. It is based upon the gross anatomical separation of the posterior and anterior pituitary along the cystic remnants of Rathke's pouch, causing the pars intermedia to remain attached to the neurohypophysis.

Two hormones are classically considered as being related to the posterior pituitary: oxytocin and vasopressin. These hormones are created in the hypothalamus and released in the posterior pituitary. After creation, they are stored in neurosecretory vesicles regrouped into Herring bodies before being secreted in the posterior pituitary via the bloodstream.

Hormone	Other names	Symbol(s)	Main targets	Effect	Source
Oxytocin		OT	Uterus, mammary glands	Uterine contractions; lactation	supraoptic and paraventricular nuclei
Vasopressin	Arginine vasopressin, antidiuretic hormone	VP, AVP, ADH	Kidneys and arterioles	Stimulates water retention; raises blood pressure by contracting arterioles	supraoptic and paraventricular nuclei

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Pars distalis
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basophil
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Pars intermedia