

Hypophysis (pituitary gland)

The **pituitary gland** (*Lat. Glandula pituitaria/ hypophysis*) is the central organ of the endocrine system. It is located behind the chiasma opticum, in the depression of os sphenoidale called the Turkish saddle (**sella turcica**), in its deepest part - the **fossa hypophysialis**. It hangs on the stem (infundibulum), which extends from the hypothalamus - from the base of the diencephalon. It is largely superior to all other glands in the endocrine system.

It consists of two sections, anterior **adenohypophysis**, and posterior **neurohypophysis**. These sections differ not only in their function but also in their embryonic origin. The adenohypophysis arises as Rathke's protrusion from the primitive oral cavity - stomodea. It is evident already in the third week of embryonic development. The neurohypophysis differentiates from the diencephalon. Thus, the **adenohypophysis is of ectoderm** origin, while the **neurohypophysis is of neuroectoderm** origin.



Location of pituitary gland

Adenohypophysis

It can be divided into **pars distalis**, **pars tuberalis**, and **pars intermedia**.

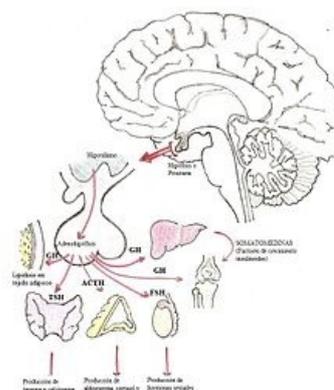
Pars distalis

The pars distalis is composed of trabecular epithelium, sparse collagen connective tissue, and blood sinusoids. It is made from **chromophobe and chromophilic** cells. Chromophilic cells stain intensively due to the number of cytoplasmic secretory granules where hormones are stored. Chromophobic cells stain little and represent either degraded chromophilic cells or follicular cells that provide support to chromophilic cells.

Chromophilic cells are further divided into **acidophilic** (intensely stained with eosin) and **basophilic** (stained with hematoxylin) cells.

Acidophilic cells produce simple proteins and predominate in the *trabecular epithelium*, including two main cell types:

- **somatotropic cells** - somatotropin (STH, growth hormone);
- **mammotropic cells** - prolactin (PRL).



Hormones of the pituitary gland

Basophilic cells secrete glycoproteins - they are *PAS-positive*:

- **thyrotropic cells** - thyrotropic hormone (TSH);
- **gonadotropic cells** - follicle-stimulating hormone (FSH), luteinizing hormone (LH);
- **corticotropic cells** - adrenocorticotrophic hormone (ACTH).

Pars tuberalis

Funnel-shaped part of pars distalis surrounding the infundibular upper stem. It contains mainly gonadotropic cells, that are chromophobic.

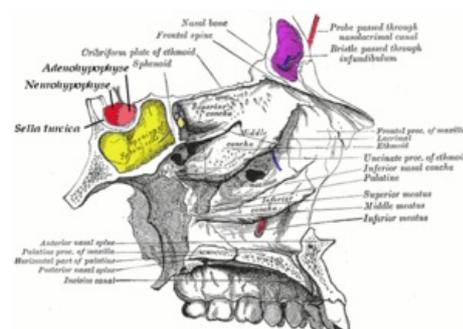
Pars intermedia

The pars intermedia is the section between the posterior and anterior pituitary lobes. There are closed follicles of various sizes, so-called Rathke's cysts, which are lined with a monolayer epithelium and contain a colloid. Furthermore, we find beams of chromophobic cells and also basophilic melanotropic cells secreting melanocyte-stimulating hormone (MSH).

Neurohypophysis

The neurohypophysis has two basic structural components - the pars nervosa and the infundibulum. Pars nervosa consists of axons of neurosecretory cells of hypothalamic nuclei, pituitary cells (type of astrocytes), and fenestrated capillaries. It has no glandular structure and does not synthesize any hormones.

Neurosecretory cells, found mainly in the supraoptic nucleus and paraventricular nucleus, send unmyelinated axons to the neurohypophysis. This connection together forms the hypothalamohypophysial tract (tractus hypothalamohypophysialis). The axons form large dilatations filled with basophilic neurosecretory granules called Herring bodies. The contents of the granules are synthesized in neurosecretory neurons and released into the



The pituitary gland is located in sella turcica

capillaries in the neurohypophysis. The granules store oxytocin, which is produced in the paraventricular nucleus, and antidiuretic hormone (ADH, vasopressin) from the supraoptic nucleus. Pituicytes are glial cells belonging to the macroglia that surround unmyelinated axons, thus supporting them.

Blood supply

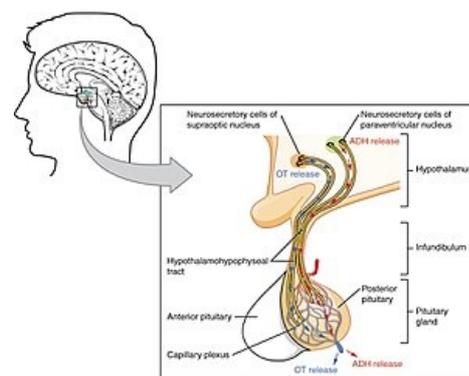
Blood reaches the pituitary gland via arteriae hypophysiales superiores et inferiores (branches of the internal carotid artery) and drains through the pituitary portal veins.

To the adenohypophysis comes the superior hypophysial artery, which in front of it branches around the median eminent by the hypothalamus in the primary capillary plexus. It then collects in the pituitary portal veins, which lead blood to the **secondary capillary plexus** through the adenohypophysis. This venous blood is collected in venae hypophysiales, which open into the sinus cavernosus and thus into the internal jugular vein, which in front of the adenohypophysis branches around the eminentia mediana hypothalami in the **primary capillary plexus**. It then collects in the pituitary portal veins, which lead blood to the secondary capillary plexus through the adenohypophysis. This venous blood is collected in **venae hypophysiales**, which open into the sinus cavernosus and then into the **internal jugular vein**.

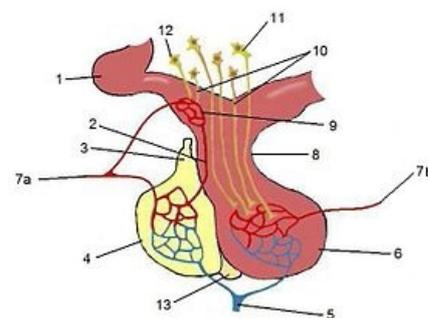
This phenomenon, when a capillary plexus is inserted between vessels of the same type, is called rete mirabile, in this case, it is **rete mirabile venosum** (the plexus is inserted between the veins).

This arrangement serves to ensure that hormones affecting the activity of the pituitary gland, released by the neurosecretory neurons of the hypothalamus into the primary capillary plexus, reach the site of action - the adenohypophysis.

To the neurohypophysis leads also the arteria hypophysialis inferior, which also goes to venae hypophysiales.



Pituitary gland - neurons of the neurohypophysis



Vessels of the pituitary gland

Activity regulation

Stimulation and inhibition of pituitary hormone release are controlled from the hypothalamus by hormones that are synthesized in the bodies of hypothalamic secretory neurons and released into the primary capillary plexus by unmyelinated axons.

Stimulating hormones are:

- **corticotropin** - corticotropin-releasing hormone (**CRH**);
- **gonadotrophin** - releasing hormone gonadotrophin (**GnRH**, gonadotropin-releasing hormone);
- **thyreoliberin** - releasing hormone thyrotropin (**TRH**, thyrotropin-releasing hormone).

Inhibitory hormones are:

- **somatostatin** inhibits somatotropin release;
- **dopamine** inhibits prolactin release.

References

Related articles

- Hypothalamic-pituitary-gonadal axis
-

Source

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- MARTÍNEK, Jindřich - VACEK, Zdeněk. *Histologický atlas*. 1. edition. 2009. ISBN 9788024723938.

External links

- Pituitary Gland, University of Pittsburgh, Department of Neurological Surgery (<http://www.neurosurgery.pitt.edu/centers-excellence/cranial-base-center/conditions-treated>)

