

HUMAN ANATOMY & PHYSIOLOGY-II- BP201T

UNIT: 4 (ENDOCRINE SYSTEM)

CLASS: 2

TOPIC: Pituitary Gland

Pituitary gland or hypophysis is a small endocrine gland is situated in a depression called 'sella turcica', present in the sphenoid bone at the base of skull. It is connected with the hypothalamus by the pituitary stalk or hypophyseal stalk.

Pituitary gland is divided into two divisions:

1. Anterior pituitary or adenohypophysis
2. Posterior pituitary or neurohypophysis.

Between the two divisions, there is a small and relatively avascular structure called pars intermedia.

DEVELOPMENT OF PITUITARY GLAND

Both the divisions of pituitary glands develop from different sources. Anterior pituitary is ectodermal in origin and arises from the pharyngeal epithelium as an upward growth known as Rathke pouch.

Posterior pituitary is neuroectodermal in origin and arises from hypothalamus as a downward diverticulum. Rathke pouch and the downward diverticulum from hypothalamus grow towards each other and meet in the midway between the roof of the buccal cavity and base of brain.

Hypothalamo-hypophyseal Relationship The relationship between hypothalamus and pituitary gland is called hypothalamo-hypophyseal relationship. Hormones secreted by hypothalamus are transported to anterior pituitary and posterior pituitary. But the mode of transport of these hormones is different. Hormones from hypothalamus are transported to anterior pituitary through hypothalamo-hypophyseal portal blood vessels. But, the hormones from hypothalamus to posterior pituitary are transported by nerve fibers of hypothalamo-hypophyseal tract.

Anterior pituitary is also known as the master gland because it regulates many other endocrine glands through its hormones.

PARTS Anterior pituitary consists of three parts: 1. Pars distalis 2. Pars tuberalis 3. Pars intermedia.

Anterior pituitary has two types of cells, which have different staining properties:

Chromophobe cells 2. Chromophil cells.

Chromophobe Cells: Chromophobe cells do not possess granules and stain poorly. These cells form 50% of total cells in anterior pituitary. Chromophobe cells are not secretory in nature, but are the precursors of chromophil cells.

Chromophil Cells: Chromophil cells contain large number of granules and are darkly stained.

Types of chromophil cells Chromophil cells are classified by two methods. 1. Classification on the basis of staining property: Chromophil cells are divided into two types: i. Acidophilic cells or alpha cells, which form 35% ii. Basophilic cells or beta cells, which form 15%.

1. Classification on the basis of secretory nature: Chromophil cells are classified into five types:

- i. Somatotropes, which secrete growth hormone
- ii. Corticotropes, which secrete adrenocorticotrophic hormone
- iii. Thyrotropes, which secrete thyroid-stimulating hormone (TSH)
- iv. Gonadotropes, which secrete follicle-stimulating hormone (FSH) and luteinizing hormone (LH)
- v. Lactotropes, which secrete prolactin.

REGULATION OF ANTERIOR PITUITARY SECRETION

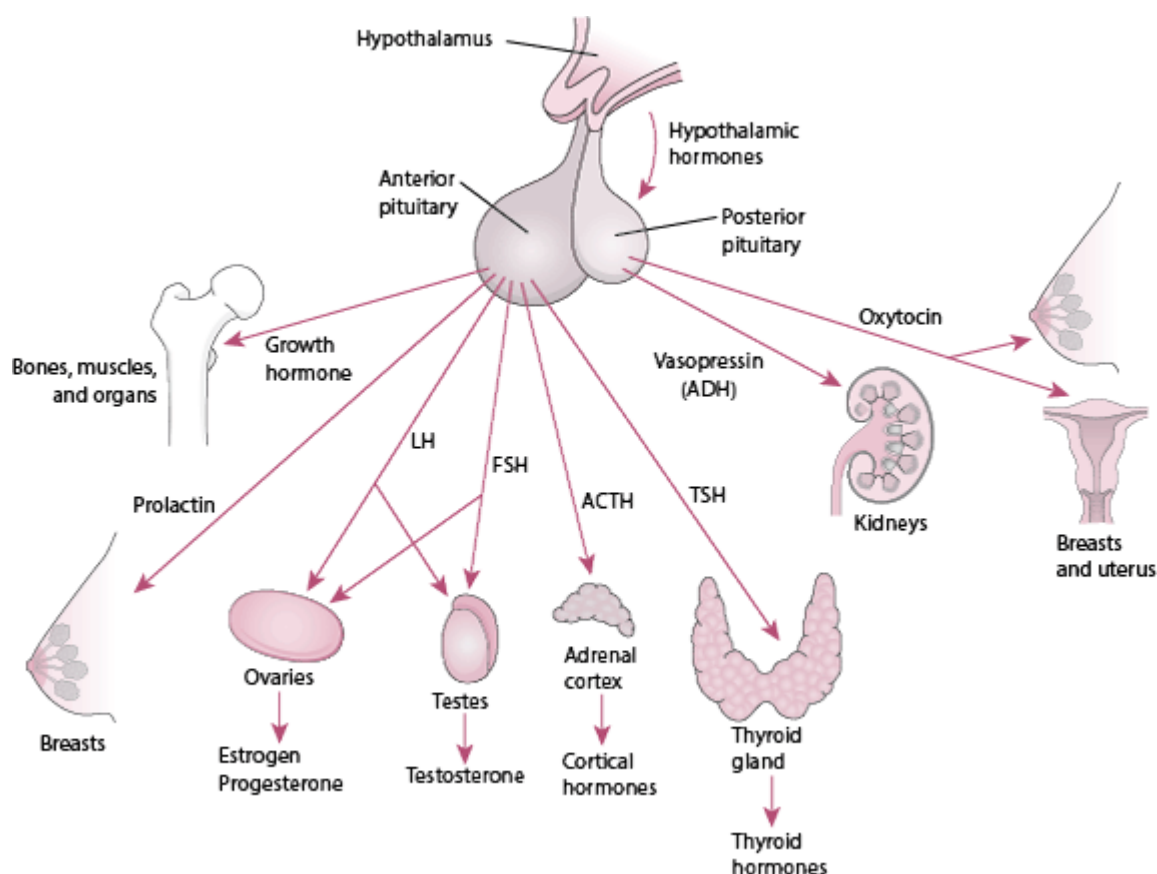
Hypothalamus controls anterior pituitary by secreting the releasing and inhibitory hormones (factors), which are called neurohormones. These hormones from hypothalamus are transported anterior pituitary through hypothalamo-hypophyseal portal vessels.

Releasing and Inhibitory Hormones Secreted by Hypothalamus

1. Growth hormone-releasing hormone (GHRH): Stimulates the release of growth hormone
2. Growth hormone-releasing polypeptide (GHRP): Stimulates the release of GHRH and growth hormone
3. Growth hormone-inhibitory hormone (GHIH) or somatostatin: Inhibits the growth hormone release
4. Thyrotropic-releasing hormone (TRH): Stimulates the release of thyroid stimulating hormone
5. Corticotropin-releasing hormone (CRH): Stimulates the release of adrenocorticotropin
6. Gonadotropin-releasing hormone (GnRH): Stimulates the release of gonadotropins, FSH and LH
7. Prolactin-inhibitory hormone (PIH): Inhibits prolactin secretion. It is believed that PIH is dopamine.

HORMONES SECRETED BY ANTERIOR PITUITARY

Six hormones are secreted by the anterior pituitary: 1. Growth hormone (GH) or somatotrophic hormone (STH) 2. Thyroid-stimulating hormone (TSH) or thyrotrophic hormone 3. Adrenocorticotrophic hormone (ACTH) 4. Follicle-stimulating hormone (FSH). 5. Luteinizing hormone (LH) in females or interstitial cell-stimulating hormone (ICSH) in males 6. Prolactin. Recently, the hormone β -lipotropin is found to be secreted by anterior pituitary.



GROWTH HORMONE

GH secretion is under negative feedback control. Hypothalamus releases GHRH and GHRP, which in turn promote the release of GH from anterior pituitary. GH acts on various tissues. It also activates the liver cells to secrete somatomedin C (IGF-I). Now, the somatomedin C increases the release of GHIH from hypothalamus. GHIH, in turn inhibits the release of GH from pituitary. Somatomedin also inhibits release of GHRP from hypothalamus. It acts on pituitary directly and inhibits the secretion of GH. GH inhibits its own secretion by stimulating

the release of GHIH from hypothalamus. This type of feedback is called short-loop feedback control. Similarly, GHRH inhibits its own release by short-loop feedback control.

Whenever, the blood level of GH decreases, the GHRH is secreted from the hypothalamus. It in turn causes secretion of GH from pituitary.

Role of ghrelin in the secretion of GH

Ghrelin is a peptide hormone synthesized by epithelial cells in the fundus of stomach. It is also produced in smaller amount in hypothalamus, pituitary, kidney and placenta. Ghrelin promotes secretion of GH by stimulating somatotropes directly.

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