Hormones

University Of Fallujah
College Of Medicine

Lecture : (2)

Stage : 2th Stage

Lecturer : Dr. Mohammed amer

Department: Chemistry and Biochemistry

Biochemistry and Disorders of Hormones of the Hypothalamic and pituitary gland

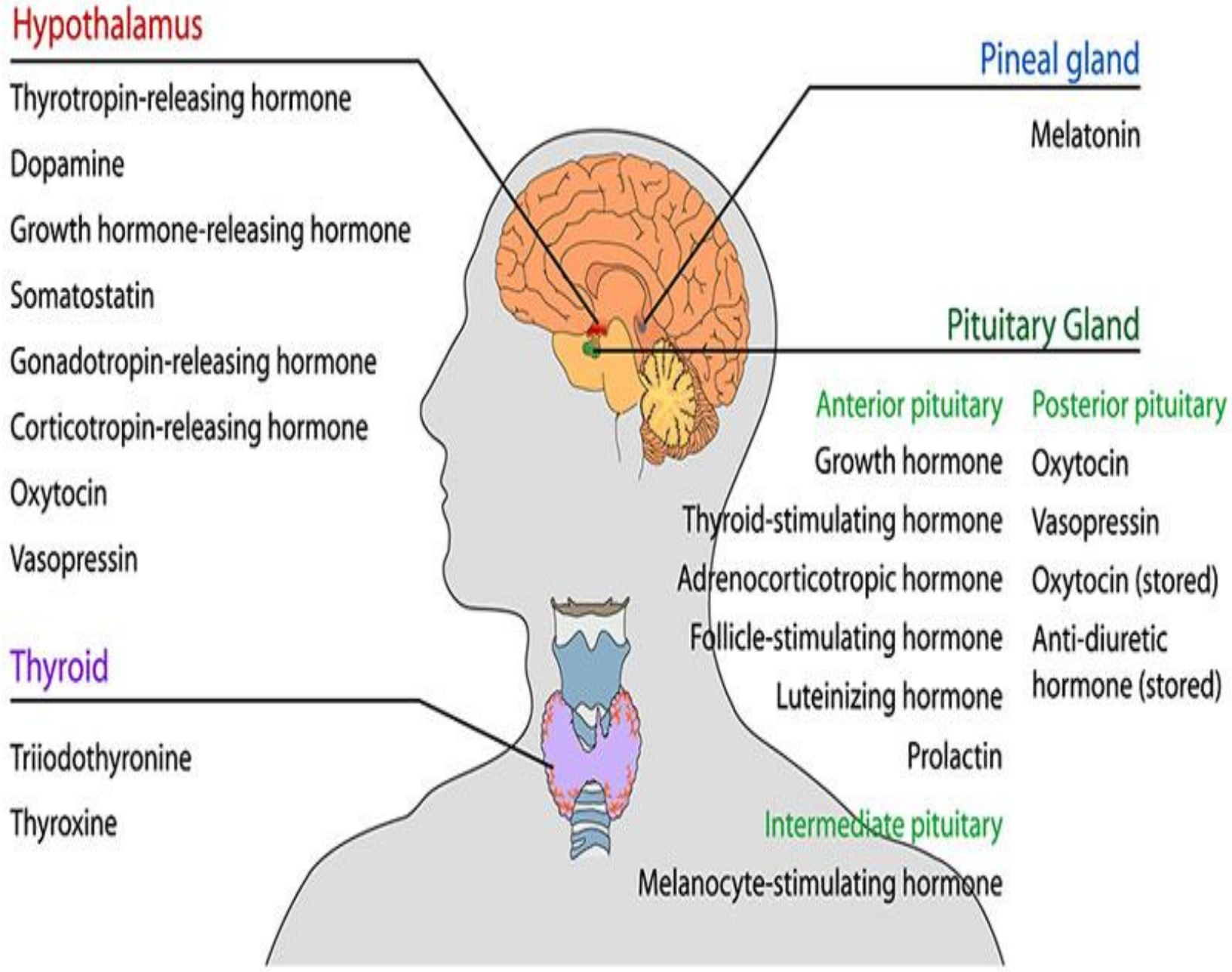
1. Hormones of the hypothalamus

- **Learning Objectives:**
- To describe the structure and function of the hypothalamus
- To list the hormones secreted from the hypothalamus
- To understand how the hypothalamus controls the secretion of hormones of the pituitary gland.

➢ Hypothalamic Hormones:-

- The hypothalamus is an integral part of the substance of the brain.
- A small cone-shaped structure, it projects downward, ending in the pituitary stalk, a tubular connection to the pituitary gland, which is a **double lobed** structure that produces the endocrine secretions when stimulated by the hypothalamus.

- The hypothalamus controls each lobe of the pituitary slightly differently.

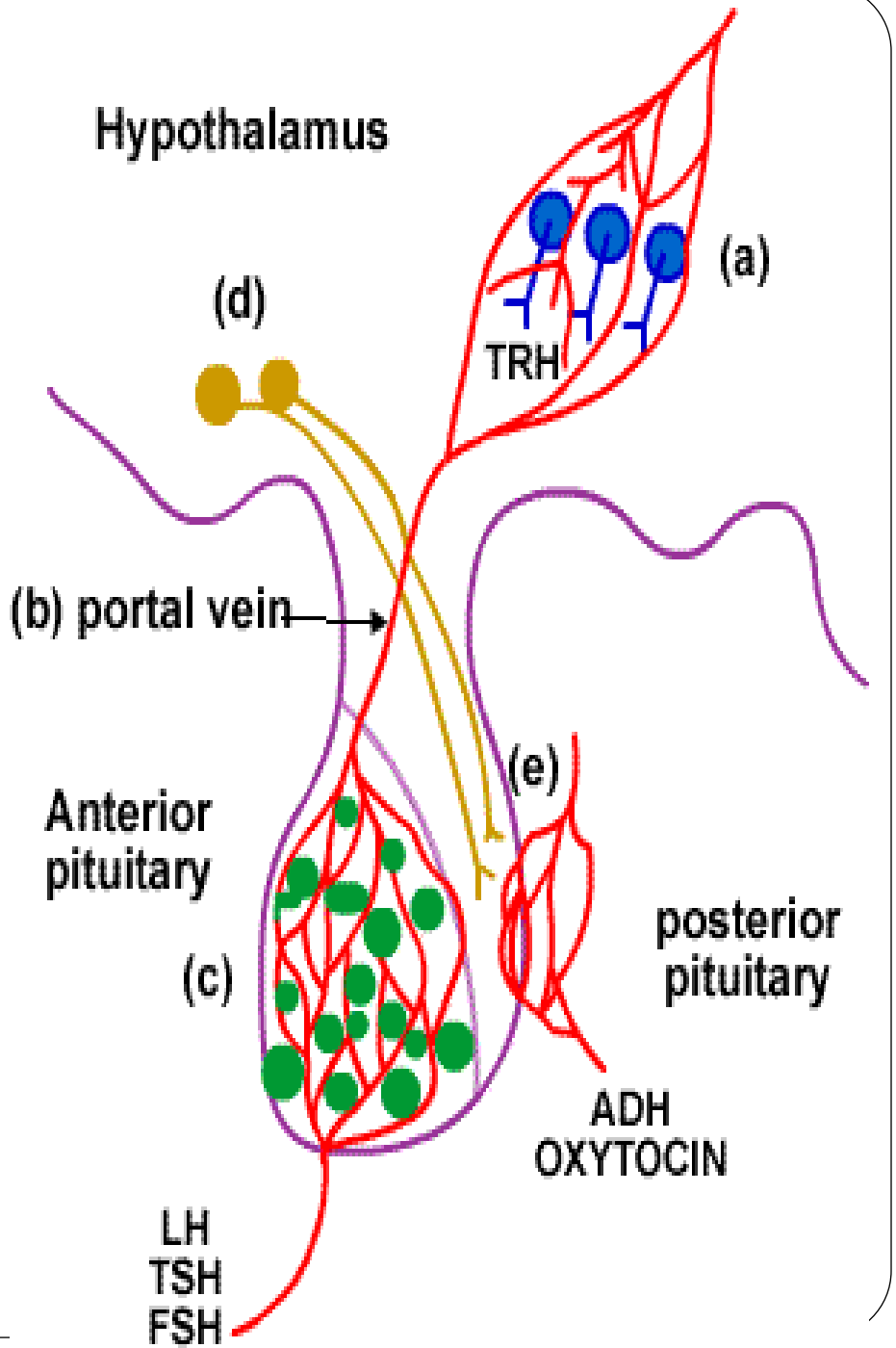

Hypothalamus
Thyrotropin-releasing hormone
Dopamine
Growth hormone-releasing hormone
Somatostatin
Gonadotropin-releasing hormone
Corticotropin-releasing hormone
Oxytocin
Vasopressin
Pineal gland
Melatonin
Pituitary Gland
Anterior pituitary
Growth hormone
Thyroid-stimulating hormone
Adrenocorticotropic hormone
Follicle-stimulating hormone
Luteinizing hormone
Prolactin
Posterior pituitary
Oxytocin
Vasopressin
Oxytocin (stored)
Anti-diuretic hormone (stored)
Intermediate pituitary
Melanocyte-stimulating hormone
Thyroid
Triiodothyronine
Thyroxine

1.Control of Anterior lobe

A. The hypothalamus acts as an endocrine gland.

B. Hormones are sent from the hypothalamus to the anterior pituitary via a blood vessel called the portal vein.

C. The target tissue is the anterior lobe of the pituitary e.g. LH, TSH, and FSH.



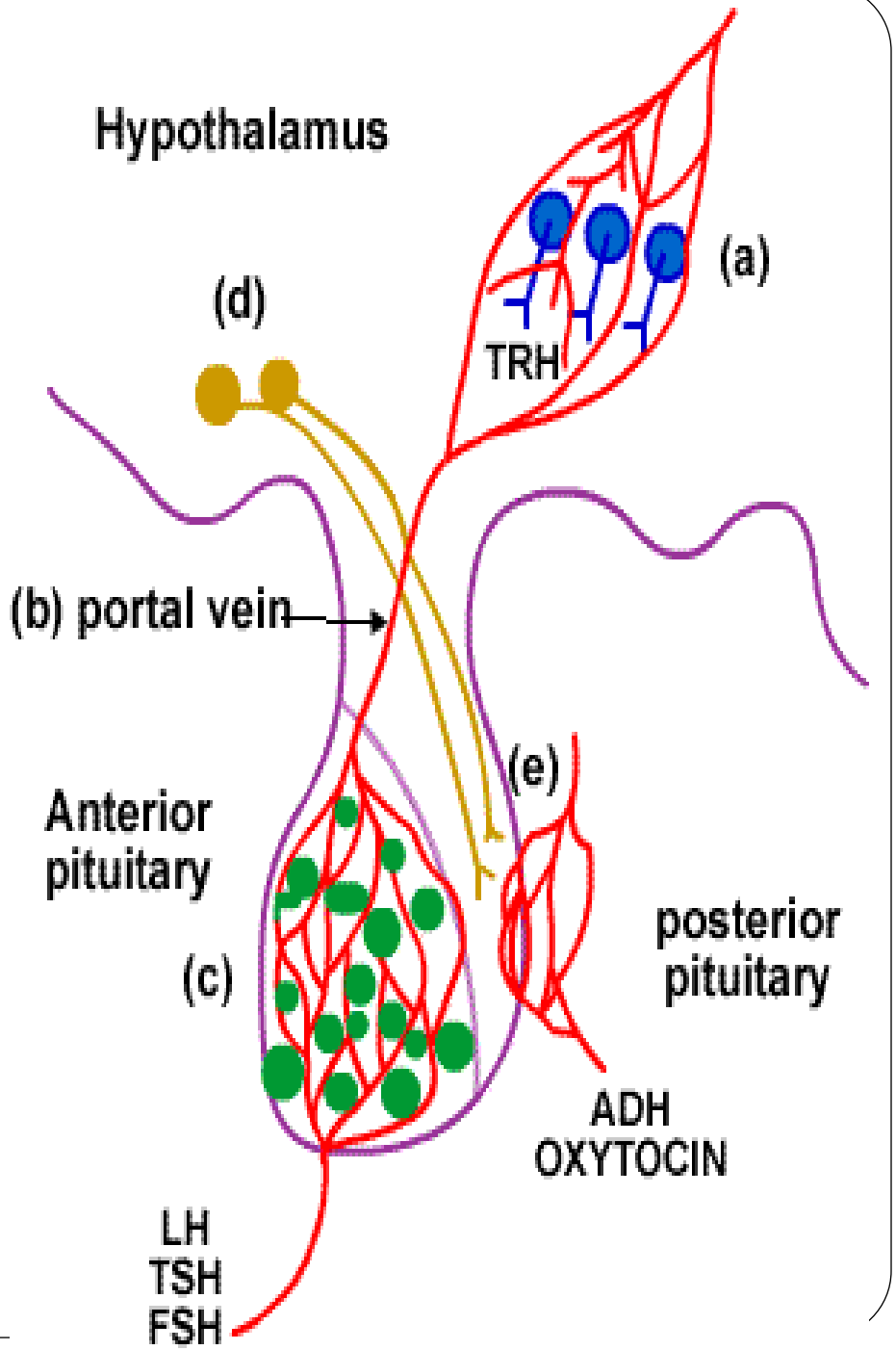
2.Control of the Posterior lobe.

d. Neuro-hormones are synthesized in the hypothalamus neurons.

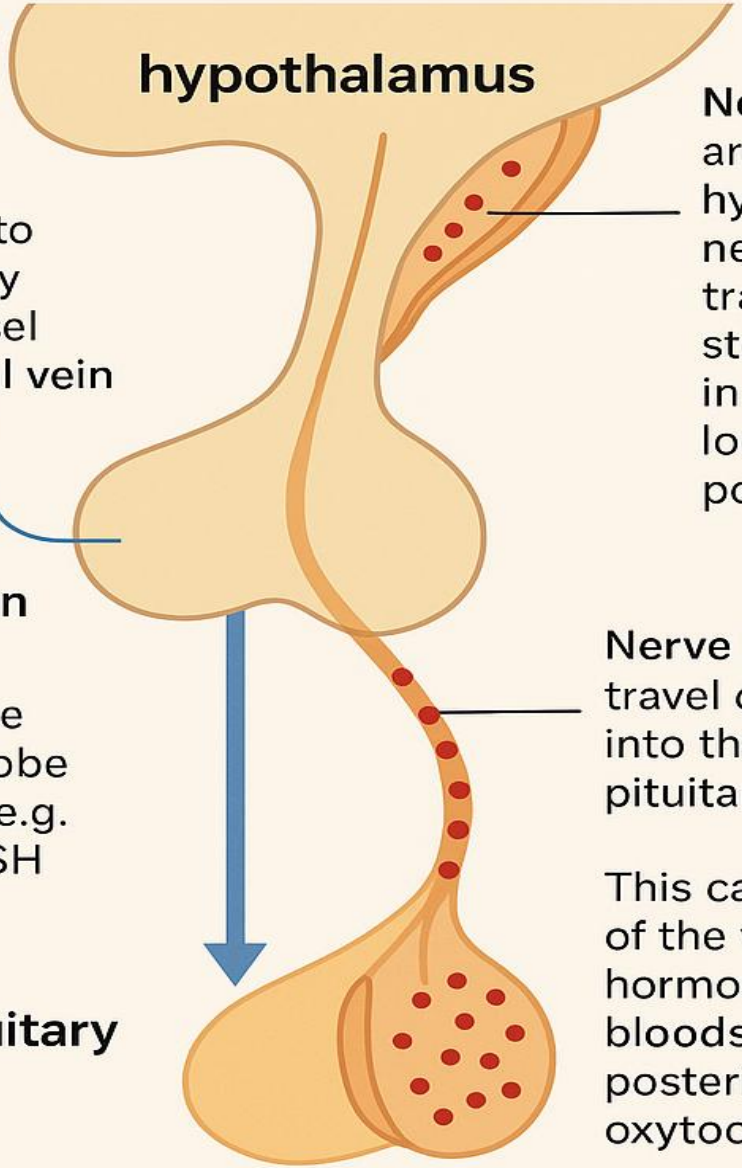
- They are transported and stored in vesicles in the axon ending located in the posterior pituitary.

e. Nerve impulses travel down the axon into the posterior pituitary.

- This causes the release of the vesicles of hormones into the blood stream at the posterior pituitary e.g. **oxytocin** , and **ADH**.



CONTROL OF ANTERIOR LOBE



	Hypothalamic hormones	No. of A.A in structure	Pituitary Hormone Affected[1]	Target Gland Hormone Affected
1	Thyrotropin-releasing hormone (TRH)	3	TSH (PRL)	T_3, T_4
2	Gonadotropin-releasing hormone (GnRH)	10	LH, FSH	Androgens, estrogens, progestins
3	Corticotropin-releasing hormone (CRH)	41	ACTH	Cortisol
4	Growth hormone-releasing hormone(GHRH or GRH)	49	GH	IGF-1
5	Prolactin release factor	Not established	PRL	neurohormones
6	Somatostatin (Growth hormone release-inhibiting hormone; somatotropin release-inhibiting hormone (GHRIH or SRIH)	14	GH (TSH, FSH, ACTH)	IGK-1; T_3 andT_4
7	Prolactin- release-inhibiting hormones (Dopamine and GAP) (PRIH or PIH)		PRL	neurohormones

1. Thyrotropin-releasing hormone(TRH)

- Is the simplest of the hypothalamic neuropeptides. It consists essentially of three amino acids.

(glutamic acid-histidine-proline)

- The simplicity of this structure is deceiving for TRH is involved in an extraordinary array of functions.
- Some of which are:
  - ✓ It stimulates the secretion of thyroid-stimulating hormone from the pituitary.
  - ✓ It also affects the secretion of prolactin from the pituitary.
- The TRH-secreting cells are subject to stimulatory and inhibitory influences from higher centers in the brain and they also are inhibited by circulating thyroid hormone.

2. Gonadotropin-releasing hormone (GnRH)

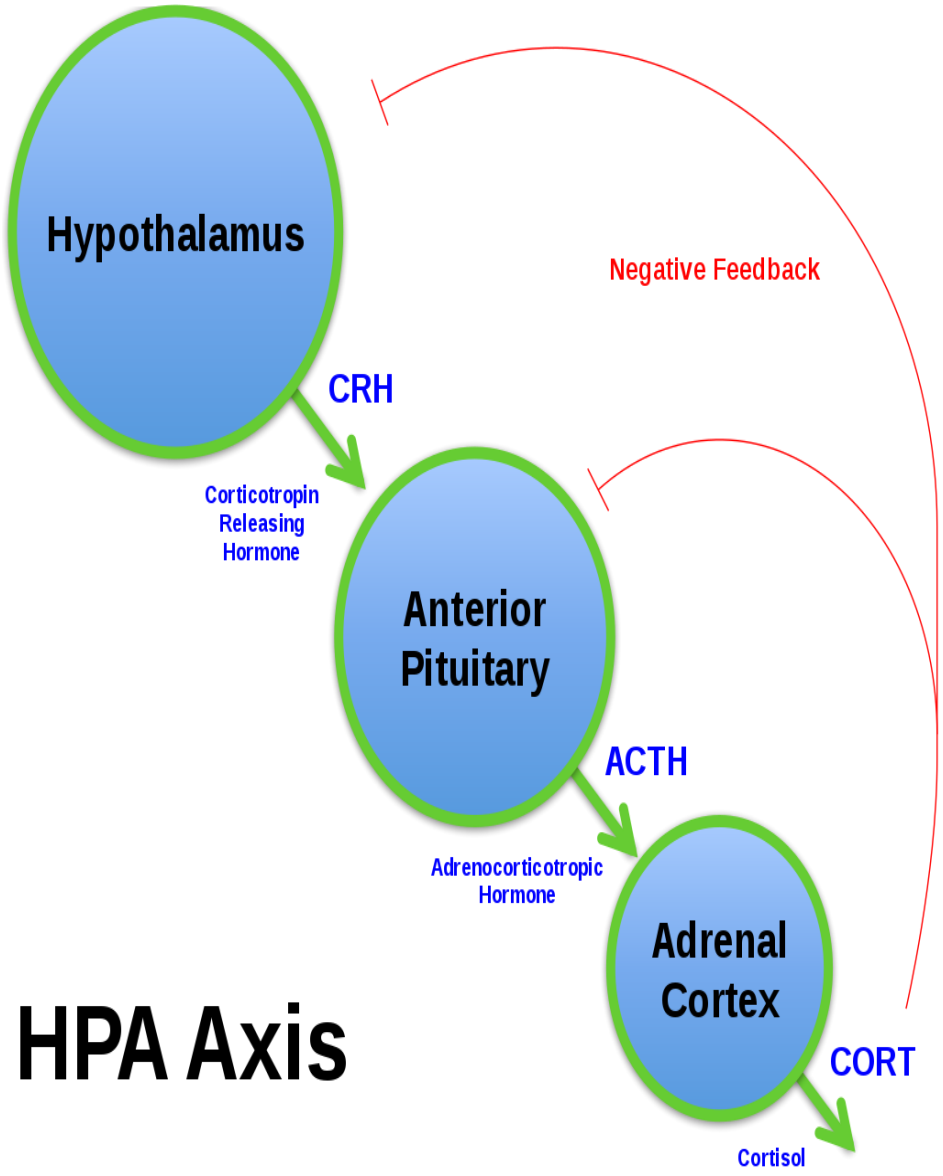
- Also known as luteinizing hormone-releasing hormone (LHRH), is a peptide chain of 10 amino acids.
- It stimulates the synthesis and release of the two pituitary gonadotropins, luteinizing hormone (LH) and follicle-stimulating hormone (FSH)

3. Prolactin release factor (PRF):

- Appears to be released from the hypothalamus in a pulsatile fashion and it is the fluctuation in PRF that regulates the circulating level of prolactin.

4. Corticotropin-releasing hormone (CRH)

- Is a large peptide consisting of a single chain of 41 amino acids.
- It stimulates not only secretion of corticotropin in the pituitary gland but also the synthesis of corticotropin in the corticotropin-producing cells (corticotrophs) of the anterior lobe of the pituitary gland



- Vasopressin, the major regulator of the body's excretion of water, has an additional ancillary role in stimulating the secretion of CRH.
- Excessive secretion of CRH leads to an increase in the size and number of corticotrophs in the pituitary gland, often resulting in a pituitary tumor.
- This, in turn, leads to excessive stimulation of the adrenal cortex, resulting in high circulating levels of adrenocortical hormones, the clinical manifestations of which are known as **Cushing's syndrome.**
- Conversely, a deficiency of CRH-producing cells can, by a lack of stimulation of the pituitary and adrenal cortical cells, result in adrenocortical deficiency – called **Addison's disease**

5. Growth hormone-releasing hormone (GHRH or GRH)

- Like : CRH, growth hormone-releasing hormone (GHRH) is a large peptide.
- A number of amino acids (varying from 37 to 49).
- It is stimulated by stresses, including physical exercise, and secretion is blocked by a powerful inhibitor called somatostatin.
- Negative feedback control of GHRH secretion is mediated largely through compounds called somatomedins, growth-promoting hormones that are generated when tissues are exposed to growth hormone itself.
- Isolated deficiency of GHRH (in which there is normal functioning of the hypothalamus except for this deficiency) may be the cause of one form of dwarfism,

6. Somatostatin (Growth hormone release-inhibiting hormone; somatotropin release-inhibiting hormone (GHRIH or SRIH)

- Somatostatin refers to a number of polypeptides consisting of chains of 14 to 28 amino acids. Somatostatin is also a powerful inhibitor of pituitary TSH secretion.
- Somatostatin, like TRH, is widely distributed in the central nervous system and in other tissues. It serves an important paracrine function in the islets of Langerhans, by blocking the secretion of both **insulin and glucagon** from adjacent cells.
- Somatostatin has emerged not only as a powerful blocker of the secretion of GH, insulin, glucagon, and other hormones but also as a potent inhibitor of many functions of the gastrointestinal tract, including the secretion of **stomach acid**, the secretion of **pancreatic enzymes**, and the **process of intestinal absorption**.

- **Prolactin release-inhibiting hormones (Dopamine and GAP)**
- The hypothalamic regulation of prolactin secretion from the pituitary is different from the hypothalamic regulation of other pituitary hormones in two respects:
- **First**, the hypothalamus primarily inhibits rather than stimulates the release of prolactin from the pituitary.
- **Second,** this major inhibiting factor is not a neuropeptide, but rather the neurotransmitter dopamine.
- Prolactin deficiency is known to occur, but only rarely. Excessive prolactin production (hyperprolactinemia) is a common endocrine abnormality.

Thank you for listening!