

HYPOTHALAMIC-PITUITARY AXIS

OBJECTIVES

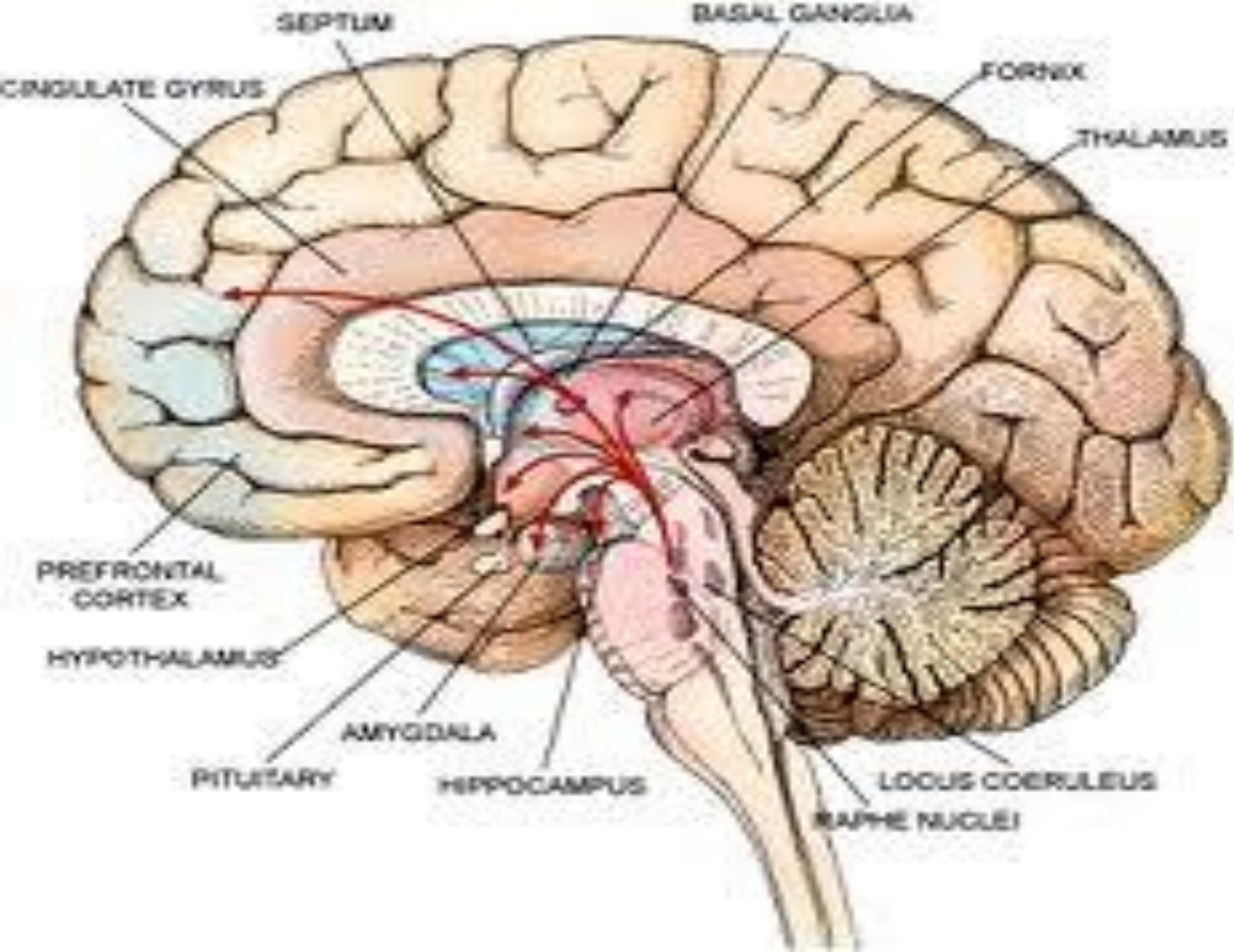
- **By the end of this lecture, students should be able to describe:**
- **Structure of pituitary gland (hypophysis)**
 - Anterior pituitary (adenohypophysis) cell types and hormones
 - Posterior pituitary (neurohypophysis) cell types and hormones
- **Control of pituitary gland by hypothalamus**
 - Hypothalamo-hypophysial portal blood vessels (Hypothalamic releasing and inhibiting hormones and median eminence)
 - Hypothalamo-hypophysial tract
- **Feedback mechanisms: positive and negative feedback**

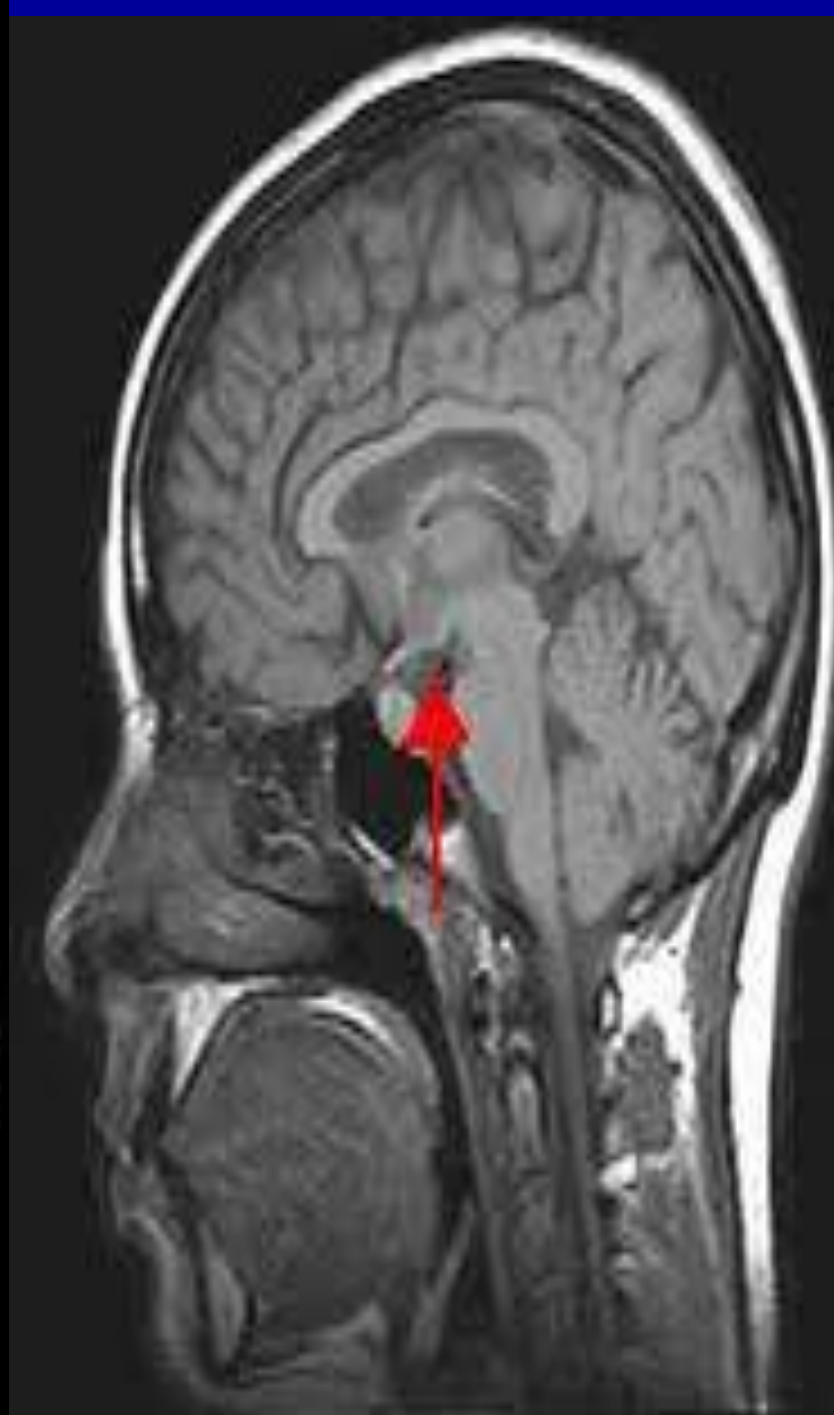
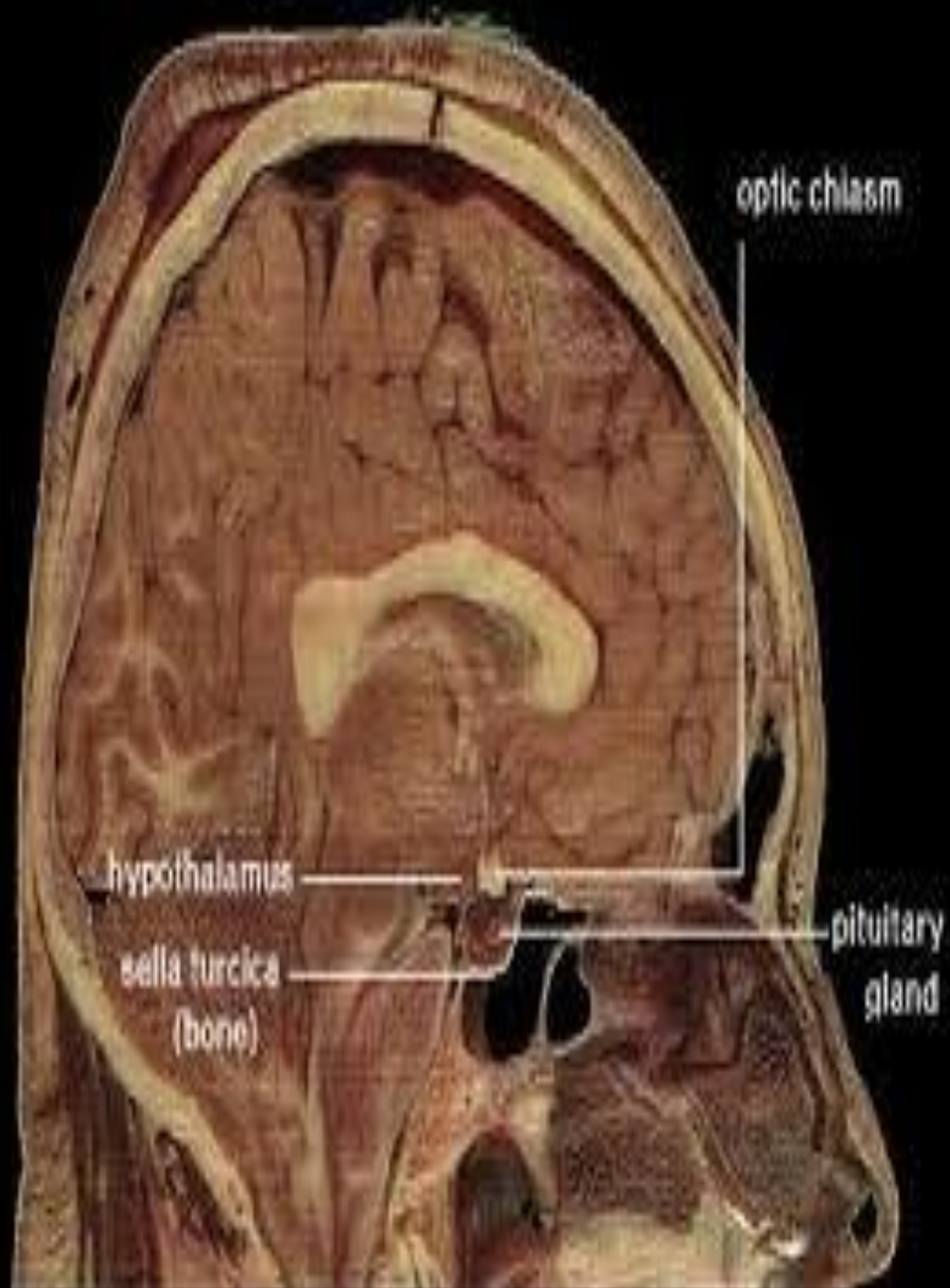
HYPOTHALAMIC-PITUITARY AXIS

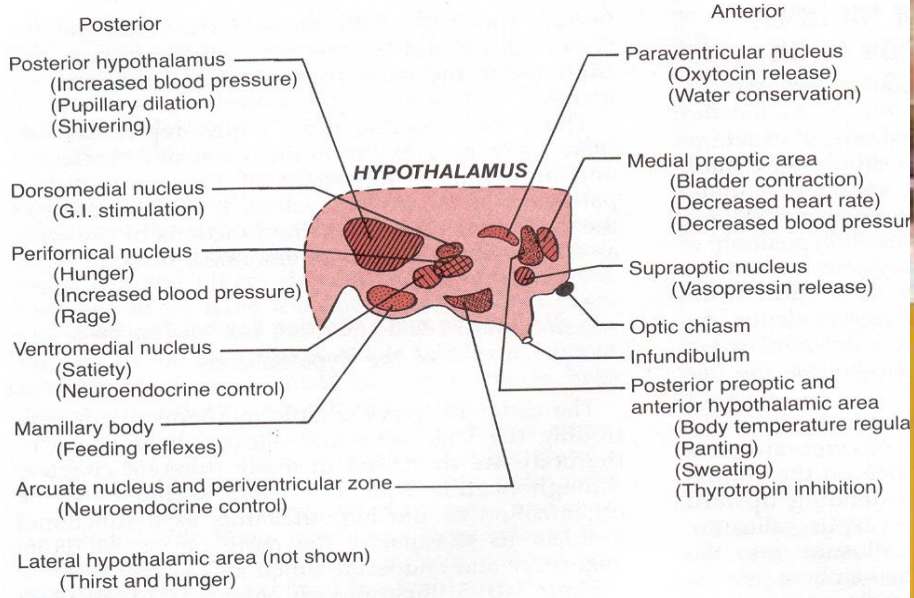
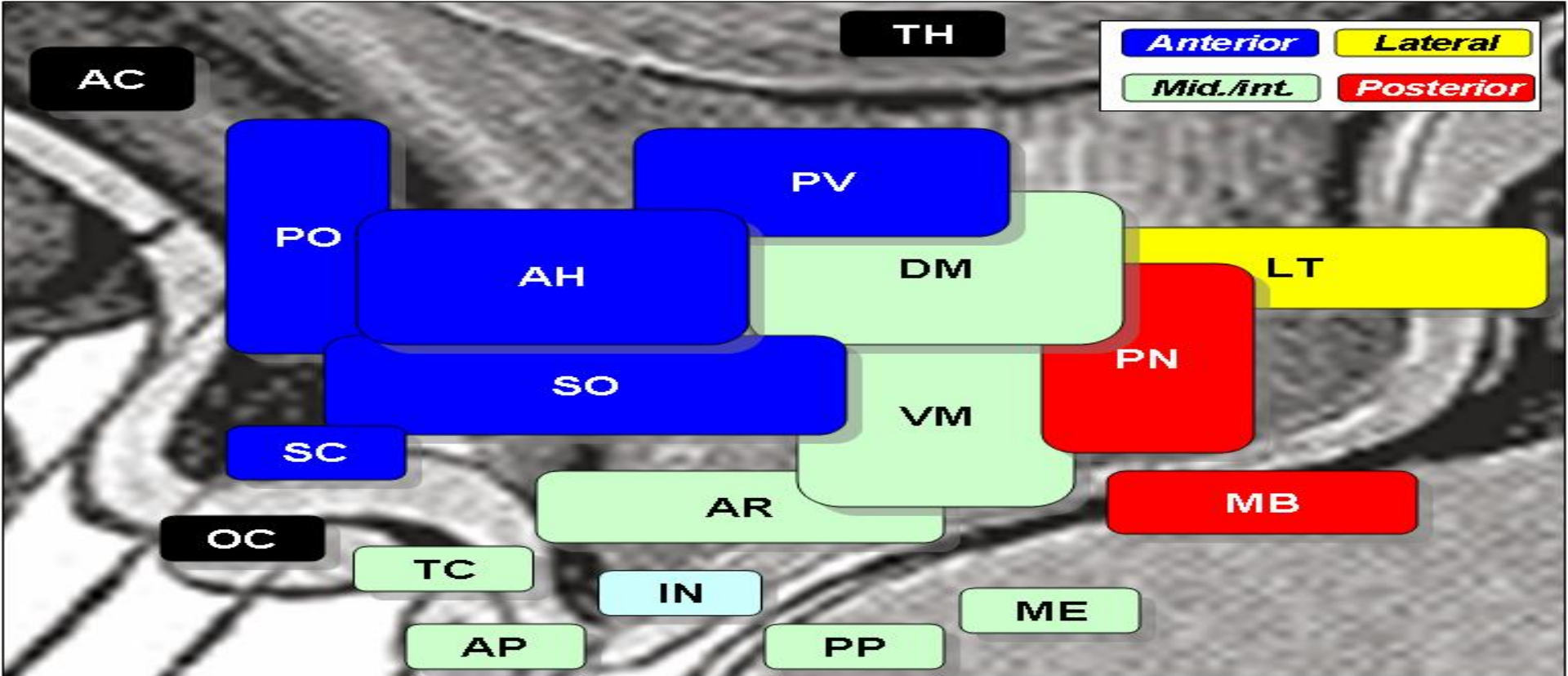
- **Coordinate.**
- **Thyroid gland, adrenal gland, reproductive gland, control growth, milk production, osmoregulation.**

HYPOTHALAMUS

- **Control pituitary gland secretion.**
- **Composed of number of nerve cells.**







Physiology of the hypothalamus

The hypothalamus is a small but powerful region of the brain that acts as the body's master control center. It regulates many of the body's most important functions, including body temperature, hunger, thirst, and sleep. It also controls the release of hormones from the pituitary gland, which in turn controls the activity of other glands in the endocrine system.

Thirst and drinking: The hypothalamus monitors the body's fluid balance and triggers the release of antidiuretic hormone (ADH) from the posterior pituitary gland. ADH causes the kidneys to reabsorb water, reducing urine output and conserving water in the body.

Hunger and eating: The hypothalamus receives signals from the stomach and the gut about the body's energy needs. It then triggers the release of ghrelin, a hormone that stimulates the appetite and encourages eating.

Body temperature: The hypothalamus acts as the body's thermostat. It monitors the body's temperature and triggers responses to keep it within a narrow range. In response to heat, it causes blood vessels to dilate and sweat glands to produce sweat. In response to cold, it causes blood vessels to constrict and shivering to begin.

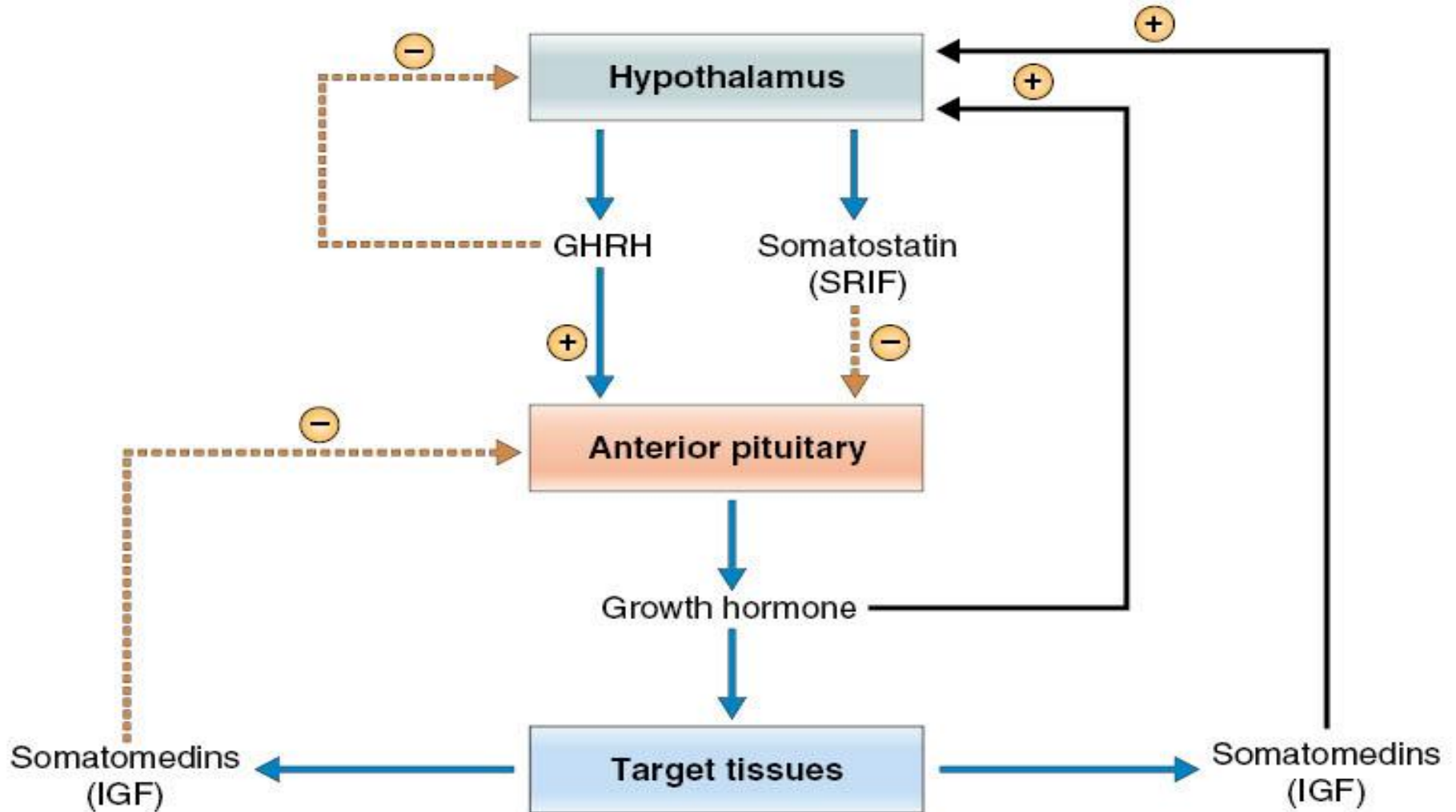
HORMONES

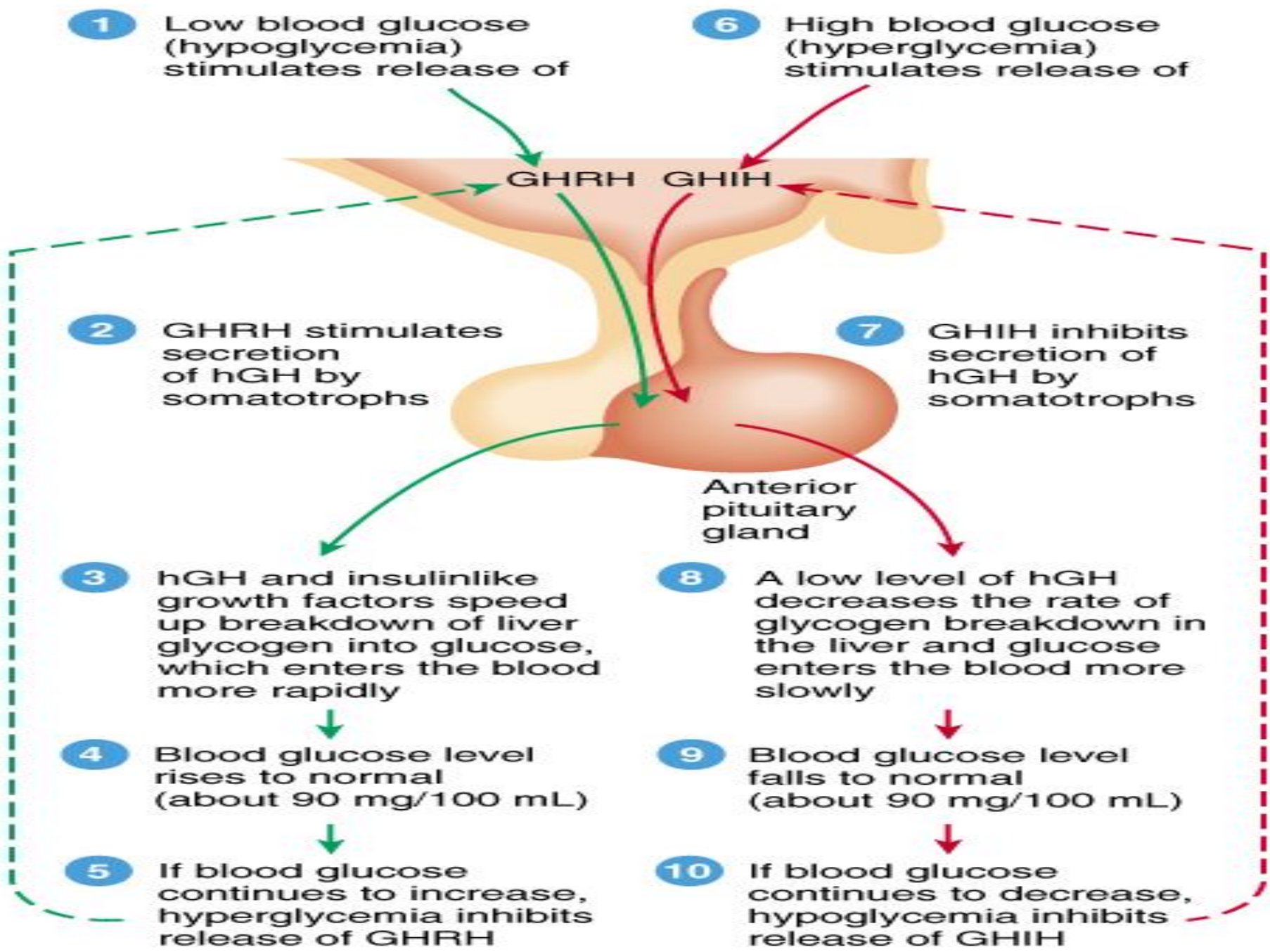
- TRH.
- CRH.
- GnRH.
- PIF.
- GHRH.
- SRIH

Table 9-2 Summary of Endocrine Glands and Actions of Hormones

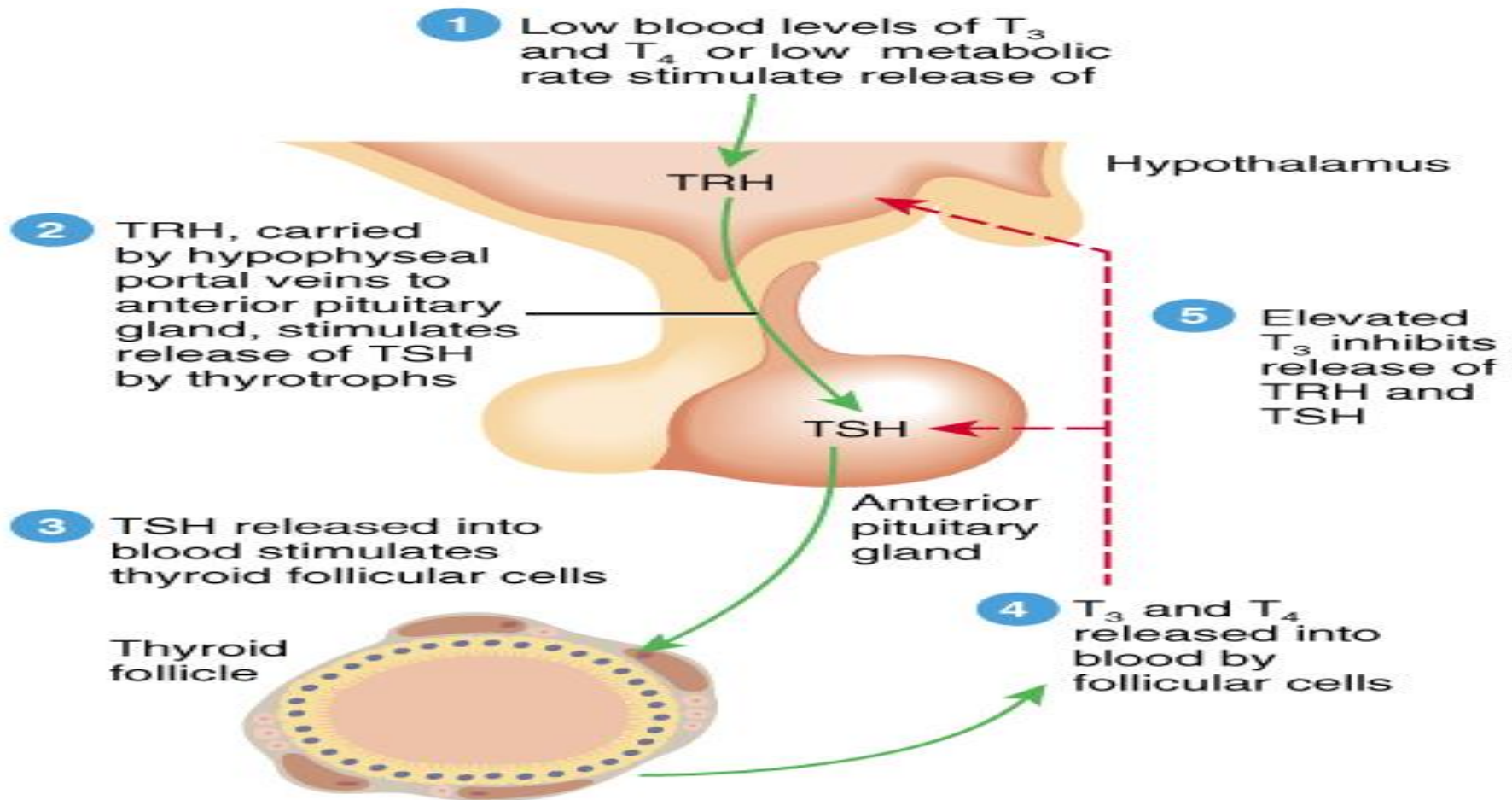
Gland of Origin	Hormones*	Chemical Classification†	Major Actions
Hypothalamus	Thyrotropin-releasing hormone (TRH)	Peptide	Stimulates secretion of TSH and prolactin
	Corticotropin-releasing hormone (CRH)	Peptide	Stimulates secretion of ACTH
	Gonadotropin-releasing hormone (GnRH)	Peptide	Stimulates secretion of LH and FSH
	Somatostatin or somatotropin release-inhibiting hormone (SRIF)	Peptide	Inhibits secretion of growth hormone
	Dopamine or prolactin-inhibiting factor (PIF)	Amine	Inhibits secretion of prolactin
	Growth hormone-releasing hormone (GHRH)	Peptide	Stimulates secretion of growth hormone

GHRH/GHIH(SRIF)



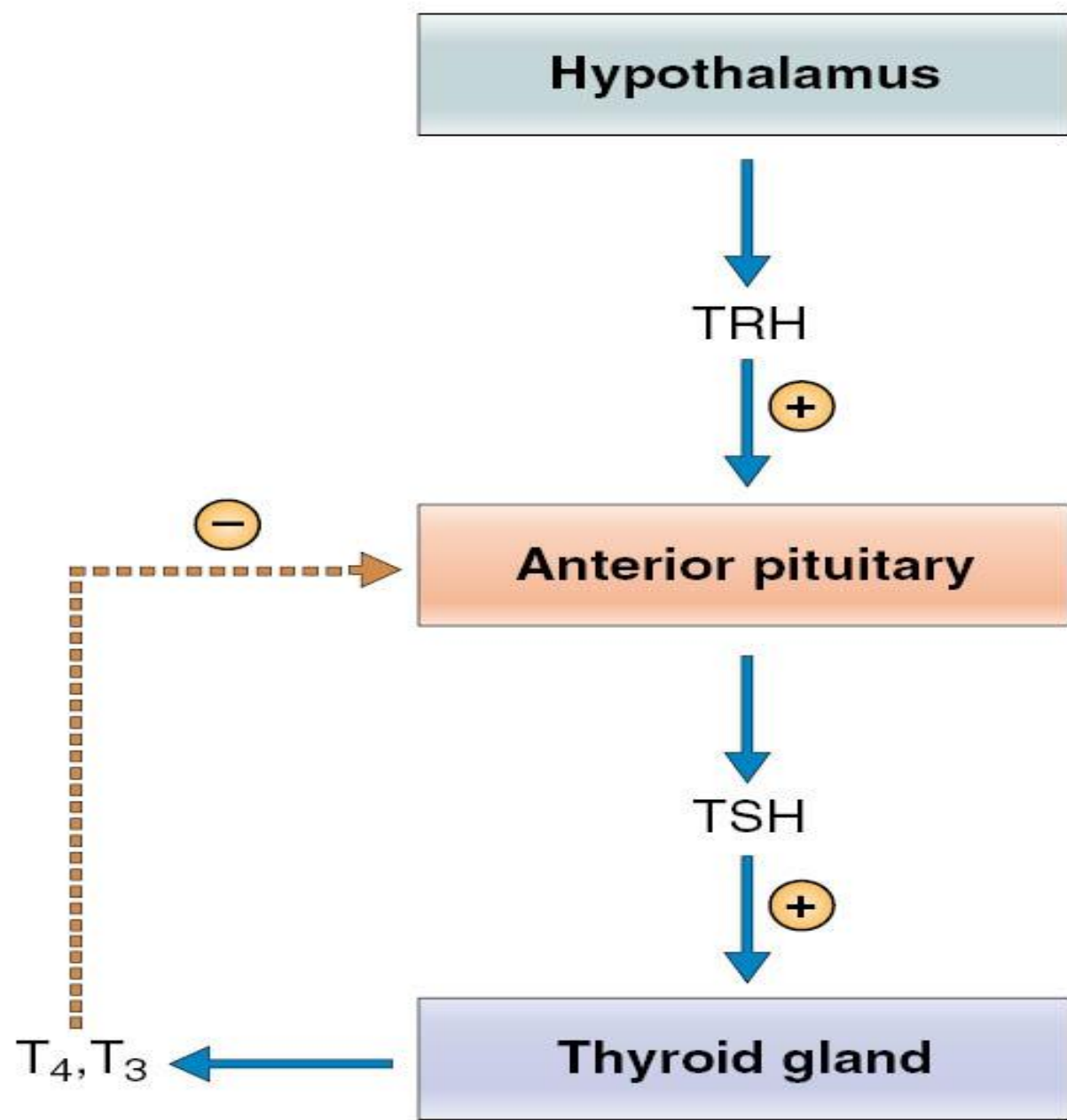


TRH

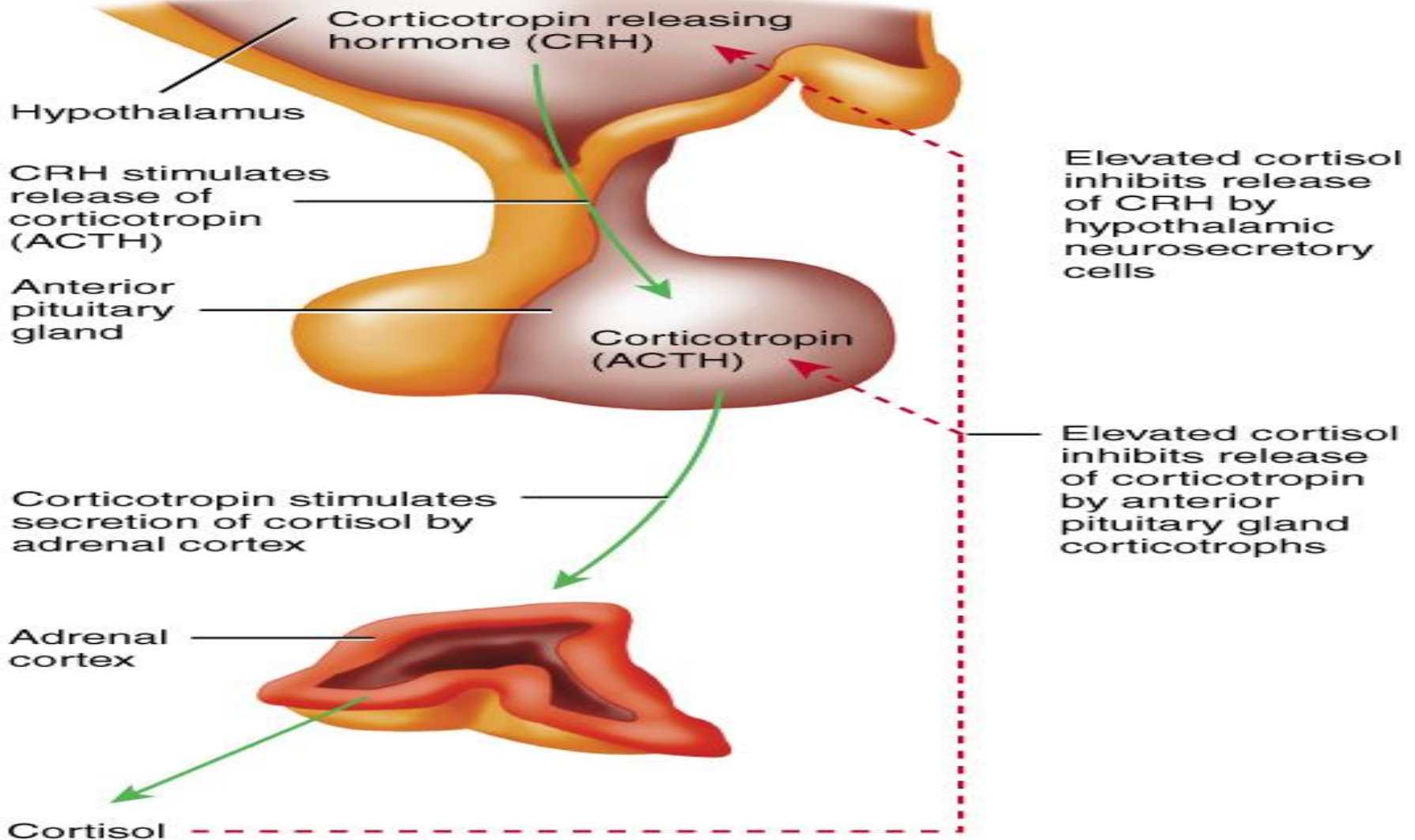


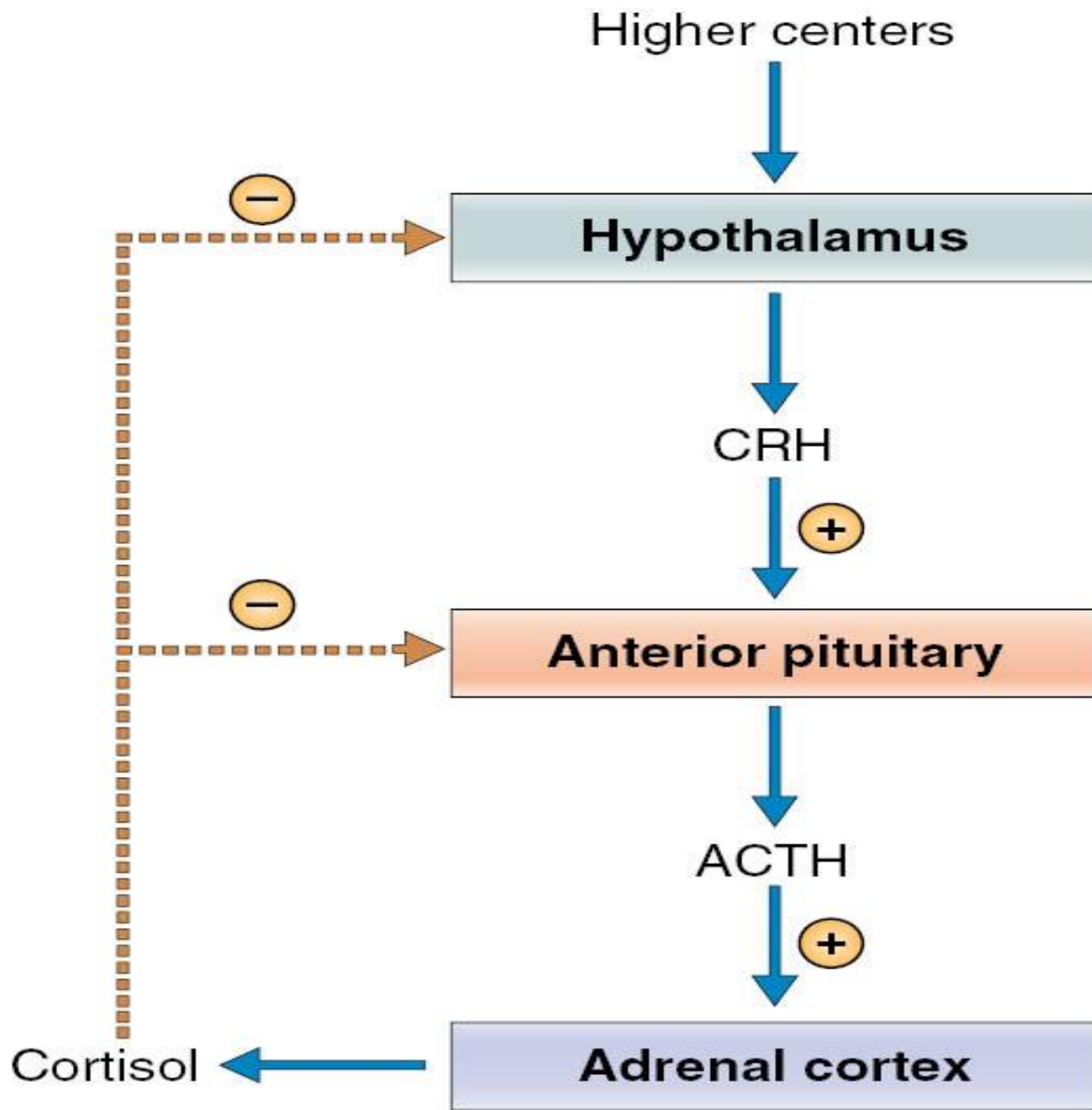
Key:

TRH = Thyrotropin releasing hormone
TSH = Thyroid-stimulating hormone
 T_3 = Triiodothyronine
 T_4 = Thyroxine (Tetraiodothyronine)

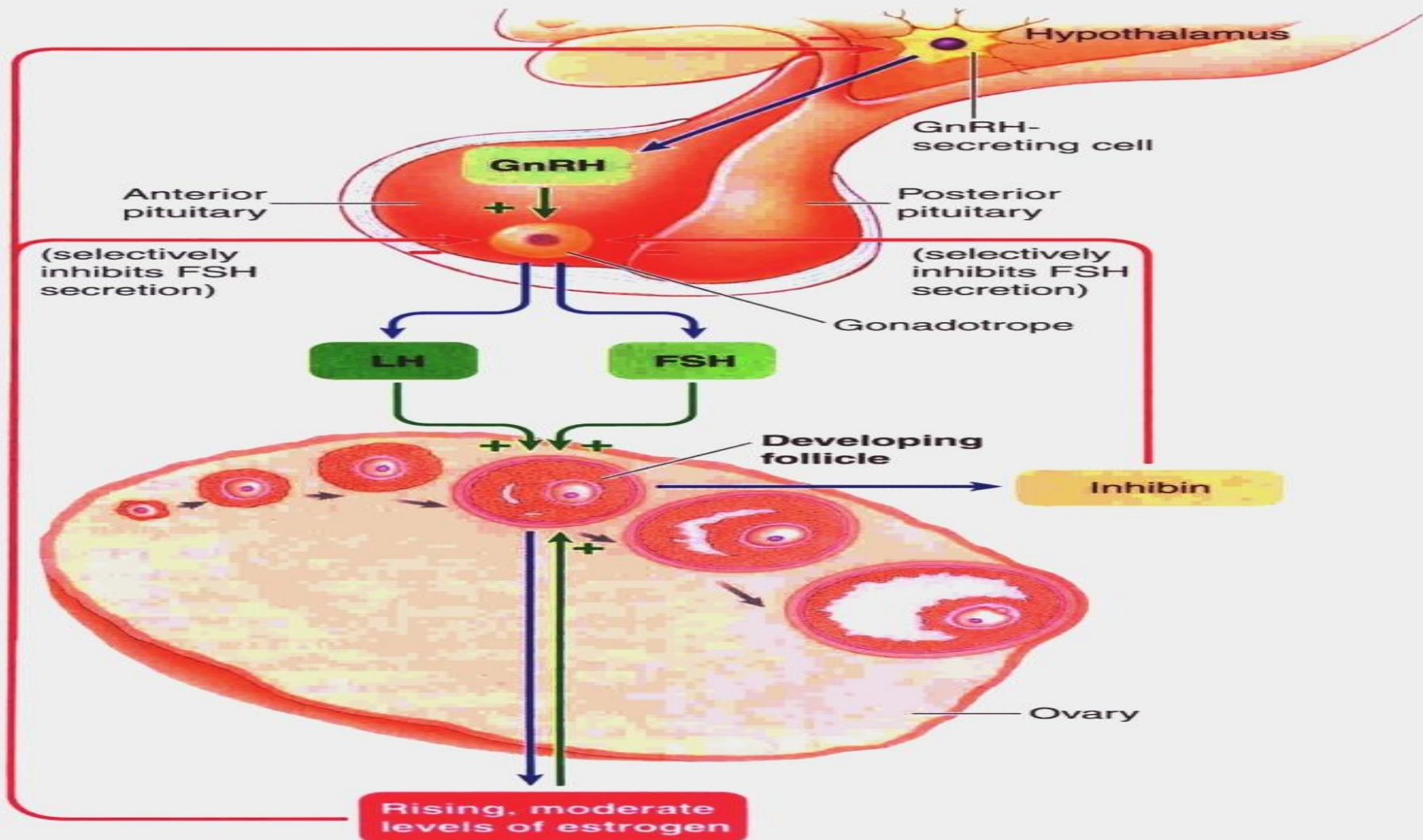


CRH

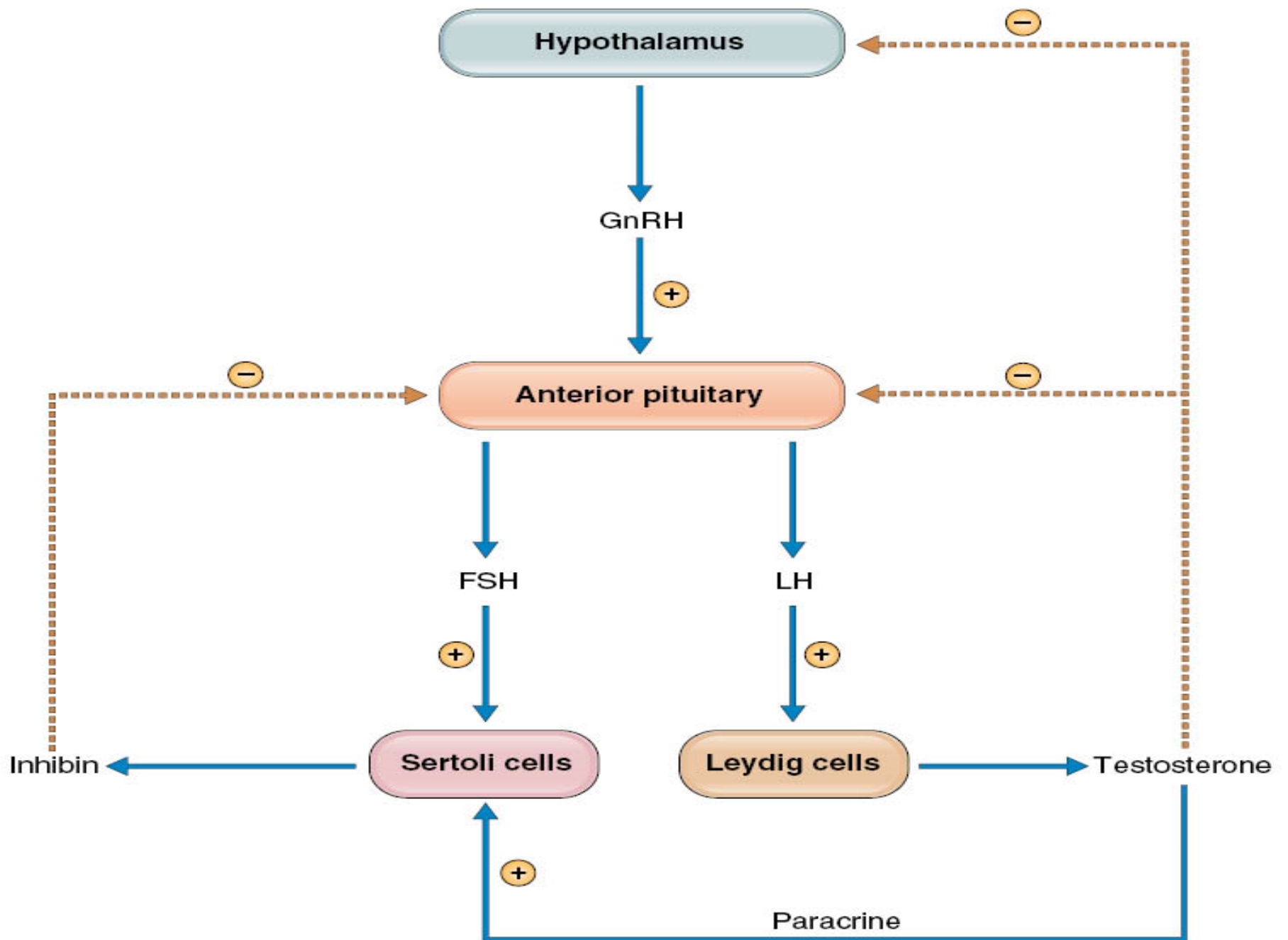


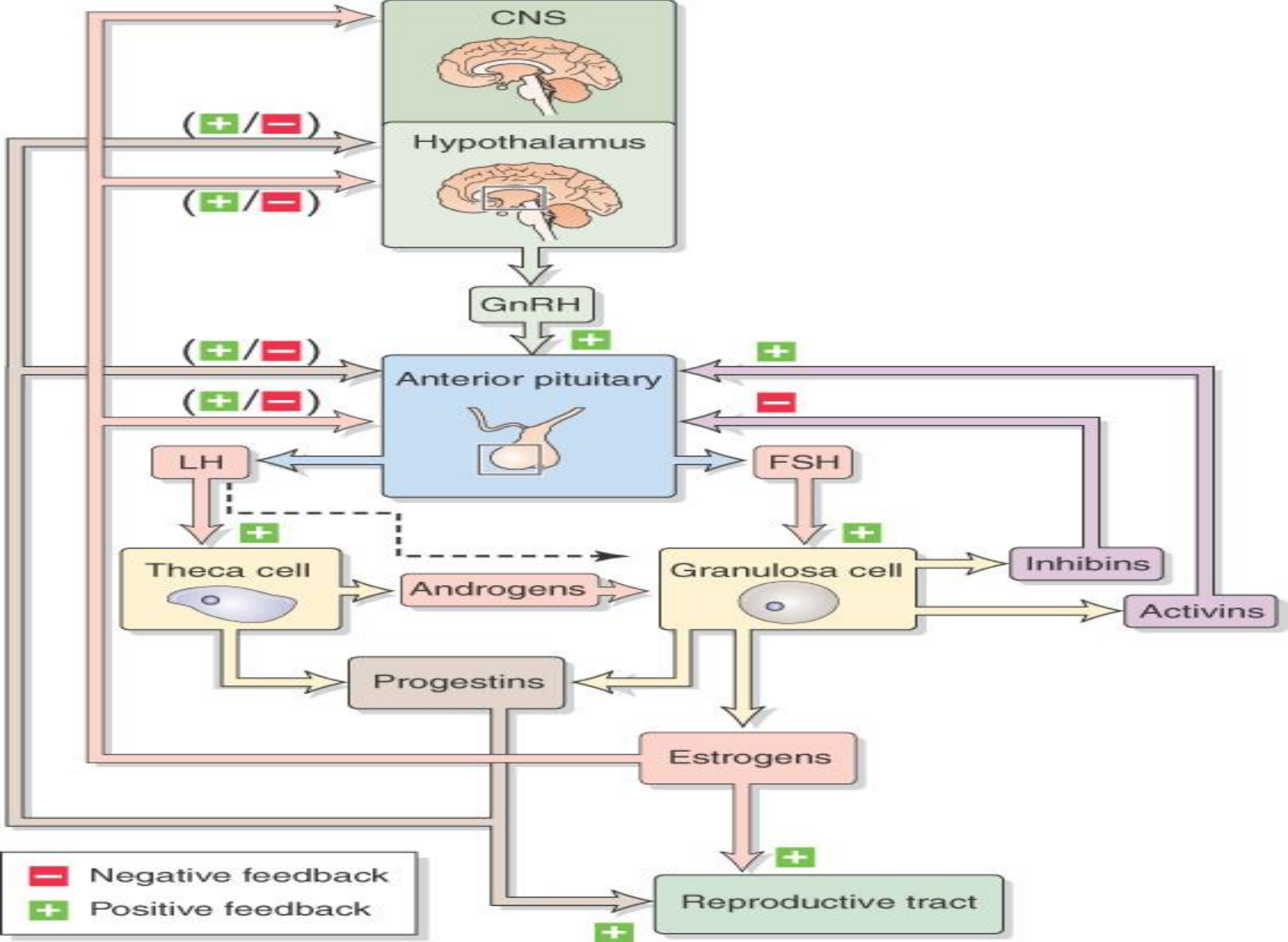


GnRH



● **FIGURE 20-20** Feedback control of FSH and tonic LH secretion during the follicular phase.





PIH

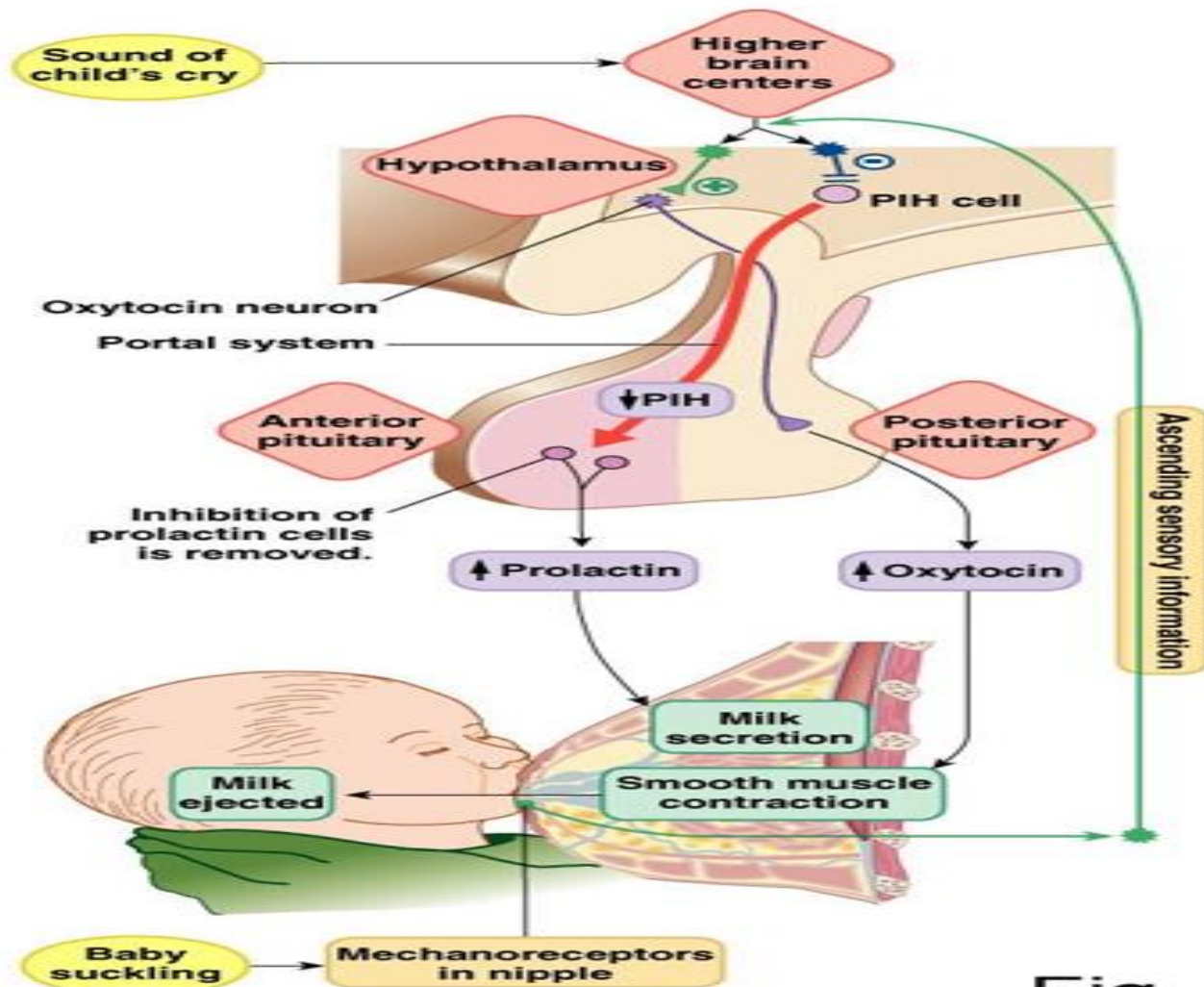
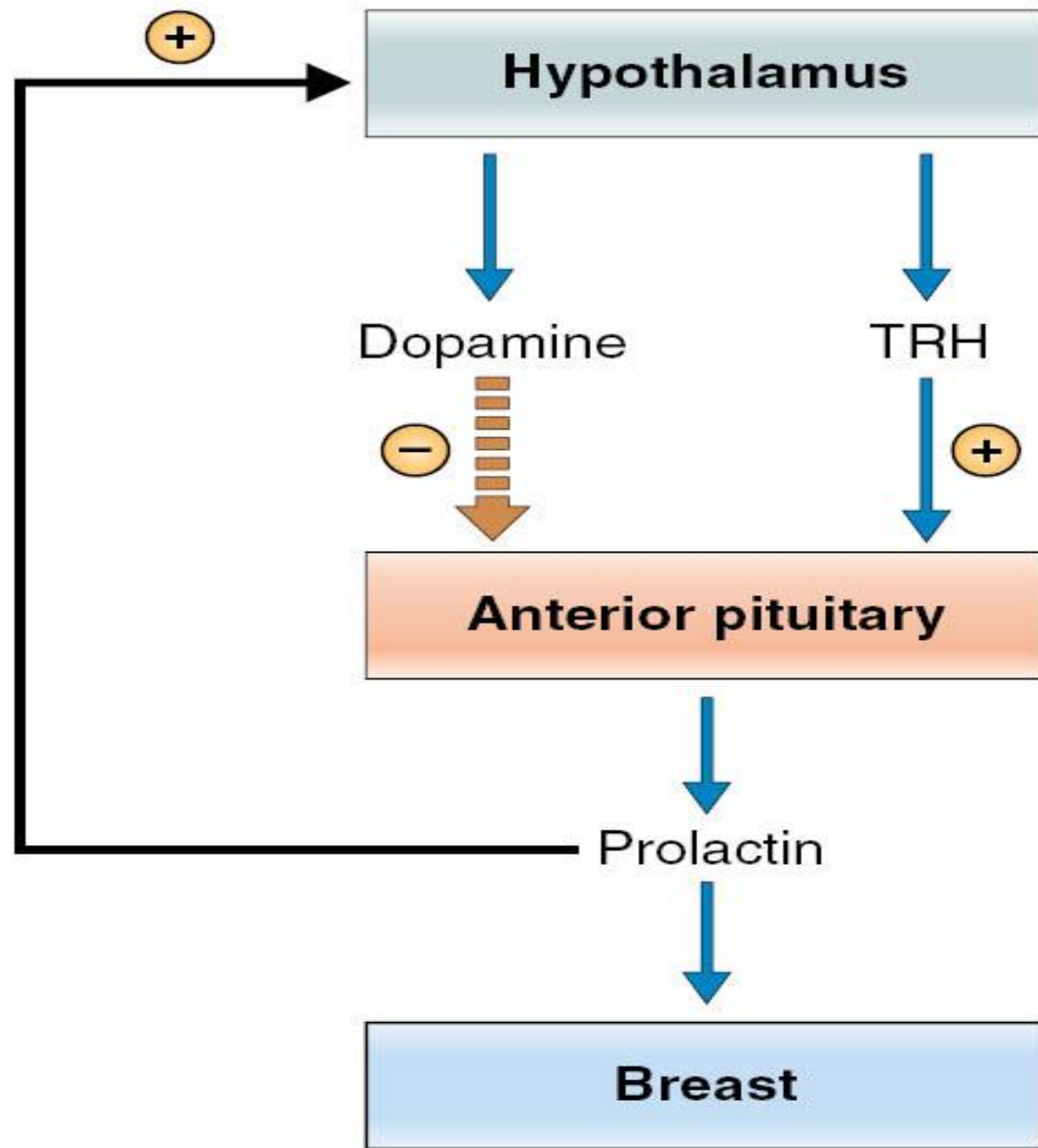
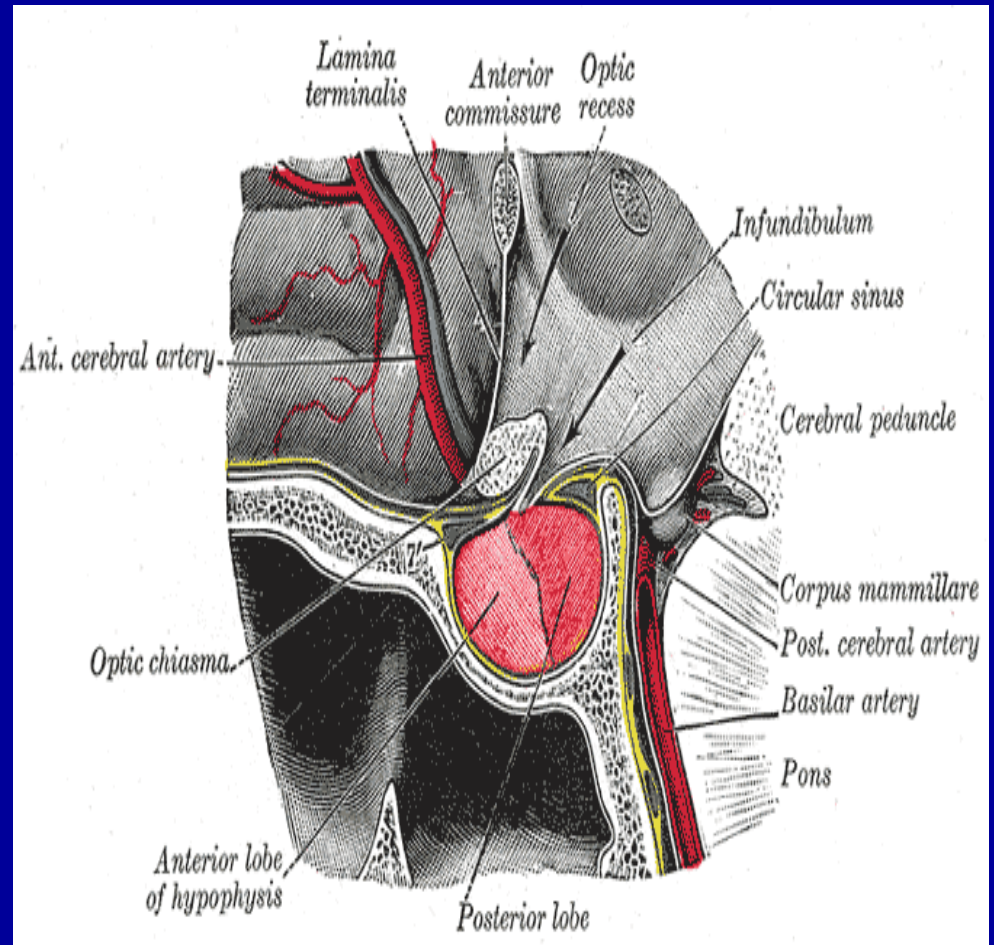


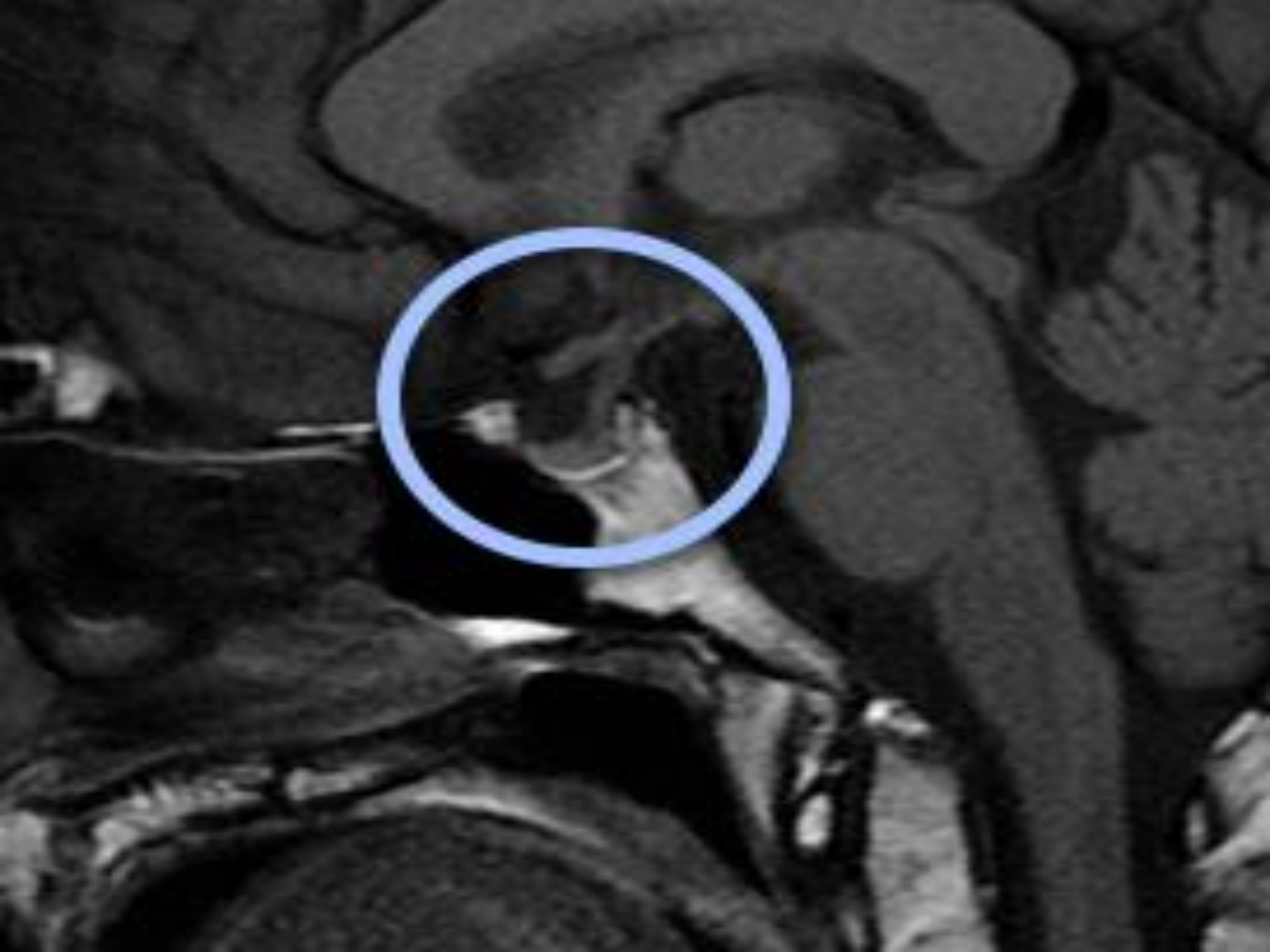
Fig. 26-23

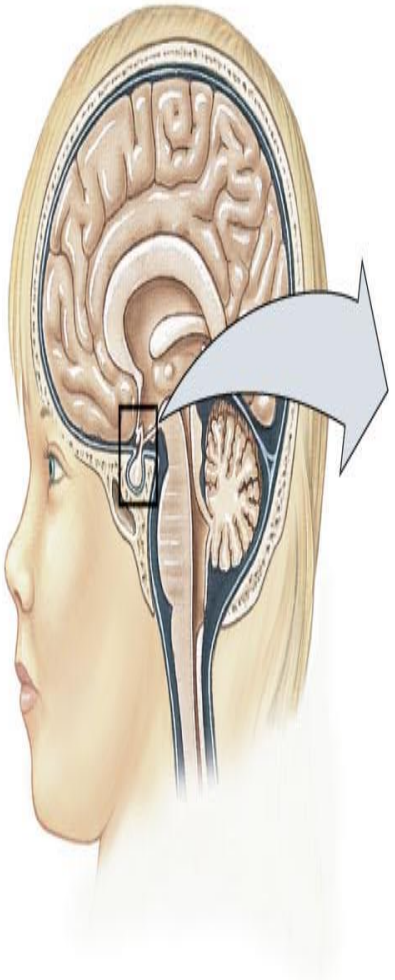


PITUITARY GLAND

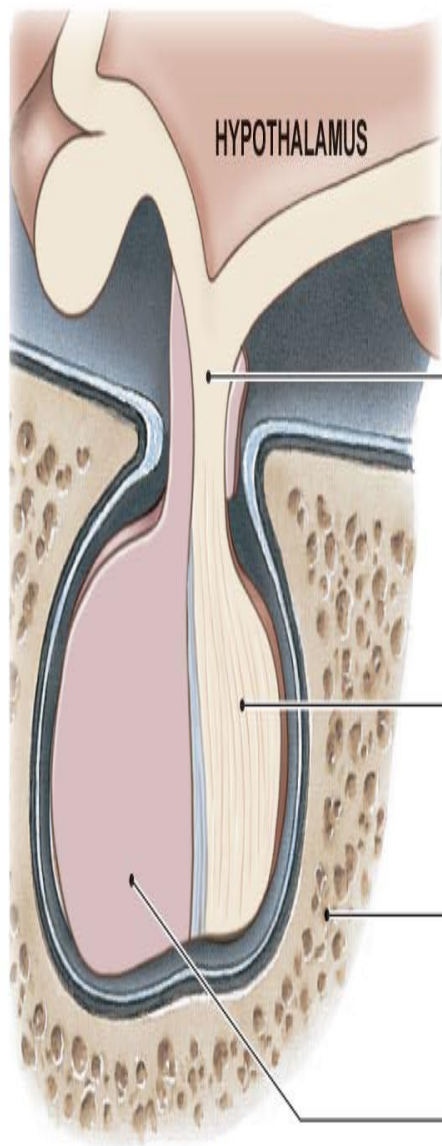
- Hypophysis.
- 1cm .
- 0.5-1 gram.







ANTERIOR ← → POSTERIOR



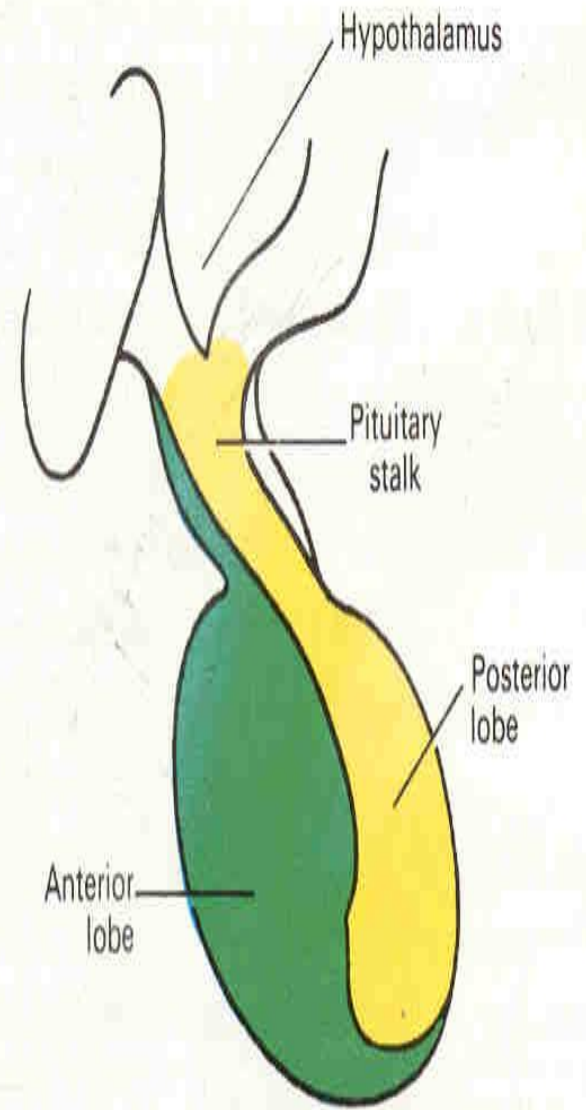
HYPOTHALAMUS

Infundibulum is the stalk that connects the pituitary to the brain.

Posterior pituitary is an extension of the neural tissue.

Sphenoid bone

Anterior pituitary is a true endocrine gland of epithelial origin.



Hypothalamus

Pituitary stalk

Posterior lobe

Anterior lobe

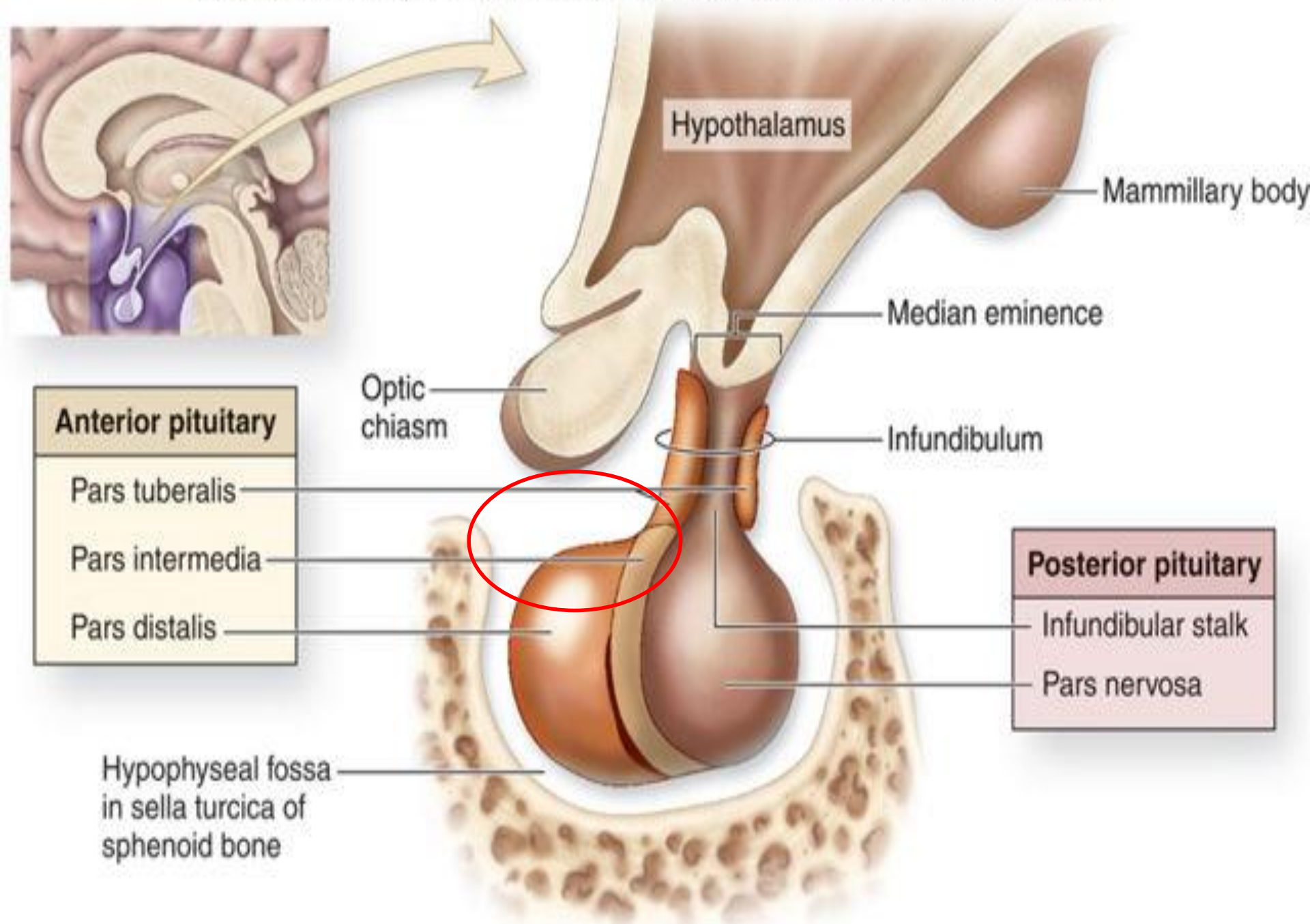
Figure 14:3 The parts of the pituitary gland and its relation to the hypothalamus.

STRUCTURE

Anterior lobe (adenohypophysis).

Posterior lobe (neurohypophysis).

Infundibulum.



RELATIONSHIP OF THE HYPOTHALAMUS TO THE POSTERIOR PITUITARY

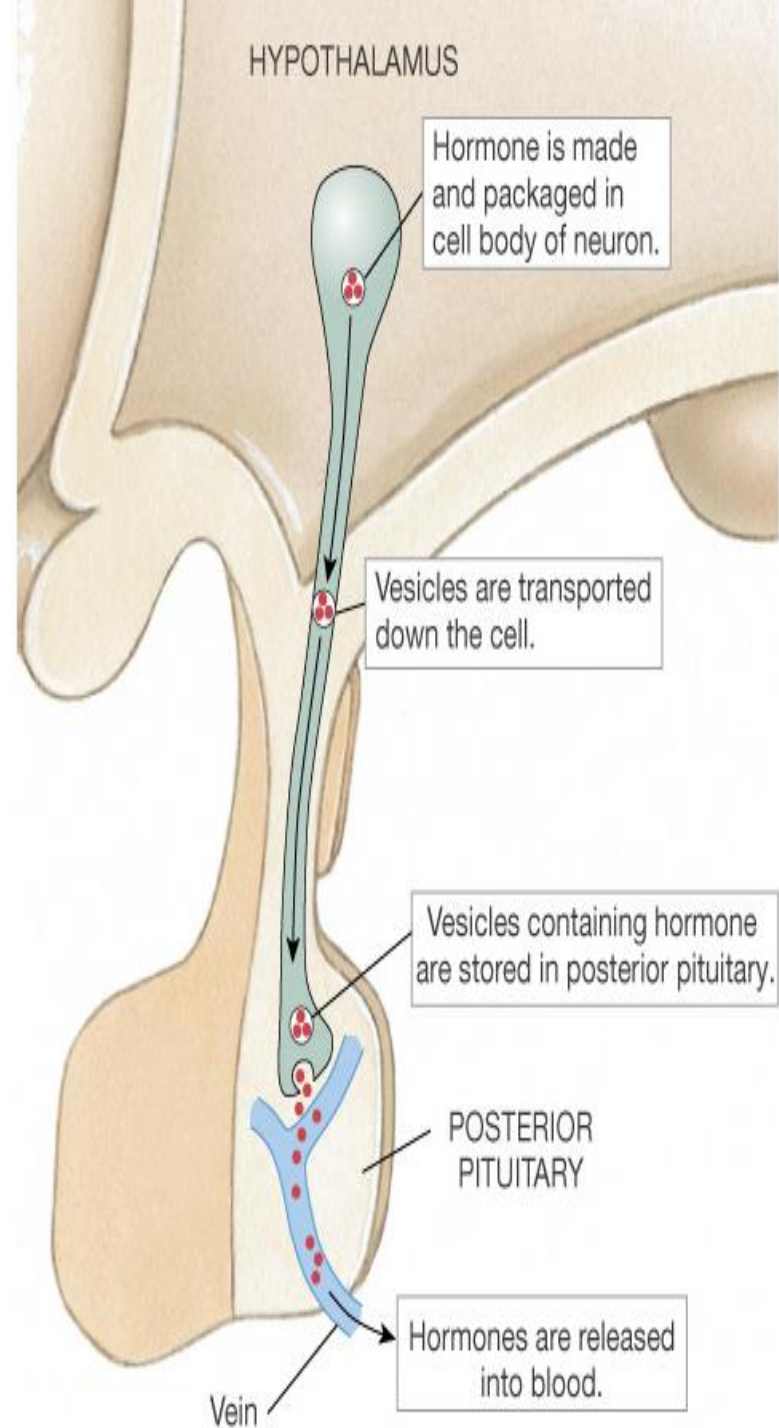
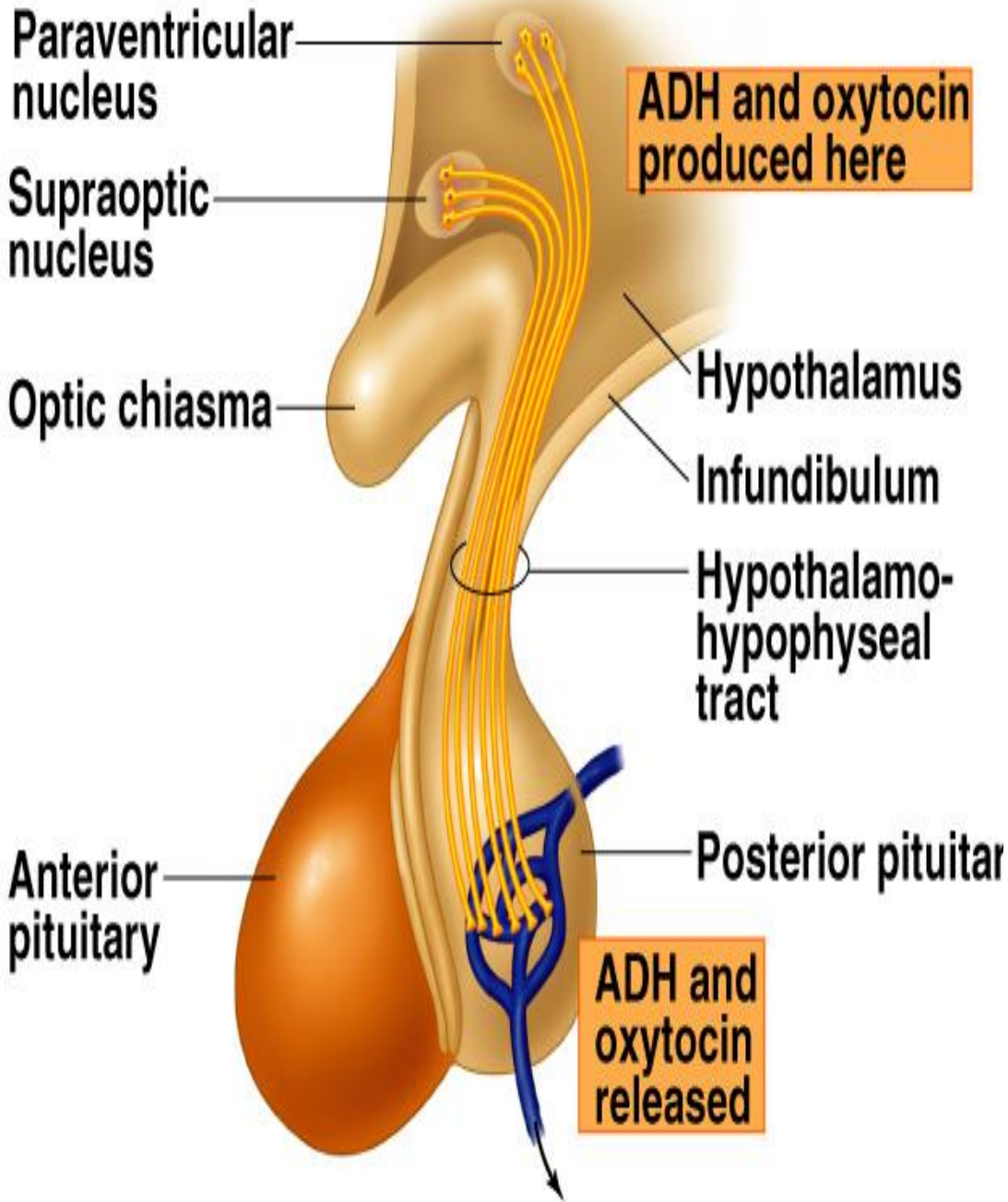
- Collection of nerve axons +supporting cells.

1- Antidiuretic hormone (ADH).

Supraoptic nuclei.

2- Oxytocin.

Paraventricular nuclei.



HYPOTHALAMO-NEURO HYPOPHYSIAL TRACT

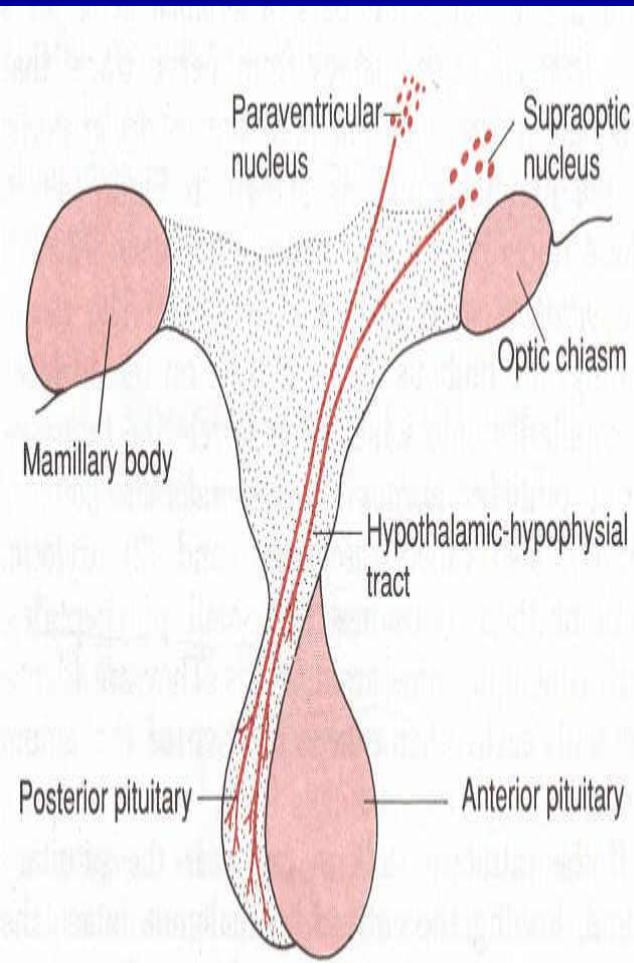
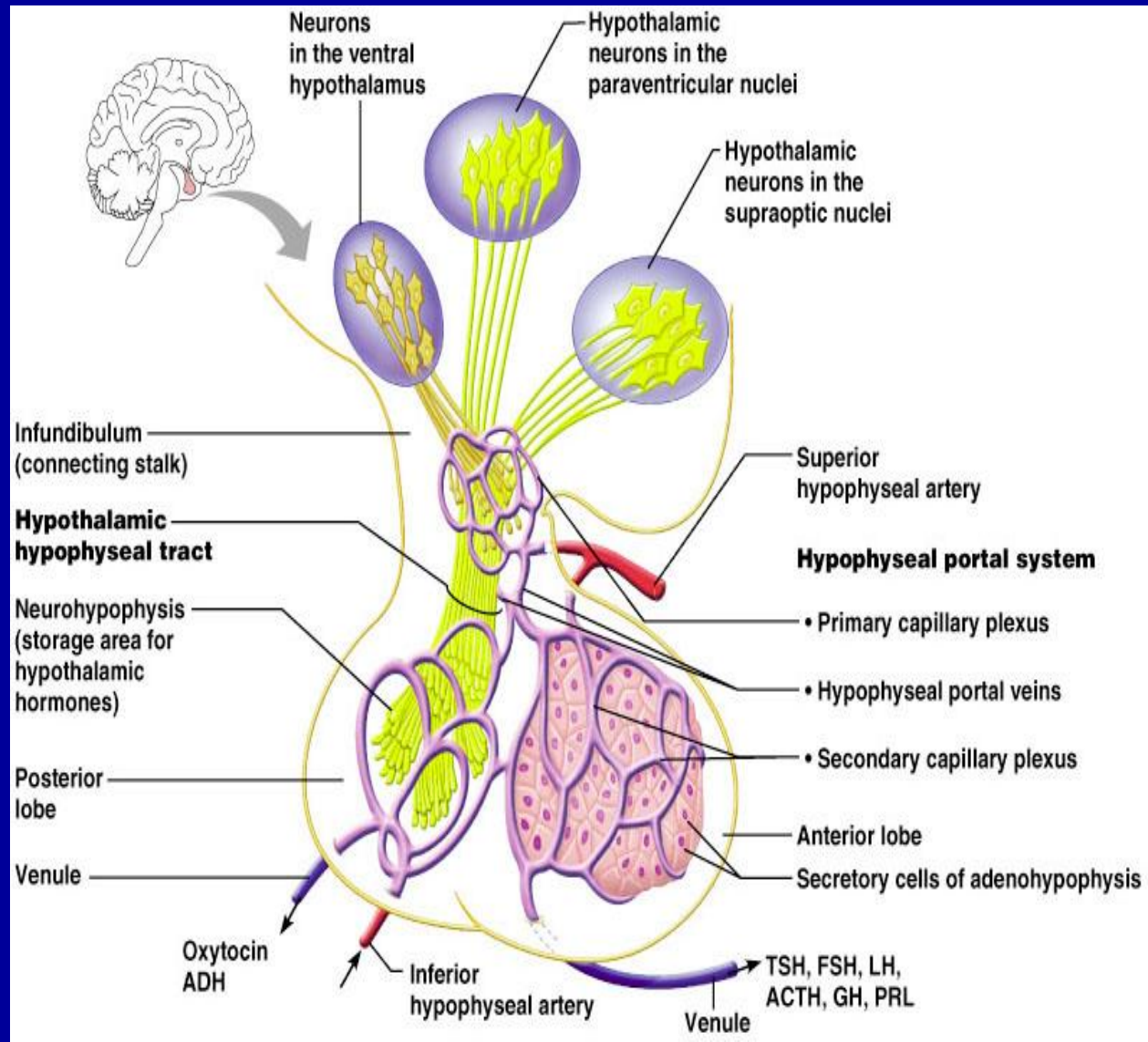


Figure 49-9 Hypothalamic control of the posterior pituitary.



RELATIONSHIP OF THE HYPOTHALAMUS TO THE ANTERIOR PITUITARY

collection of endocrine glands.

1- TSH

2- FSH

3- LH

4- GH

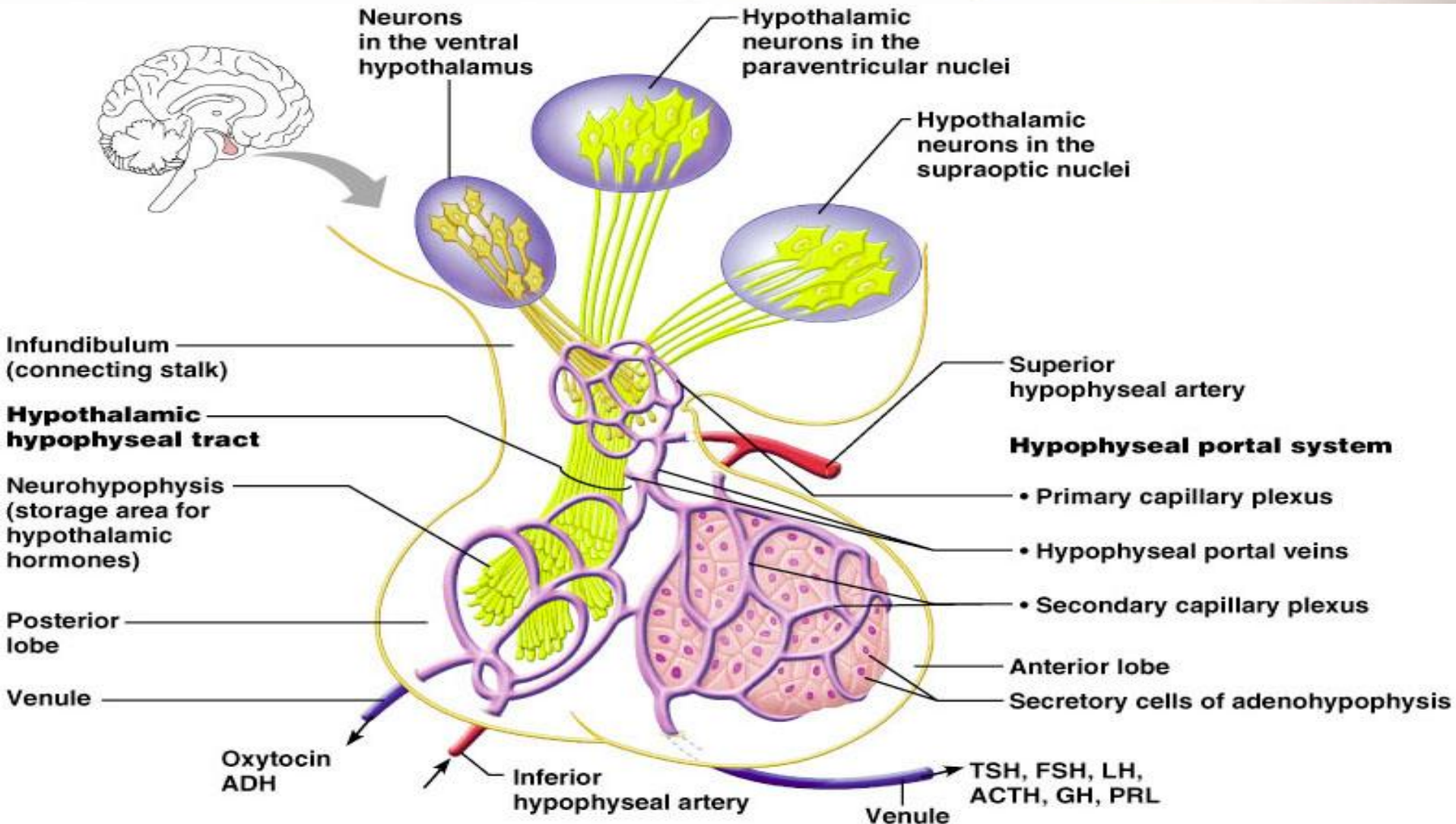
5- PROLACTIN

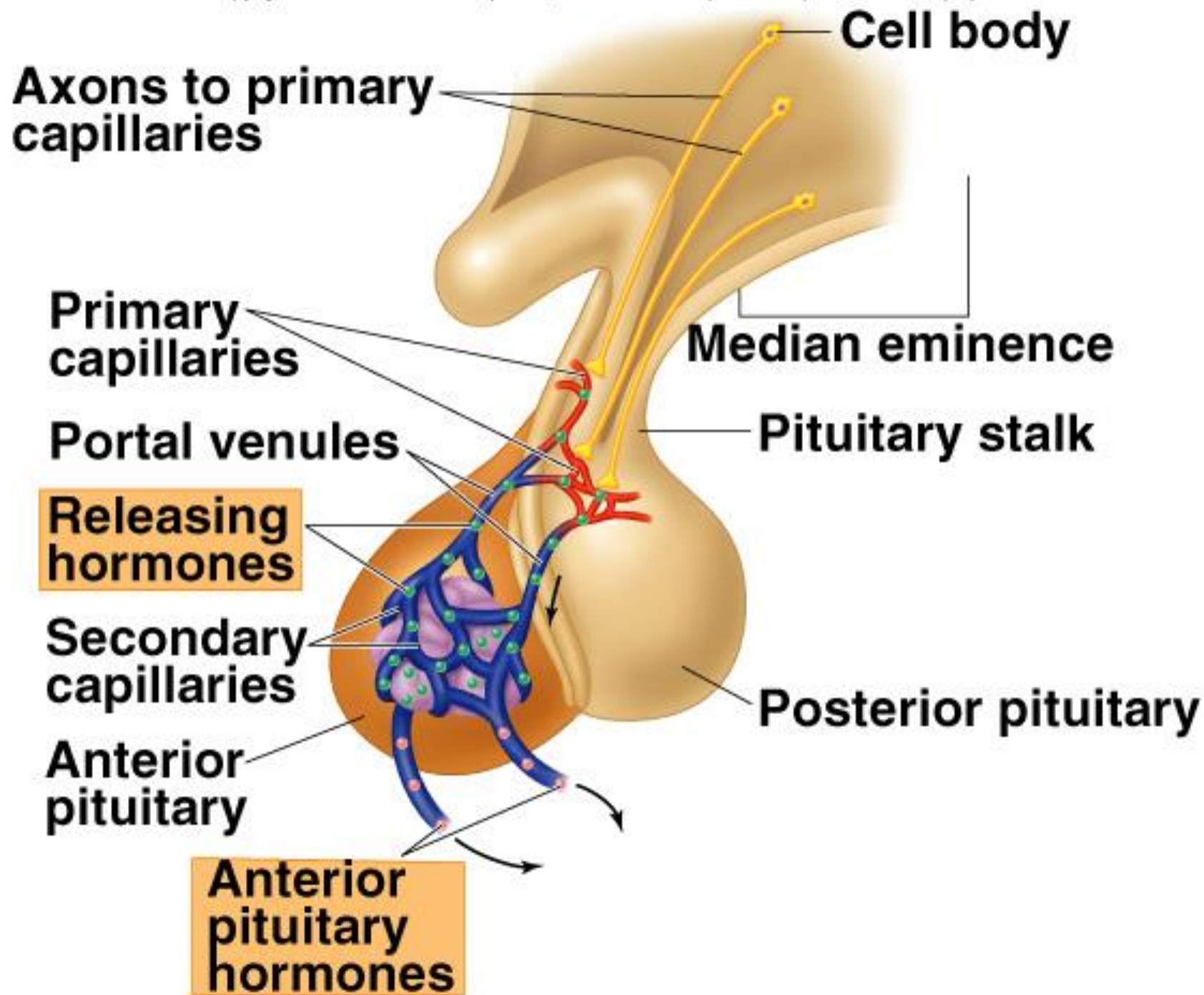
6- ACTH.

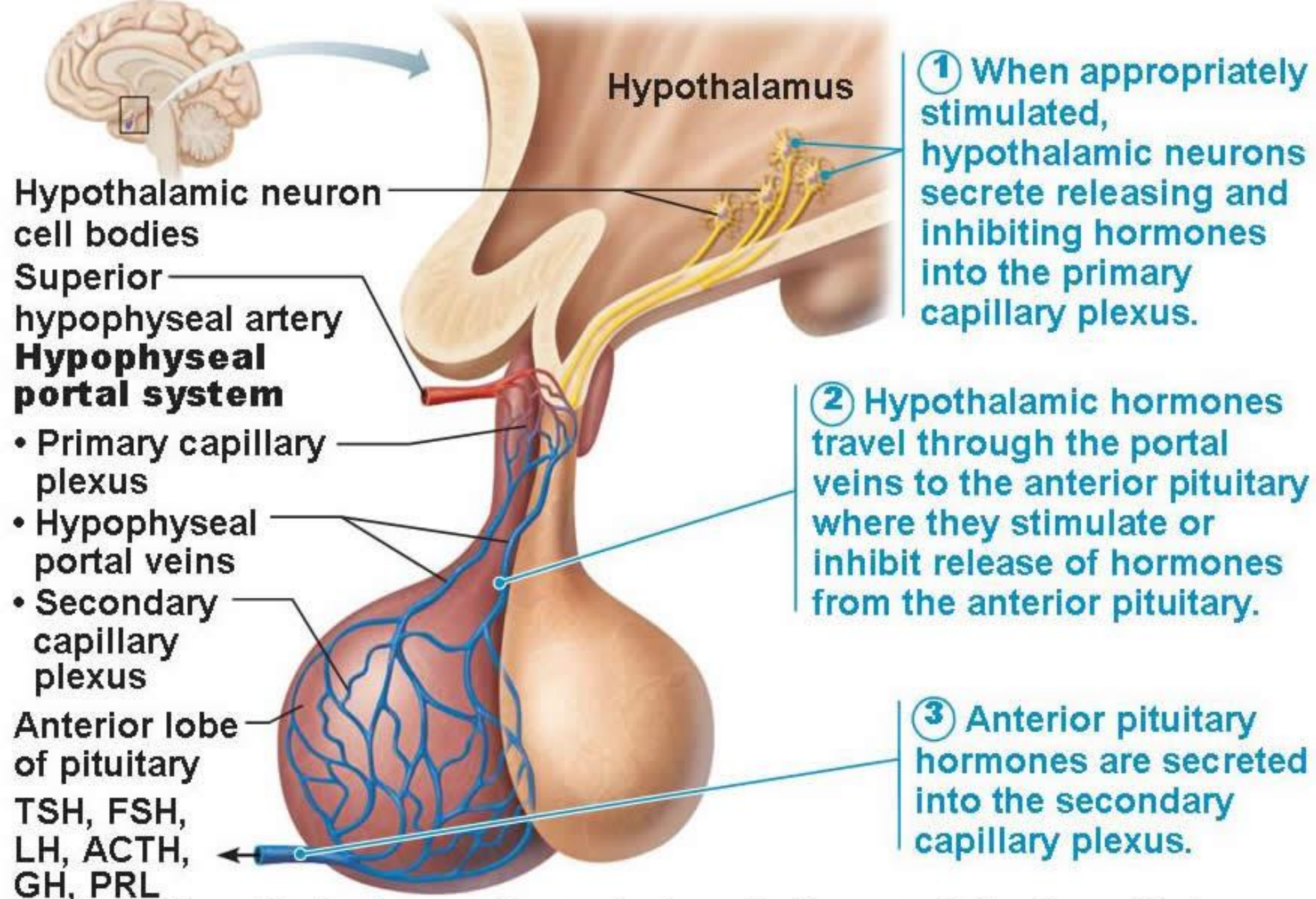
Table 11.6 | Anterior Pituitary Hormones

Hormone	Target Tissue	Principal Actions	Regulation of Secretion
ACTH (adrenocorticotrophic hormone)	Adrenal cortex	Stimulates secretion of glucocorticoids	Stimulated by CRH (corticotropin-releasing hormone); inhibited by glucocorticoids
TSH (thyroid-stimulating hormone)	Thyroid gland	Stimulates secretion of thyroid hormones	Stimulated by TRH (thyrotropin-releasing hormone); inhibited by thyroid hormones
GH (growth hormone)	Most tissue	Promotes protein synthesis and growth; lipolysis and increased blood glucose	Inhibited by somatostatin; stimulated by growth hormone-releasing hormone
FSH (follicle-stimulating hormone)	Gonads	Promotes gamete production and stimulates estrogen production in females	Stimulated by GnRH (gonadotropin-releasing hormone); inhibited by sex steroids and inhibin
PRL (prolactin)	Mammary glands and other sex accessory organs	Promotes milk production in lactating females; additional actions in other organs	Inhibited by PIH (prolactin-inhibiting hormone)
LH (luteinizing hormone)	Gonads	Stimulates sex hormone secretion; ovulation and corpus luteum formation in females; stimulates testosterone secretion in males	Stimulated by GnRH; inhibited by sex steroids

HYPOTHALAMIC-HYPOPHYSIAL PORTAL SYSTEM



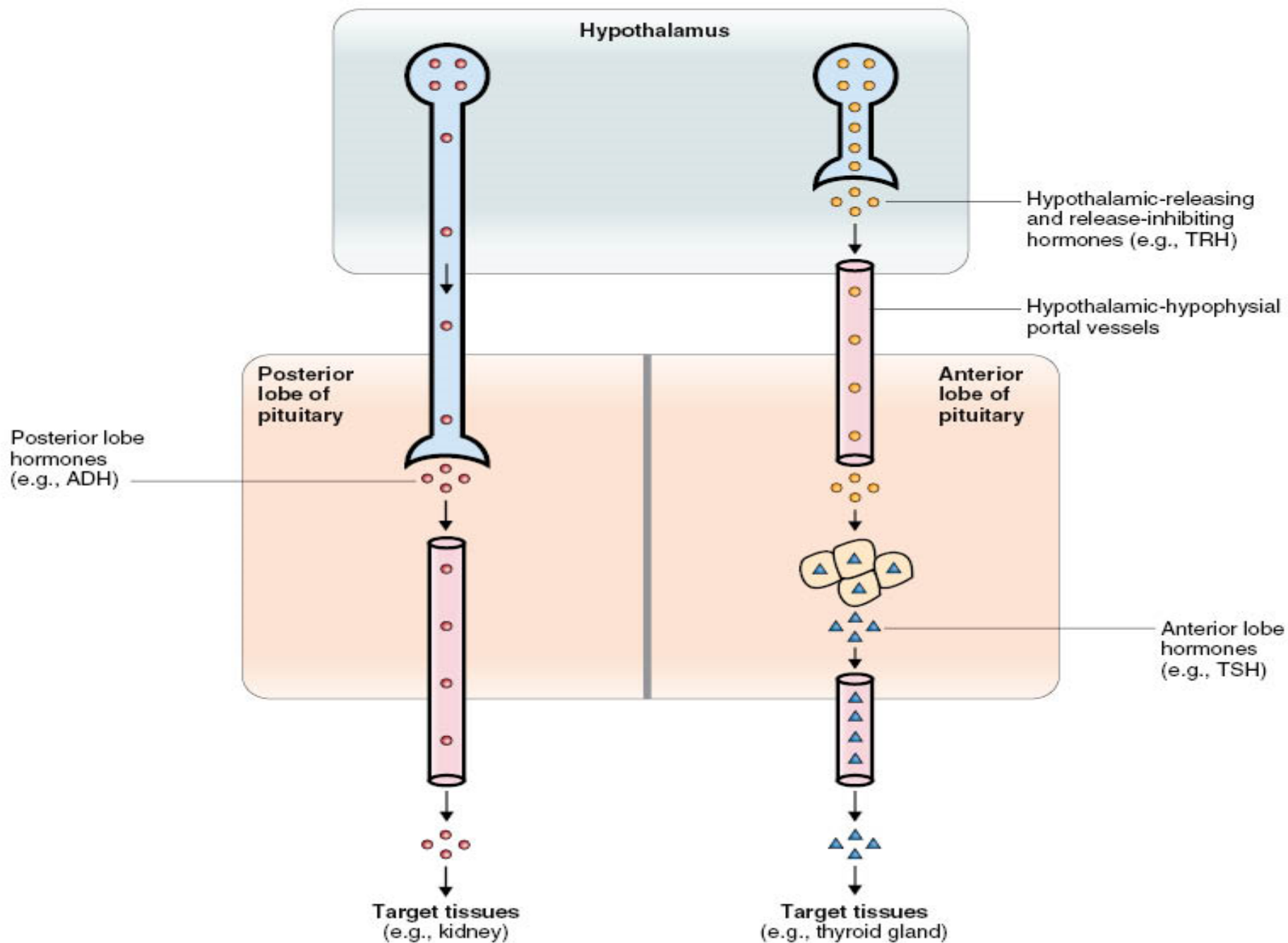




(b) Relationship between the anterior pituitary and the hypothalamus

- **Both neural and endocrine.**

HYPOTHALAMIC-PITUITARY RELATIONSHIPS



NEGATIVE FEEDBACK MECHANISM

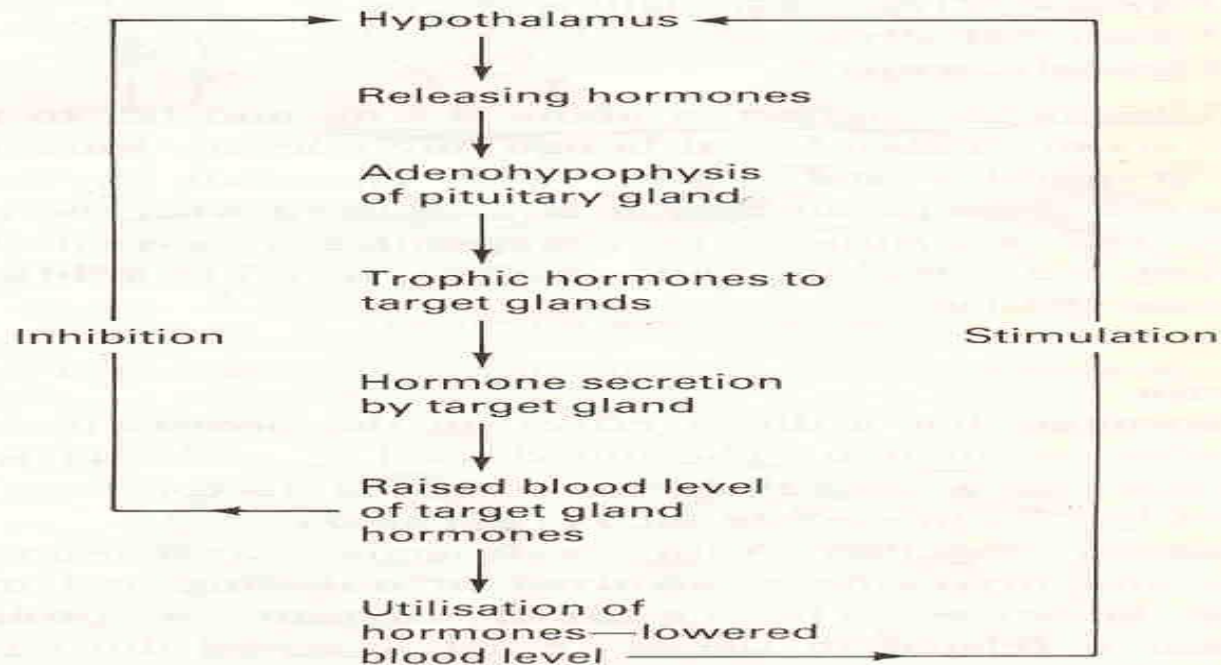
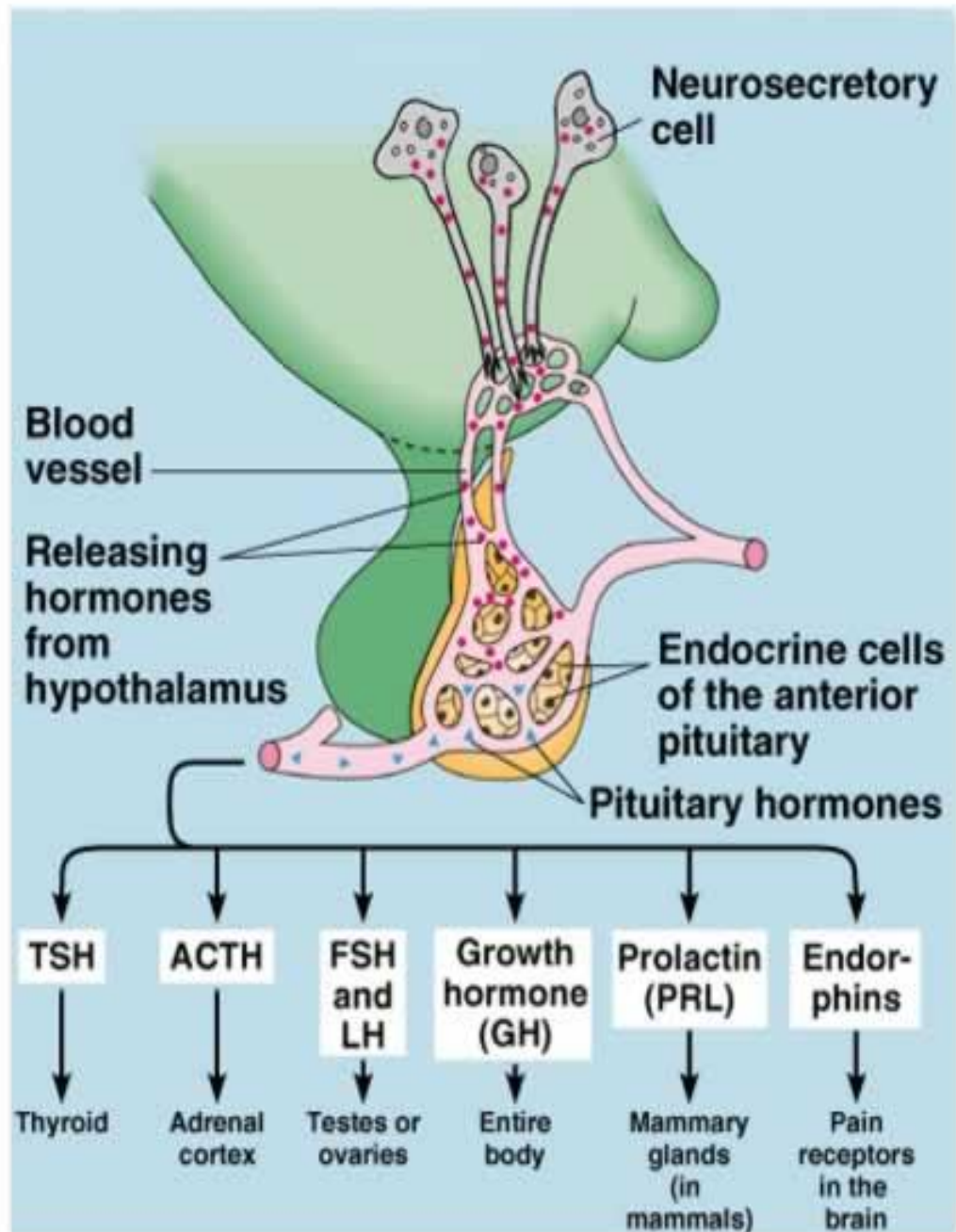
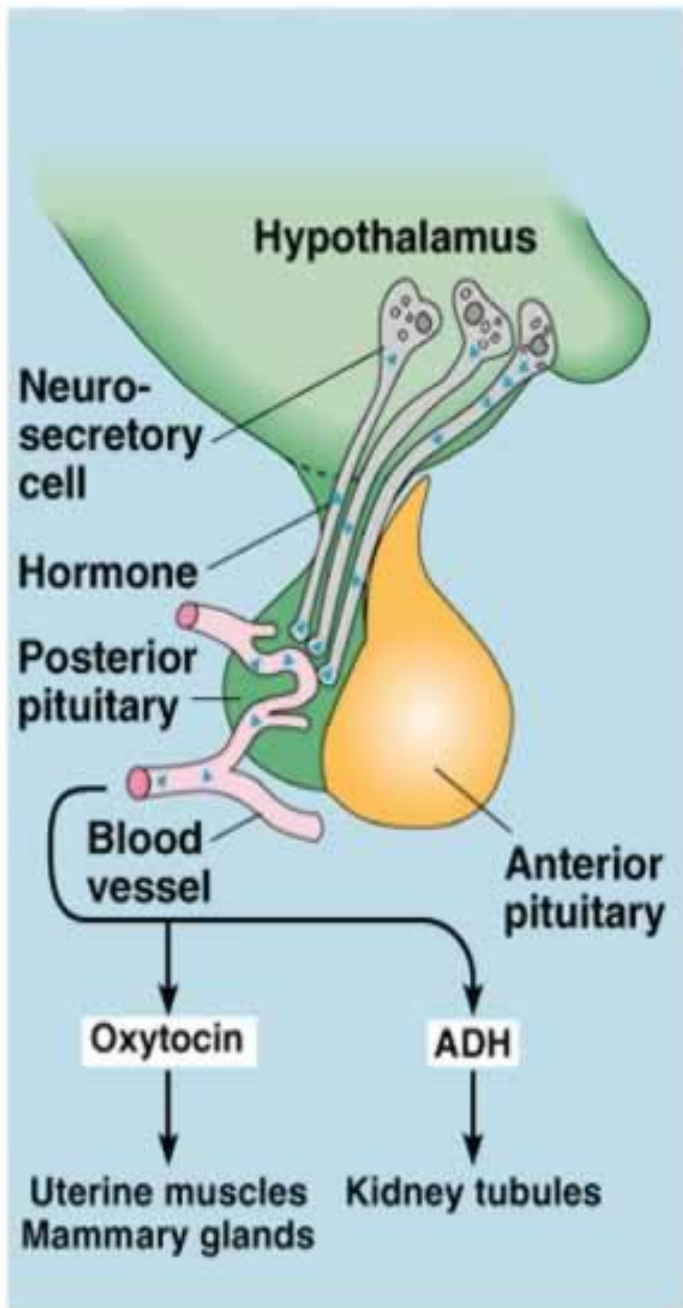


Figure 14:4 Diagram of the negative feedback regulation of the secretions of hormones by the anterior lobe of the pituitary gland.



Adrees@ksu.edu.sa

