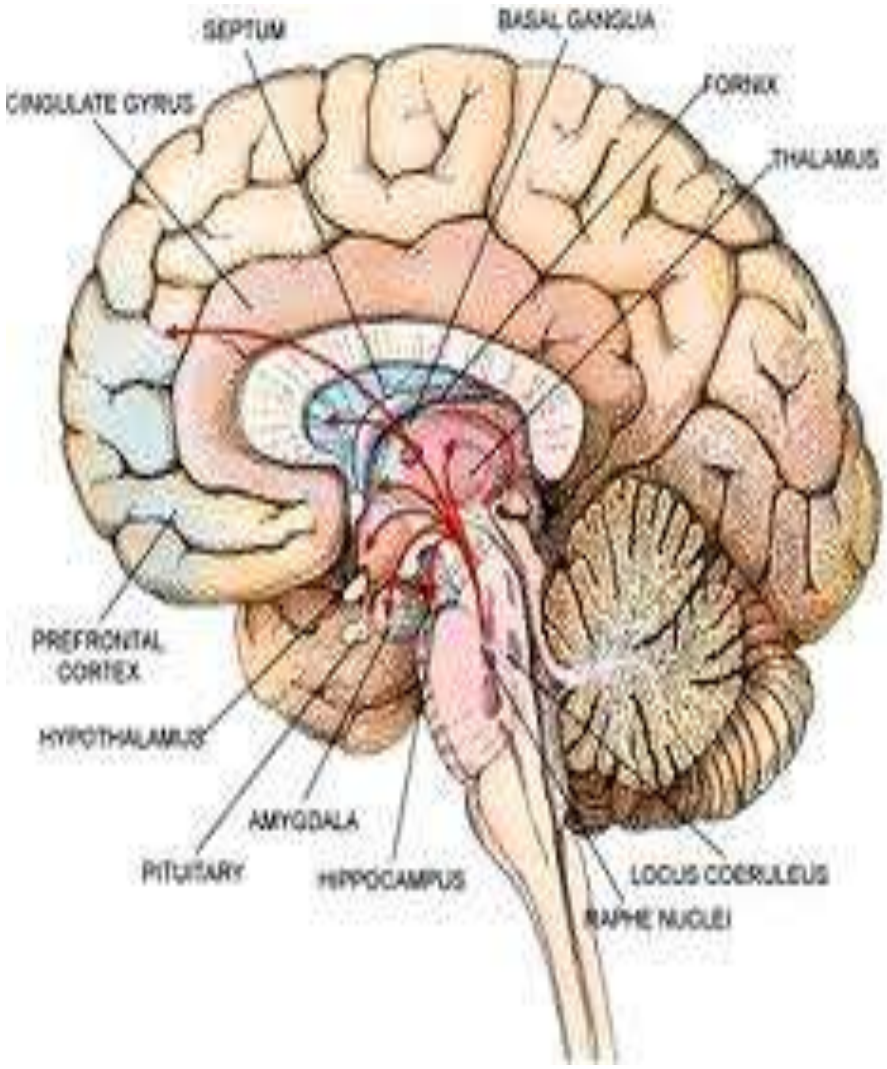
HYPOTHALAMIC-PITUITARY AXIS

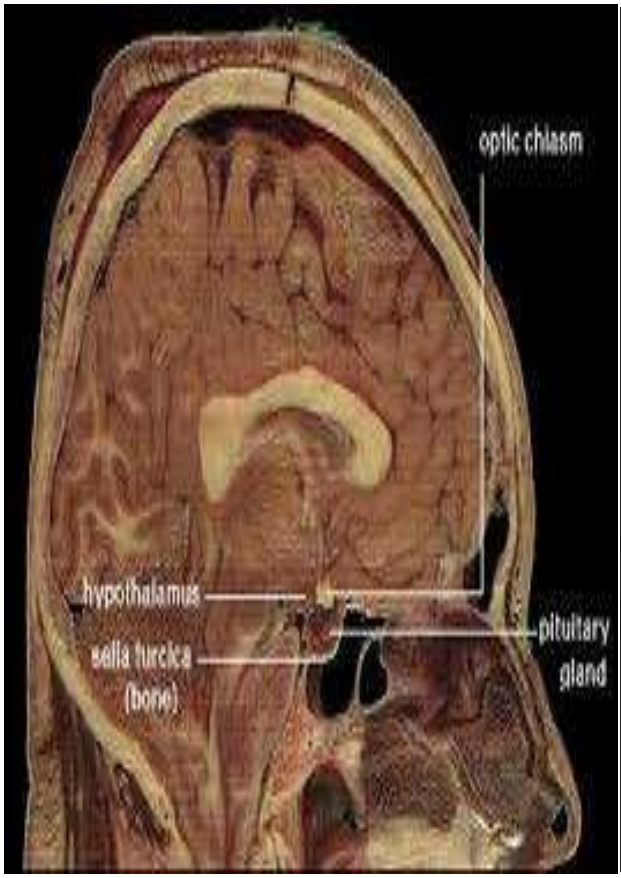
HYPOTHALAMIC-PITUITARY AXIS

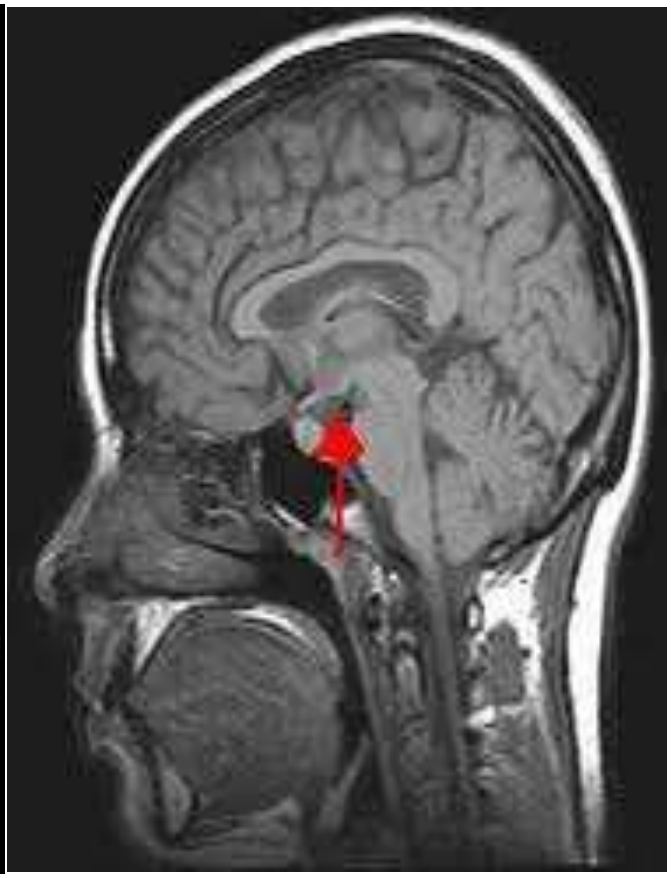
- **Coordinate.**
- **Thyroid gland, adrenal gland, reproductive gland, control growth, milk production, osmoregulation.**
-

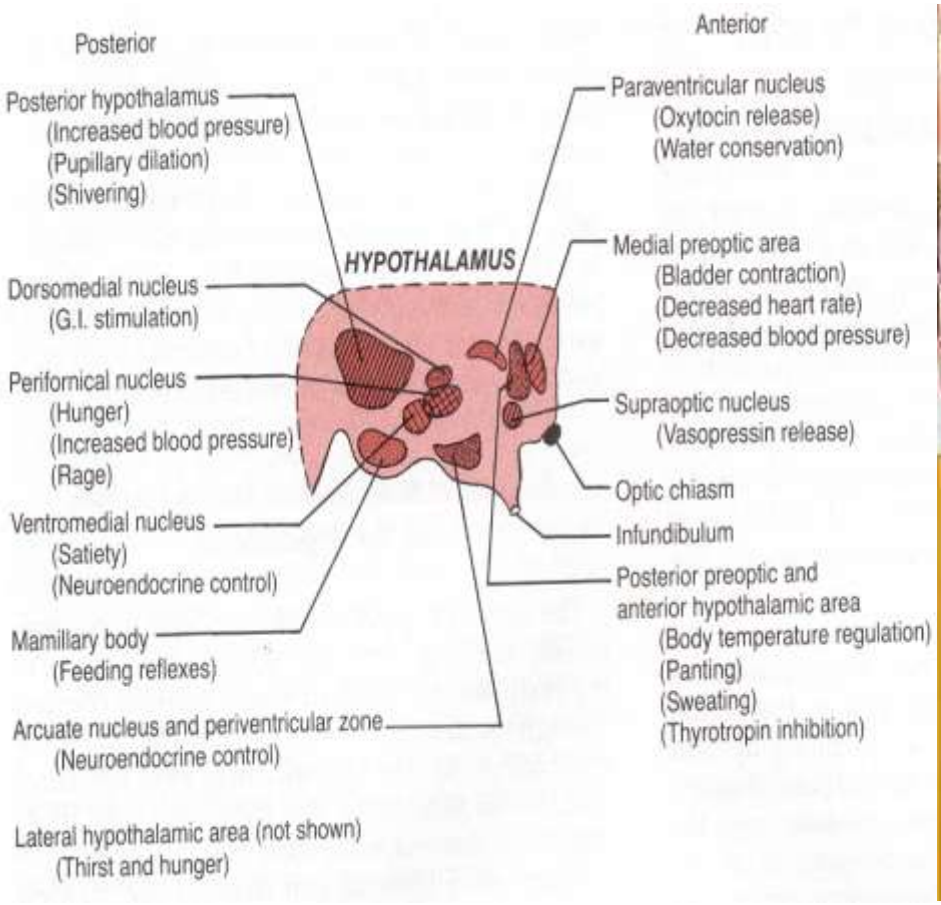
HYPOTHALAMUS

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




optic chiasm
hypothalamus
sella turcica
(bone)
pituitary
gland




Posterior
Anterior
Posterior hypothalamus
(Increased blood pressure)
(Pupillary dilation)
(Shivering)
Dorsomedial nucleus
(G.I. stimulation)
Perifornical nucleus
(Hunger)
(Increased blood pressure)
(Rage)
Ventromedial nucleus
(Satiety)
(Neuroendocrine control)
Mamillary body
(Feeding reflexes)
Arcuate nucleus and periventricular zone
(Neuroendocrine control)
Lateral hypothalamic area (not shown)
(Thirst and hunger)
HYPOTHALAMUS
Paraventricular nucleus
(Oxytocin release)
(Water conservation)
Medial preoptic area
(Bladder contraction)
(Decreased heart rate)
(Decreased blood pressure)
Supraoptic nucleus
(Vasopressin release)
Optic chiasm
Infundibulum
Posterior preoptic and
anterior hypothalamic area
(Body temperature regulation)
(Panting)
(Sweating)
(Thyrotropin inhibition)

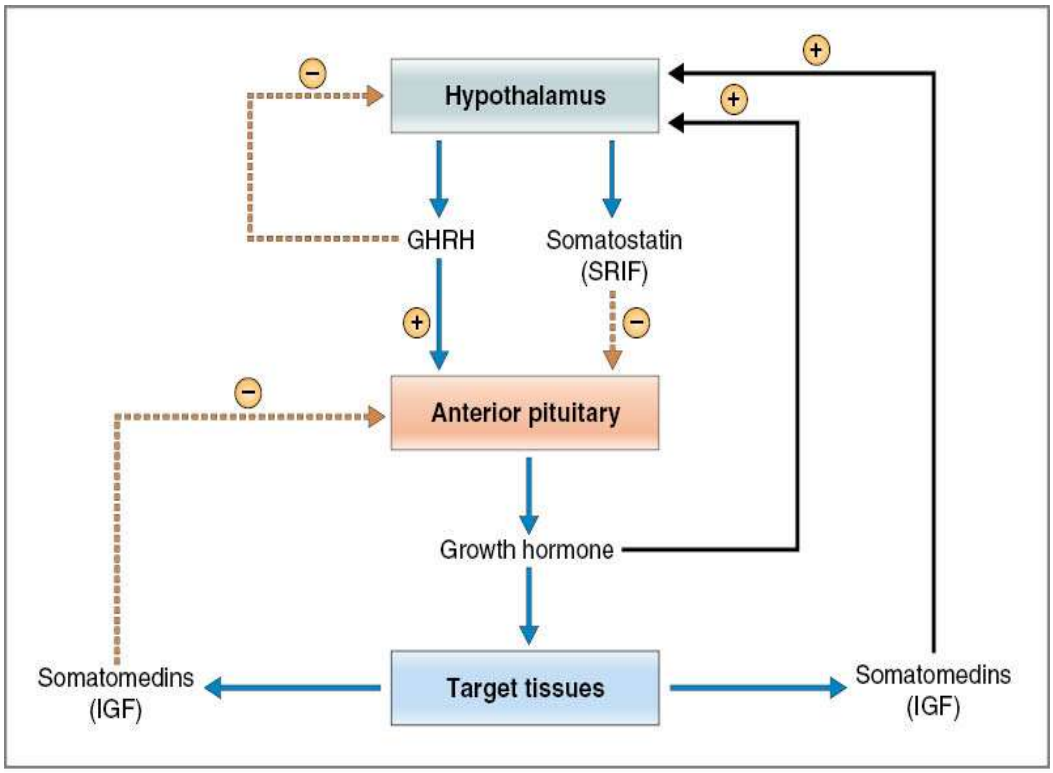
HORMONES

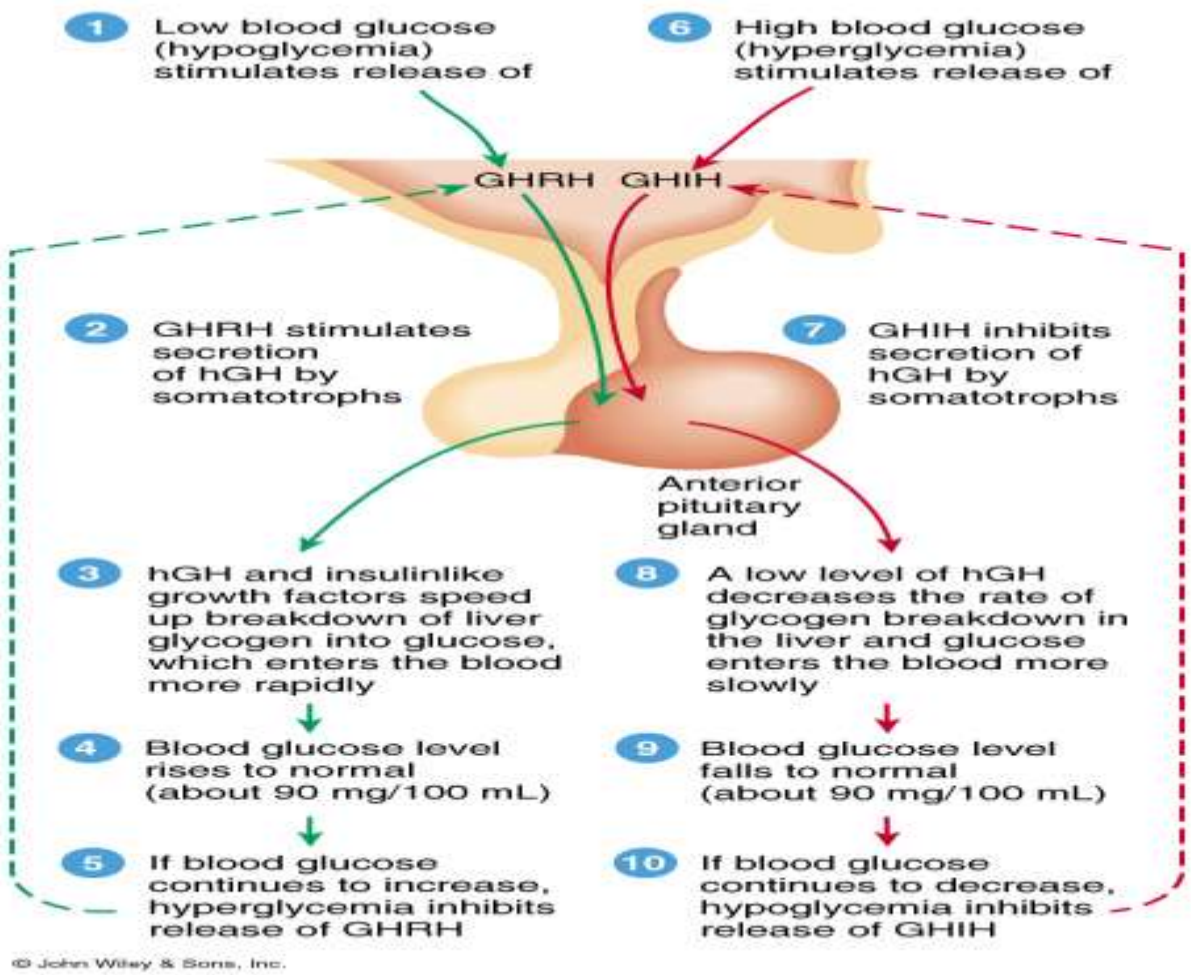
- **TRH.**
- **CRH.**
- **GnRH.**
- **PIF.**
- **GHRH.**

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

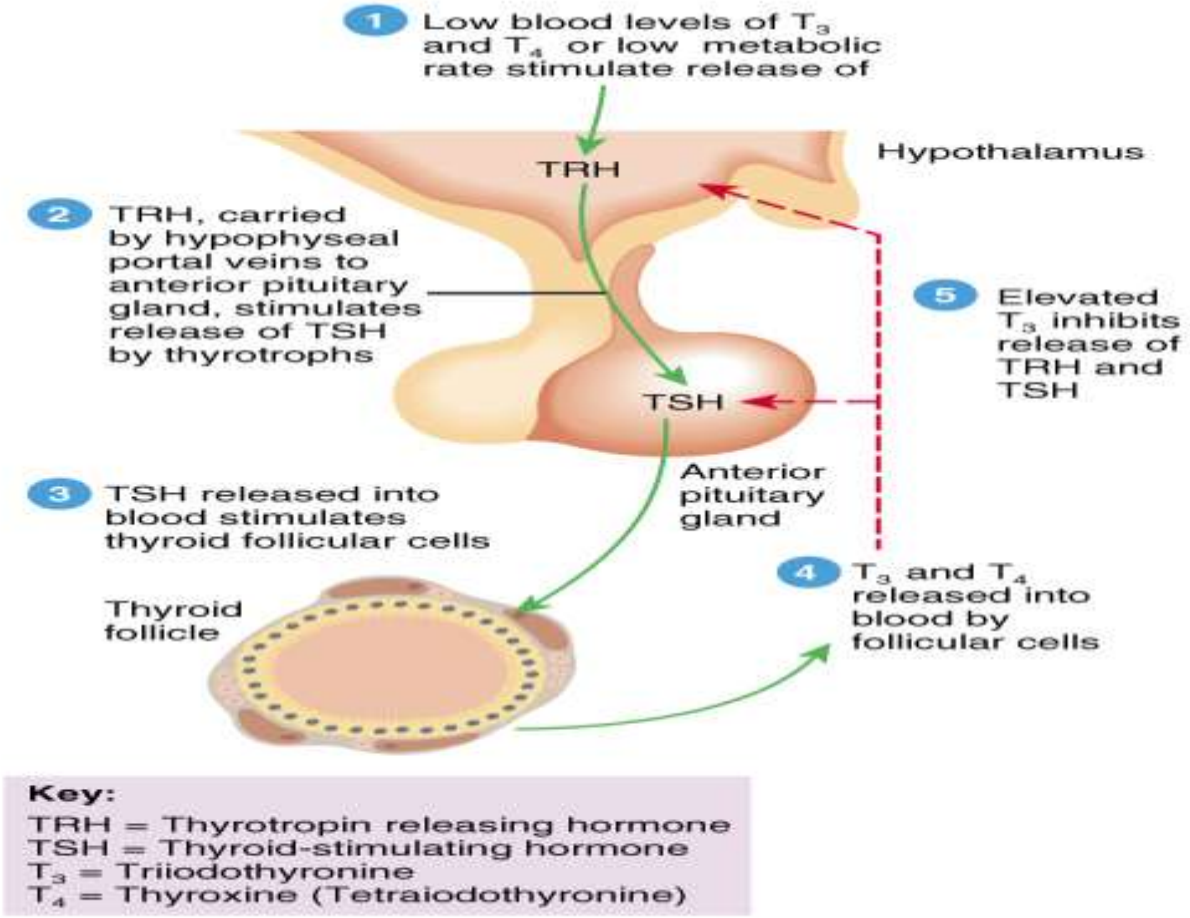
Gland of Origin	Hormones*	Chemical Classification†	Major Actions
Hypothalamus	Thyrotropin-releasing hormone (TRH)	Peptide	Stimulates secretion of TSH and prolactin
	Corticotropin-releasing hormone (CRH)	Peptide	Stimulates secretion of ACTH
	Gonadotropin-releasing hormone (GnRH)	Peptide	Stimulates secretion 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

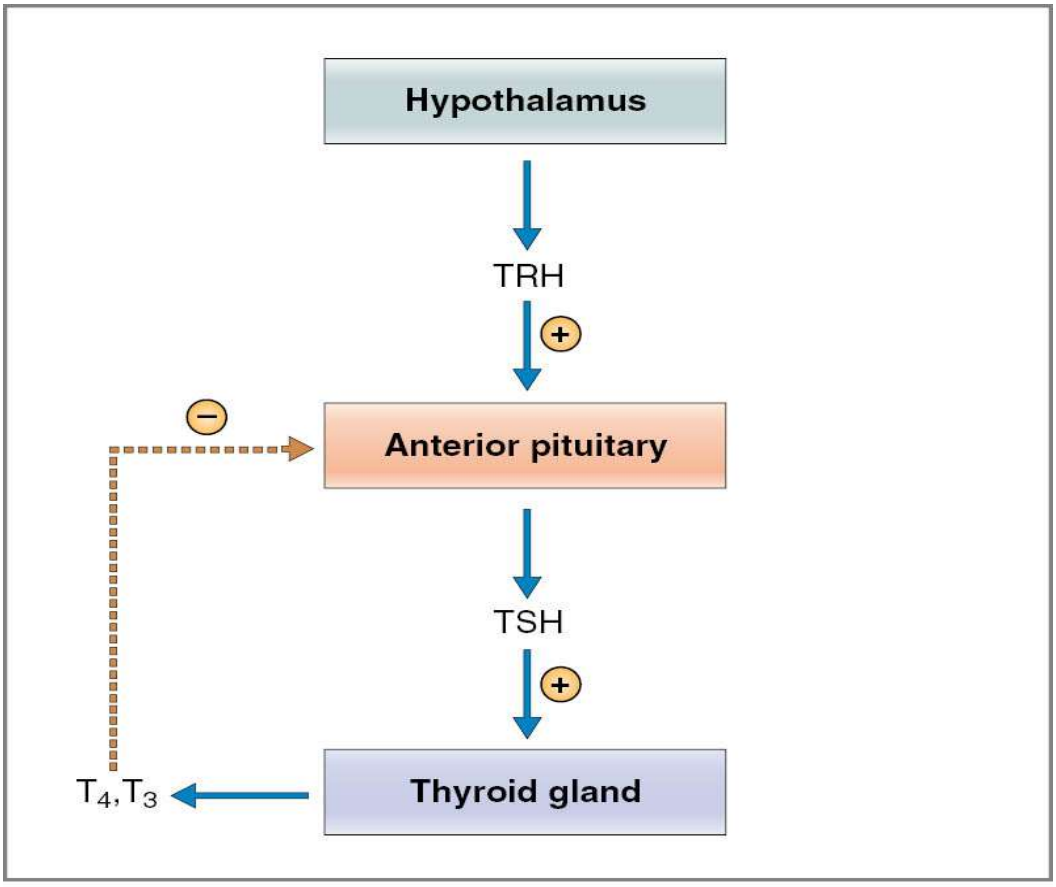
GHRH/GHIH(SRIF)



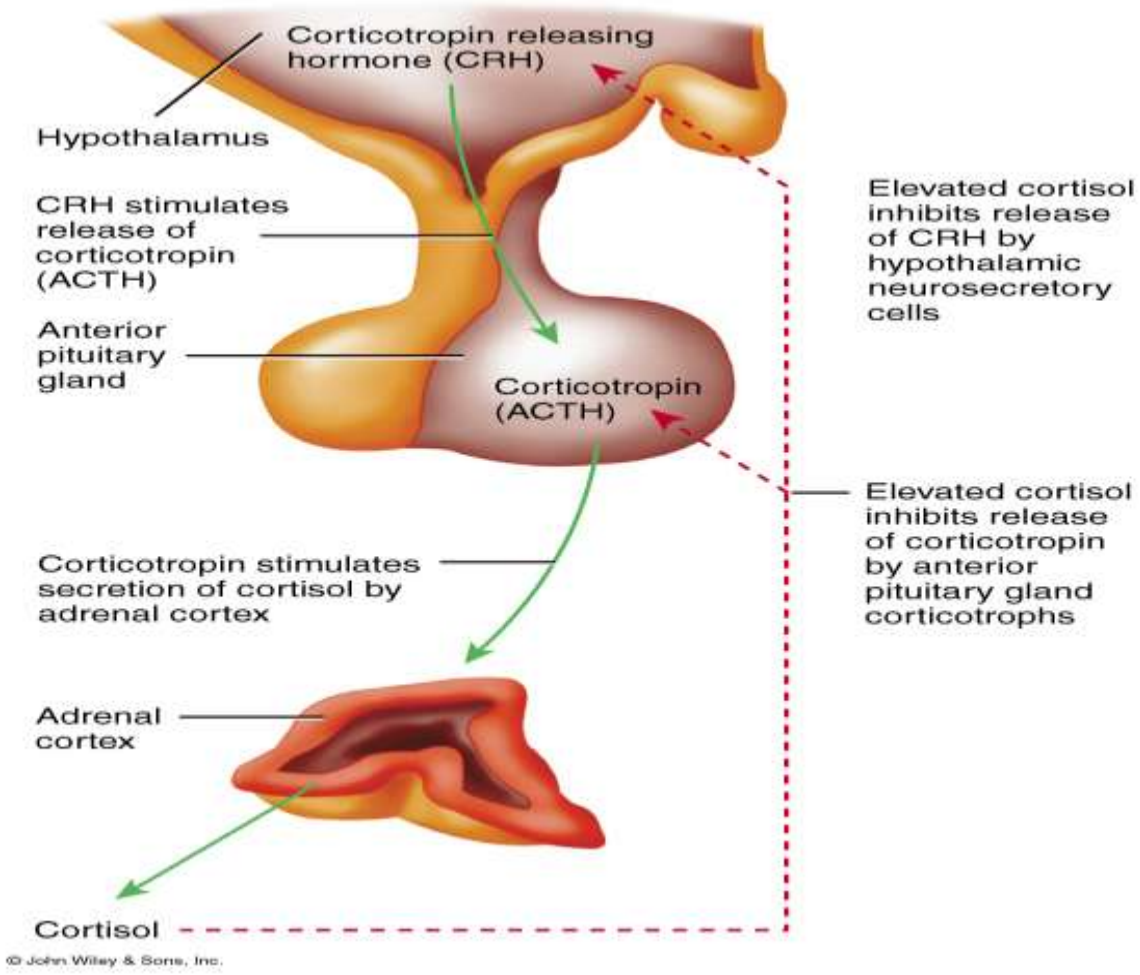


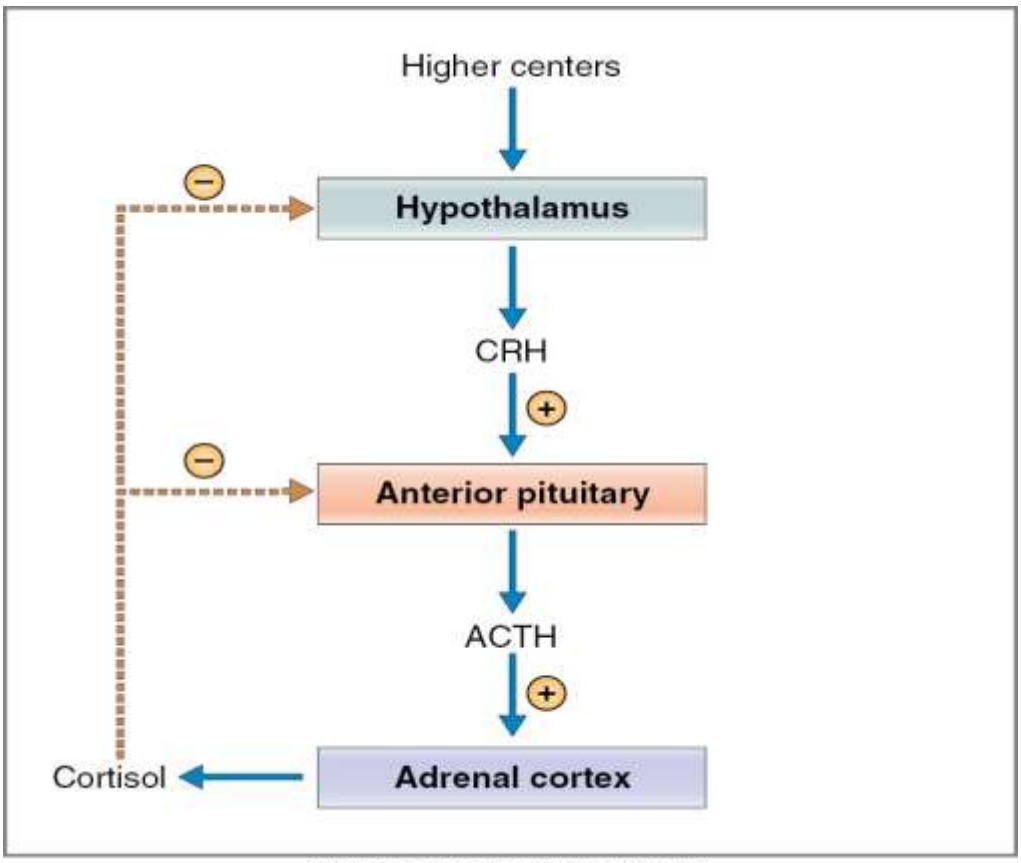
TRH





CRH


Corticotropin releasing hormone (CRH)
Hypothalamus
CRH stimulates release of corticotropin (ACTH)
Anterior pituitary gland
Corticotropin (ACTH)
Elevated cortisol inhibits release of CRH by hypothalamic neurosecretory cells
Elevated cortisol inhibits release of corticotropin by anterior pituitary gland corticotrophs
Corticotropin stimulates secretion of cortisol by adrenal cortex
Adrenal cortex
Cortisol
© John Wiley & Sons, Inc.


Higher centers
Hypothalamus
CRH
Anterior pituitary
ACTH
Adrenal cortex
Cortisol
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GnRH

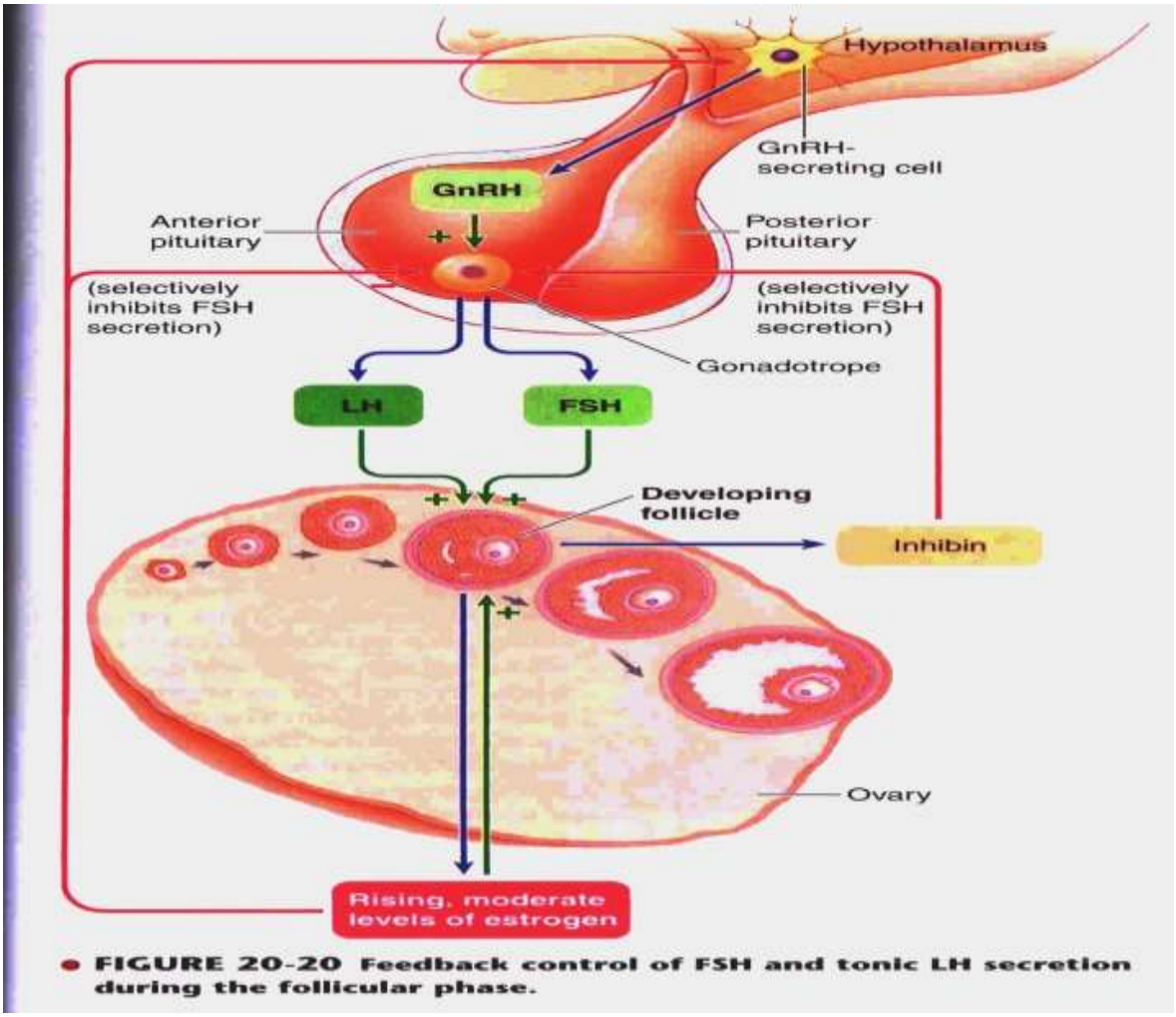
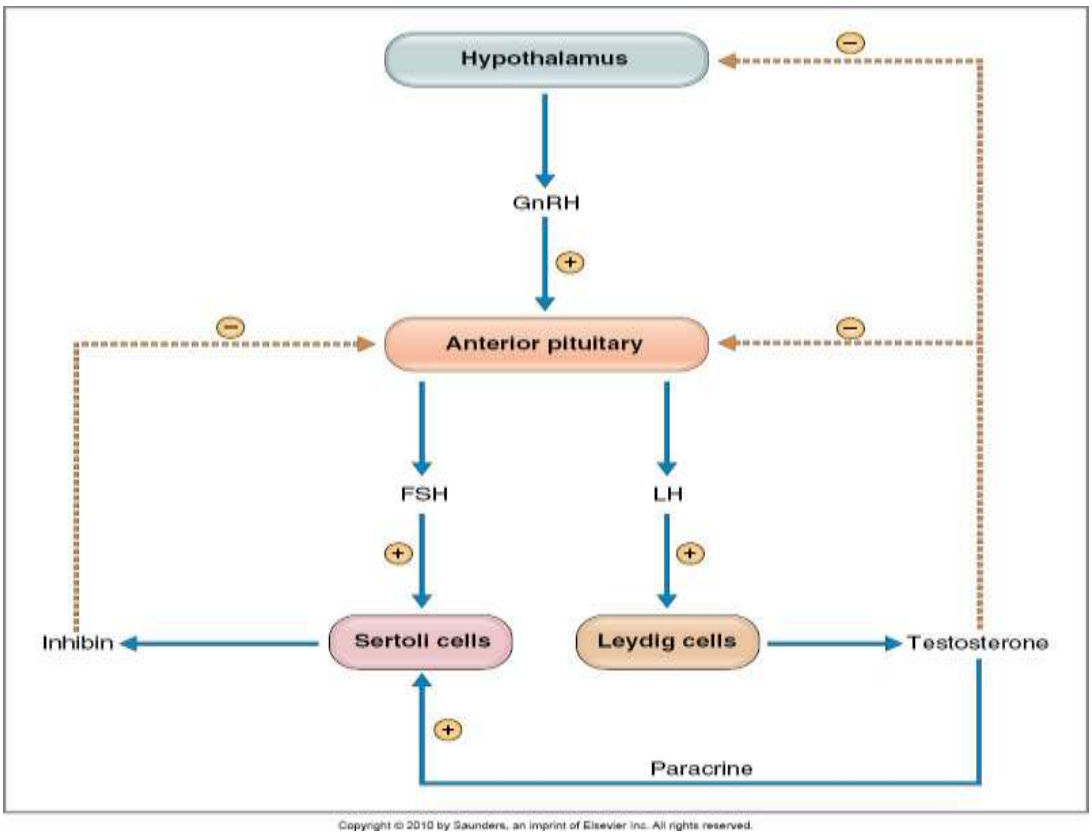
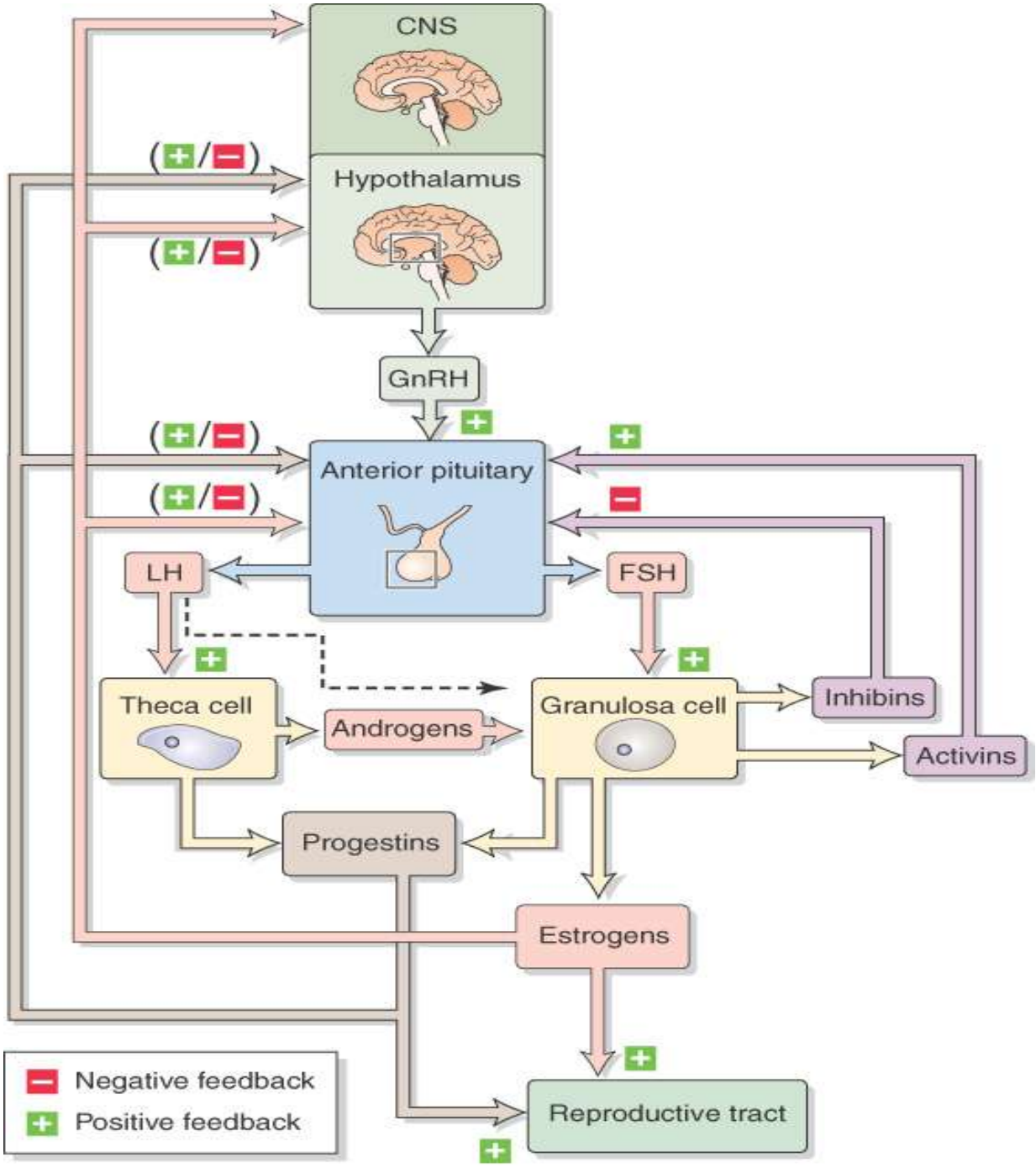


FIGURE 20-20 Feedback control of FSH and tonic LH secretion during the follicular phase.





PIH

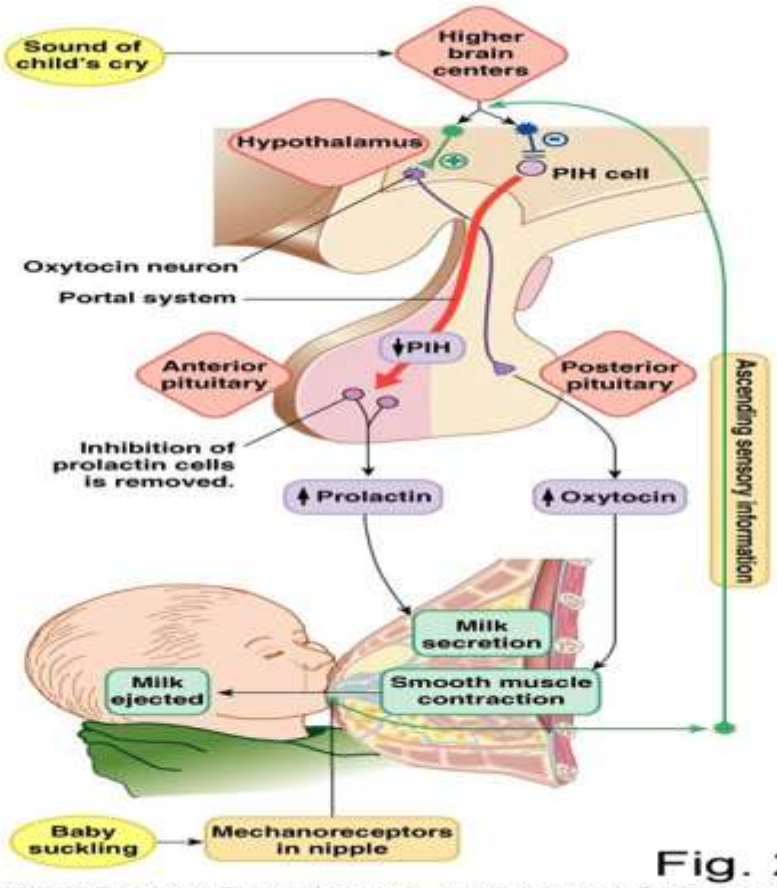
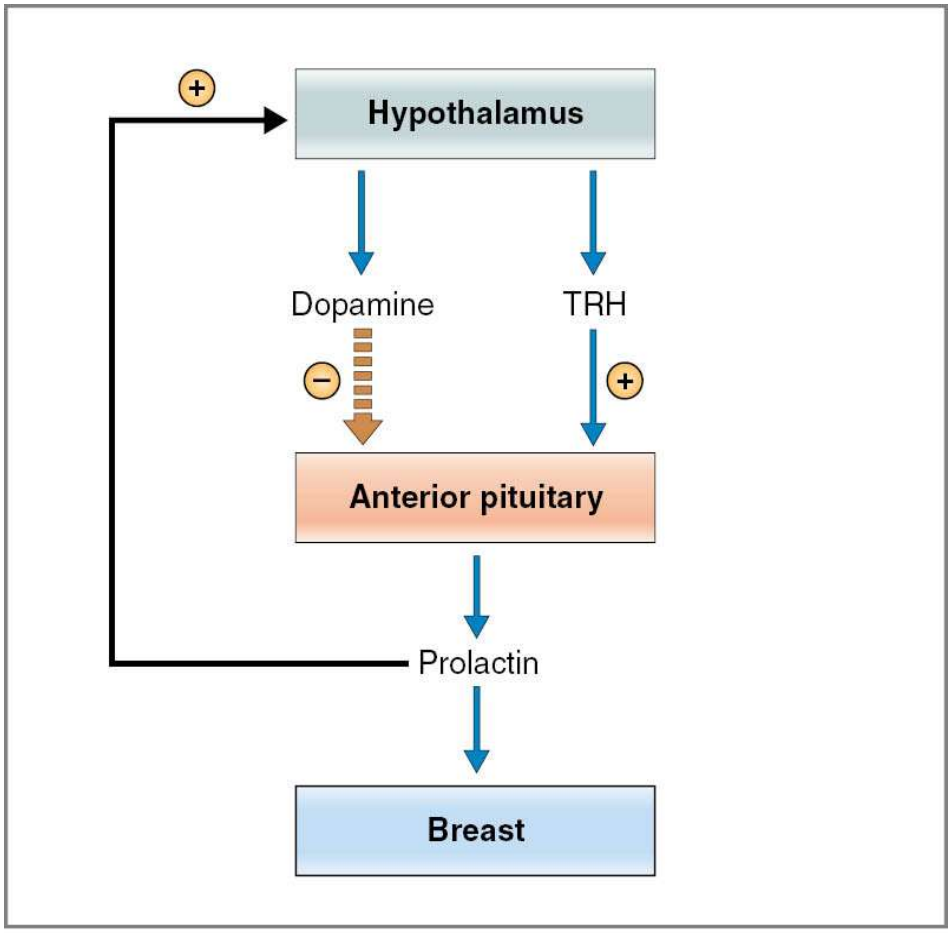
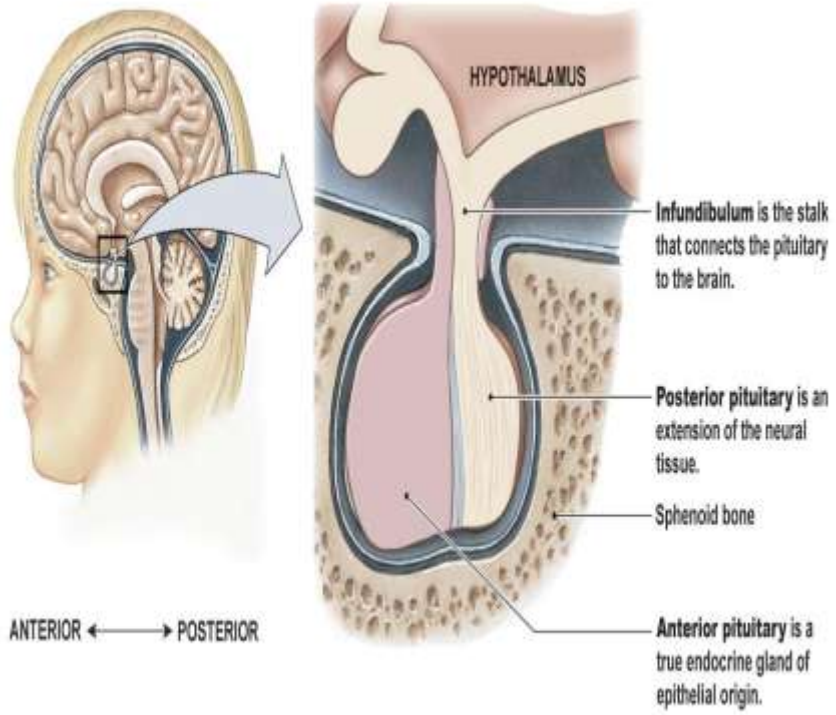


Fig. 26-23



PITUITARY GLAND

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



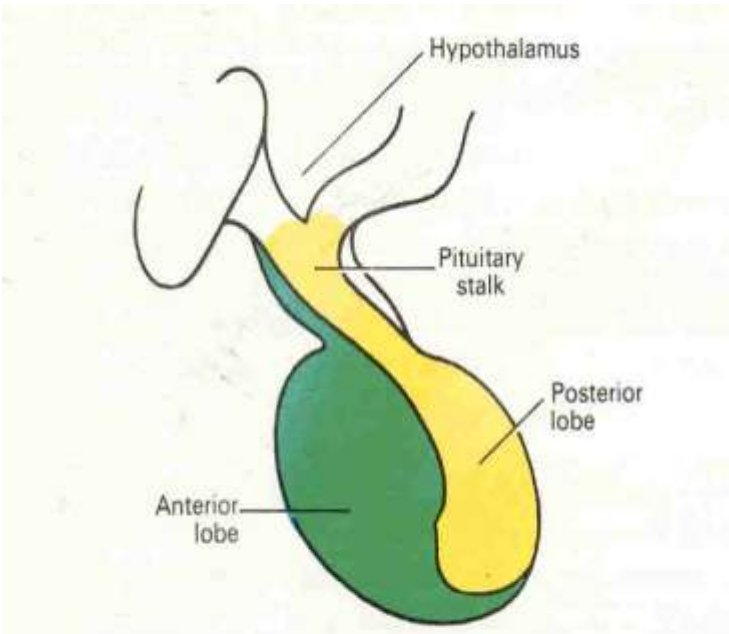


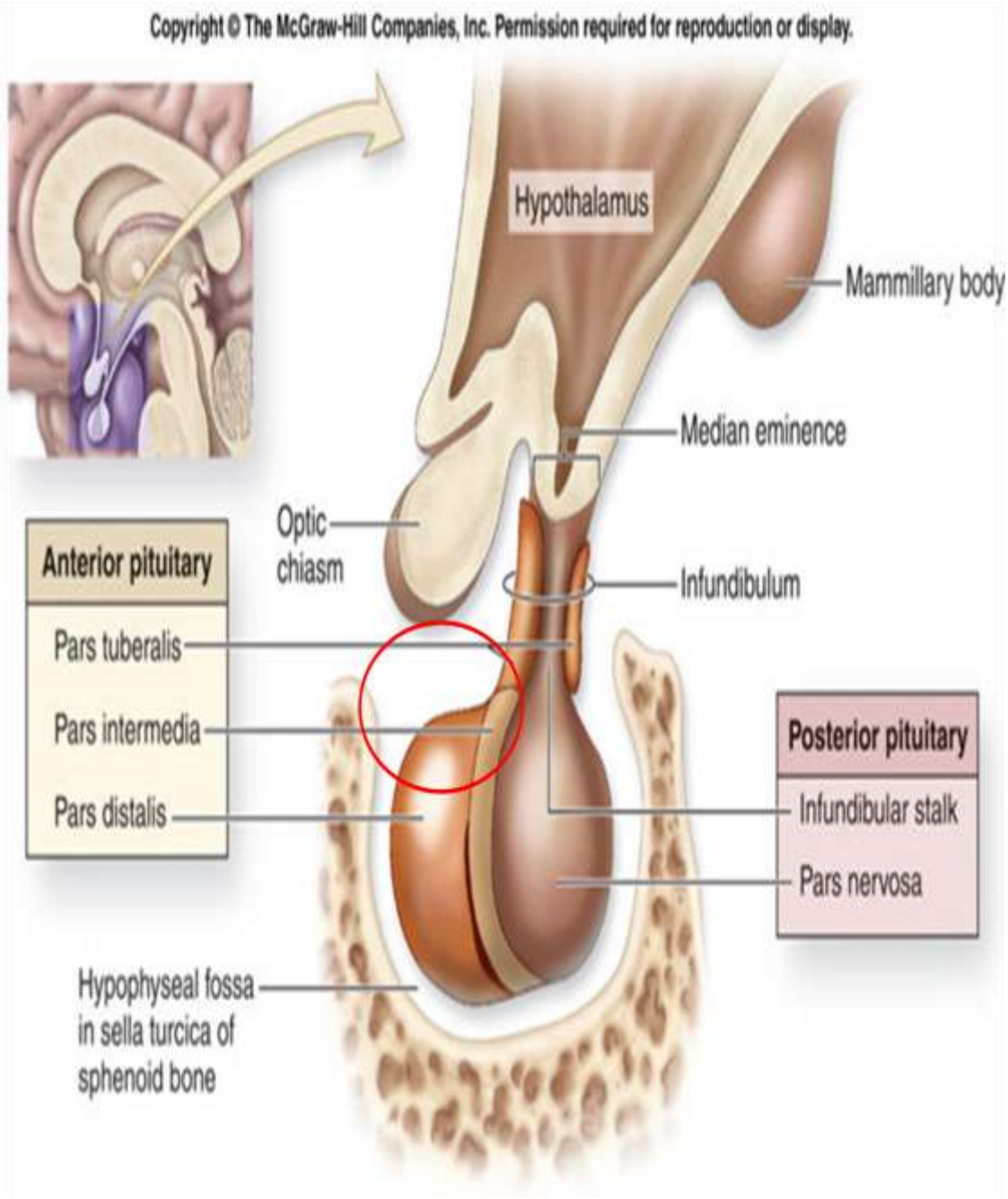
Figure 14:3 The parts of the pituitary gland and its relation to the hypothalamus.

STRUCTURE

Anterior lobe (adenohypophysis).

Posterior lobe (neurohypophysis).

Infundibulum.



RELATIONSHIP OF THE HYPOTHALAMUS TO THE POSTERIOR PITUITARY

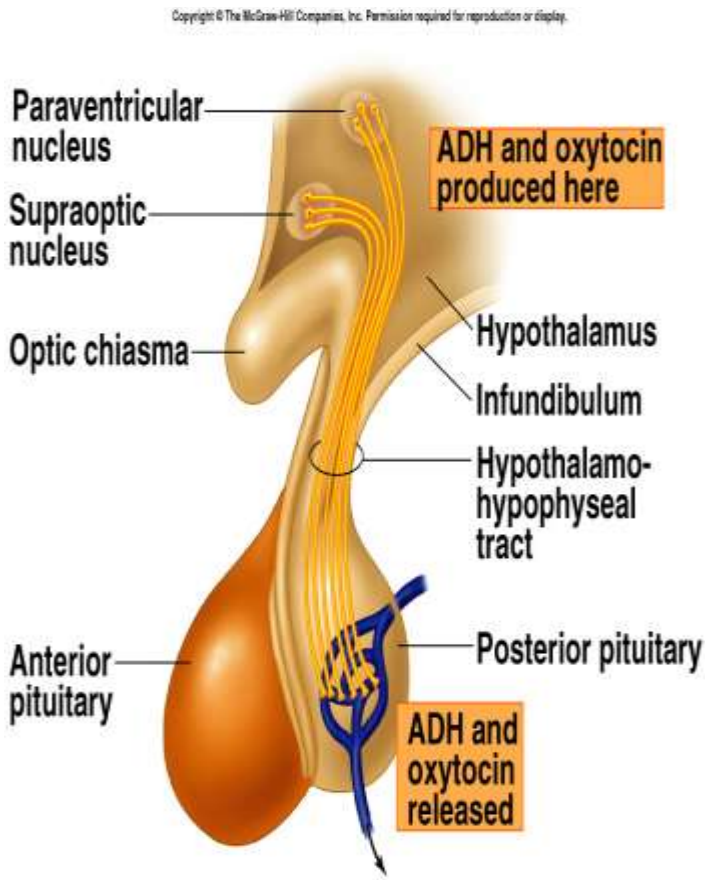
Collection of nerve axons +supporting cells.

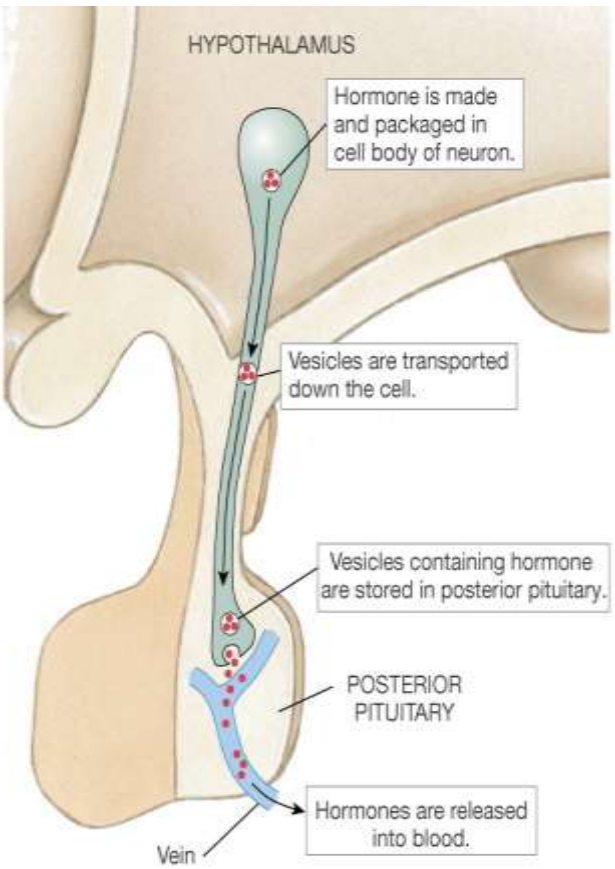
1- Antidiuretic hormone (ADH).

Supraoptic nuclei.

2- Oxytocin.

Paraventricular nuclei.





HYPOTHALAMO-NEURO HYPOPHYSIAL TRACT

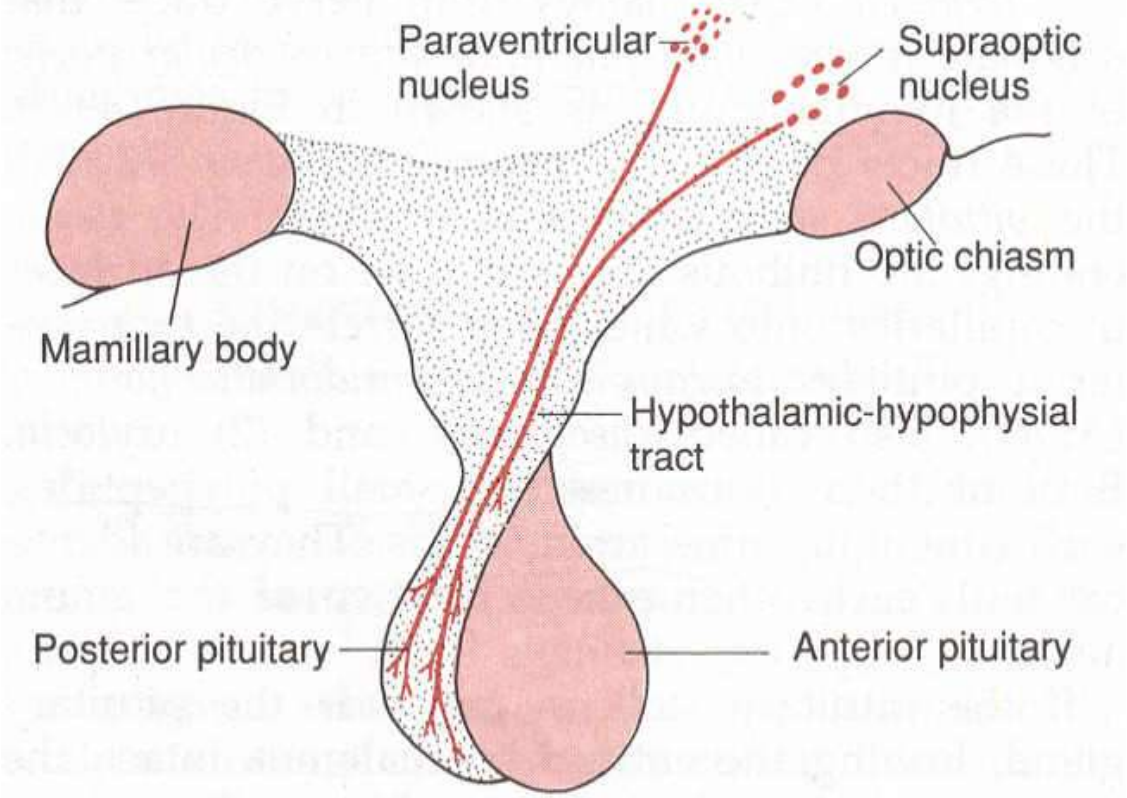
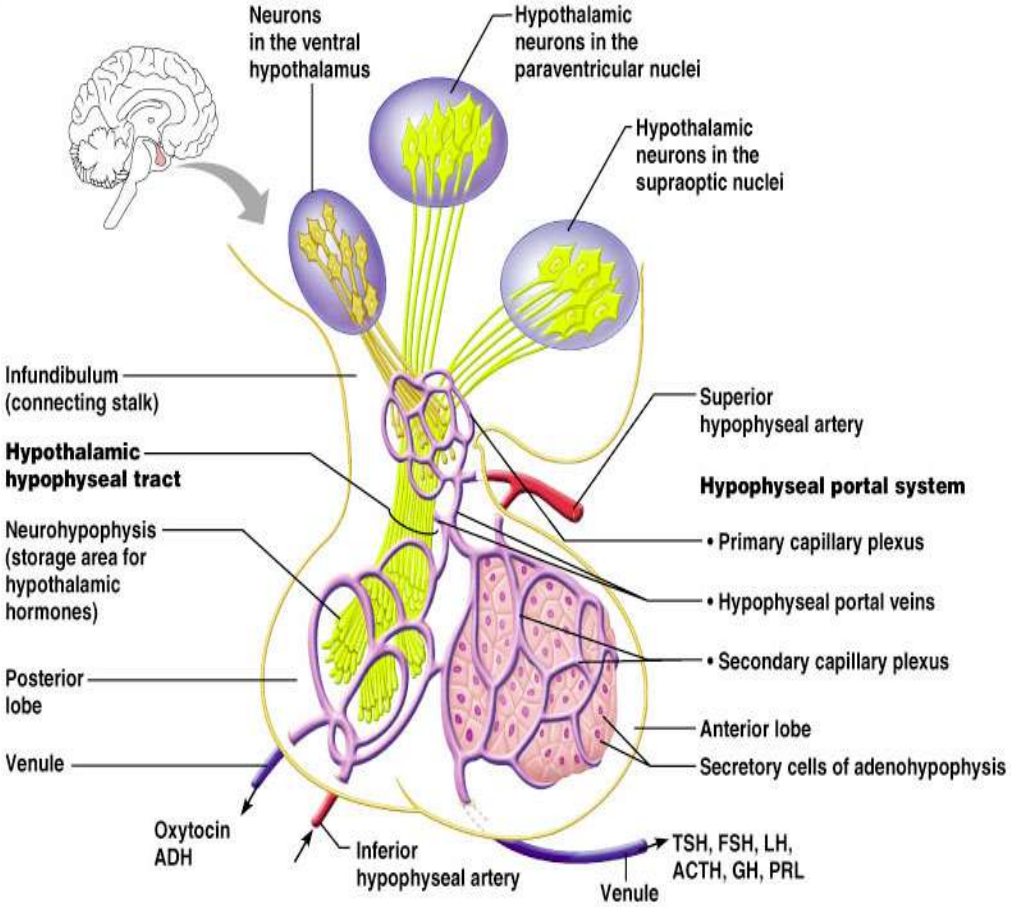


Figure 49–9 Hypothalamic control of the posterior pituitary.



RELATIONSHIP OF THE HYPOTHALAMUS TO THE ANTERIOR PITUITARY

collection of endocrine glands.

1- TSH

2- FSH

3- LH

4- GH

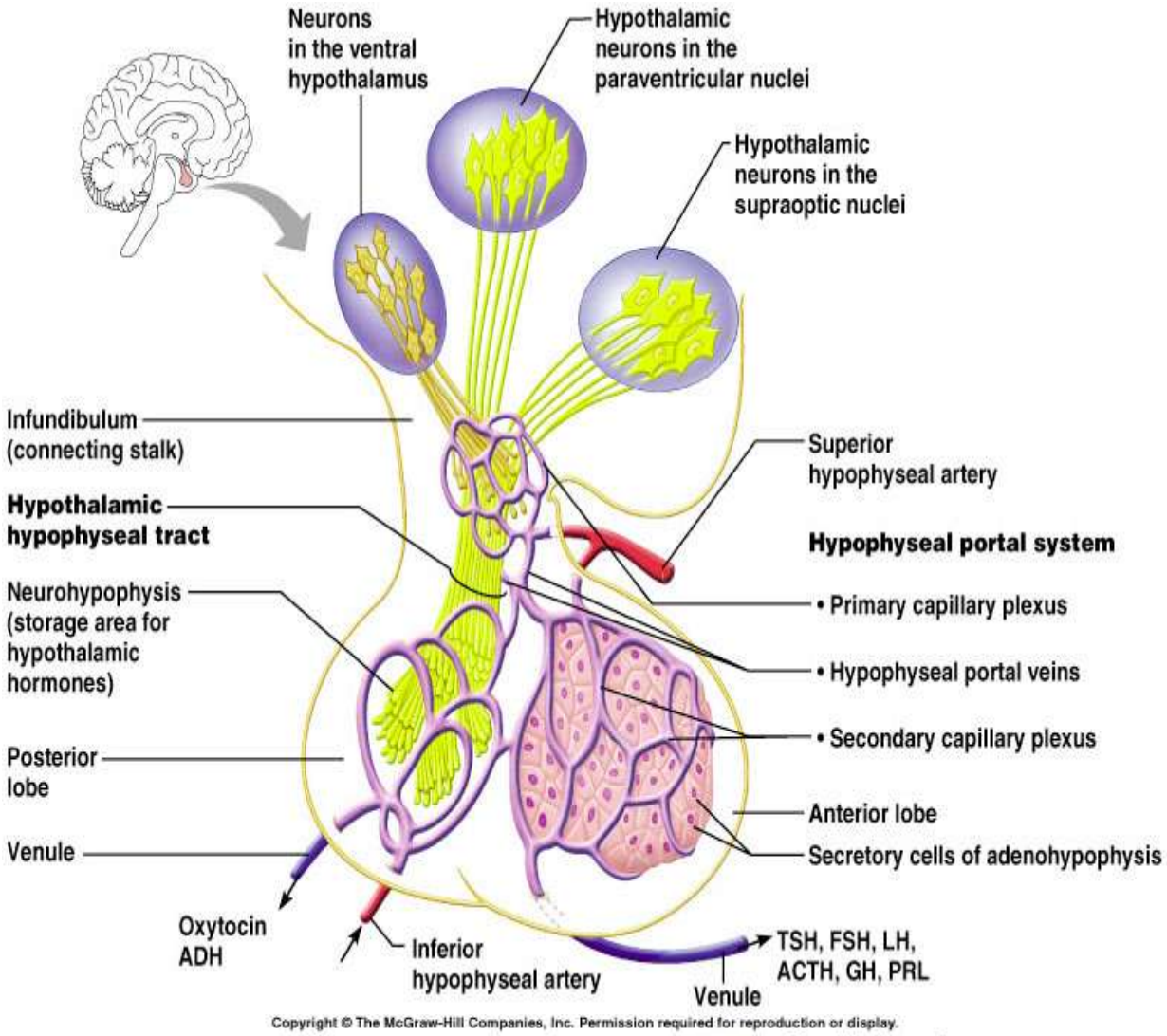
5- PROLACTIN

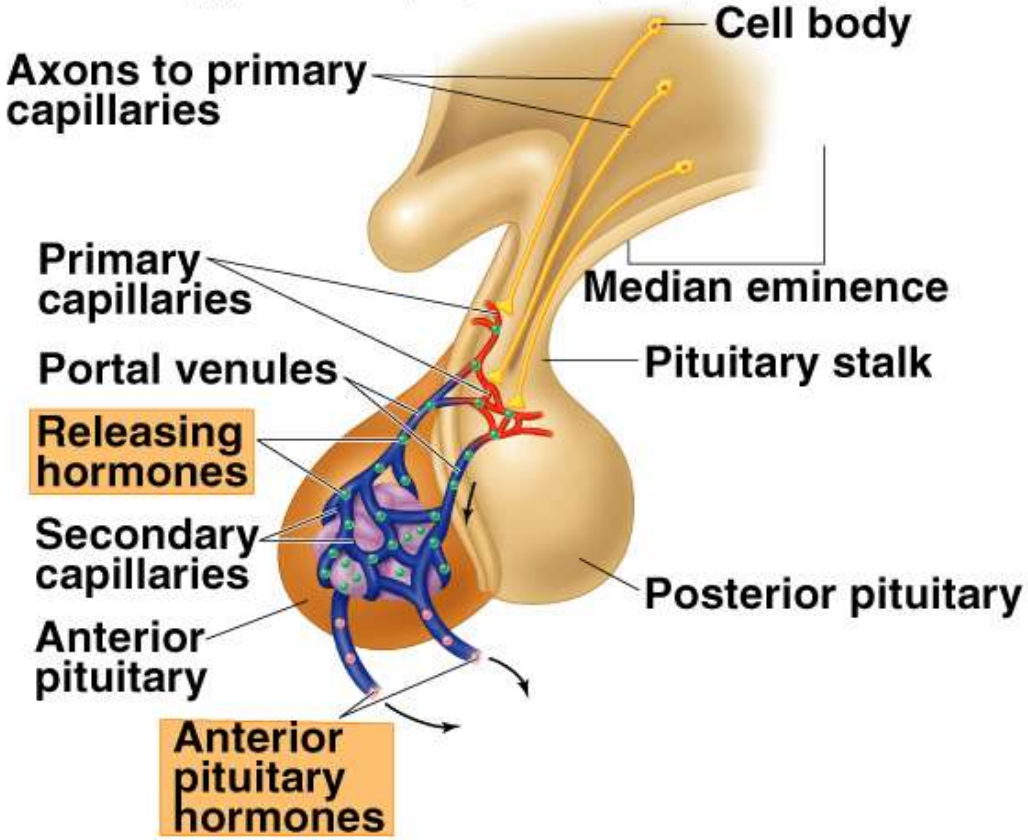
6- ACTH.

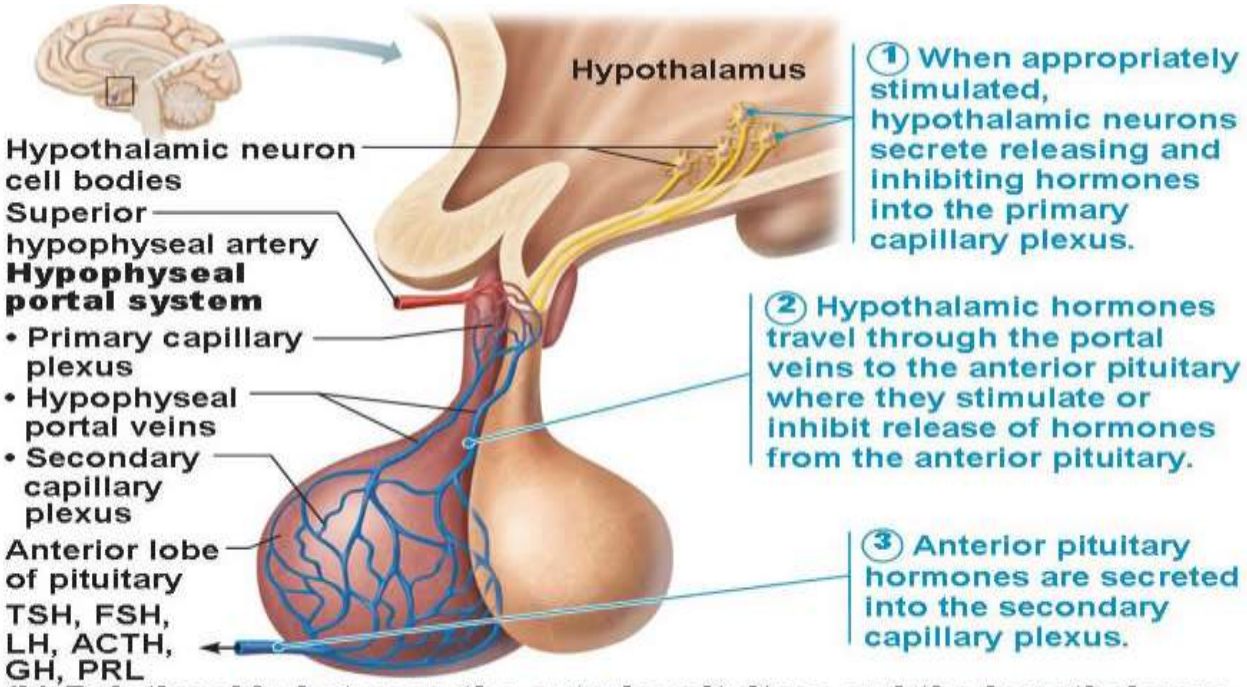
Table 11.6 | Anterior Pituitary Hormones

Hormone	Target Tissue	Principal Actions	Regulation of Secretion
ACTH (adrenocorticotropic 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

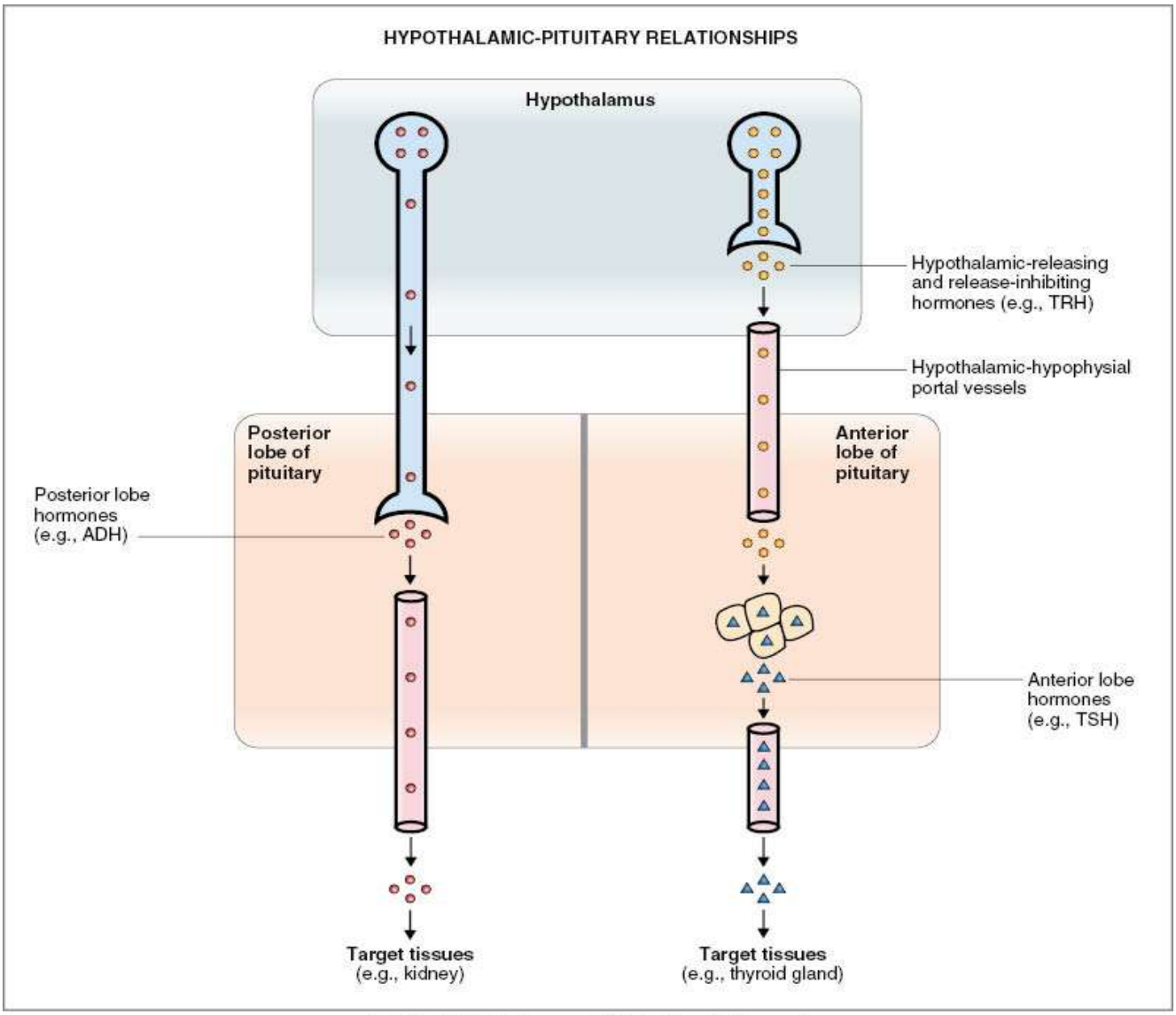






(b) Relationship between the anterior pituitary and the hypothalamus

- **Both neural and endocrine.**



NEGATIVE FEEDBACK MECHANISM

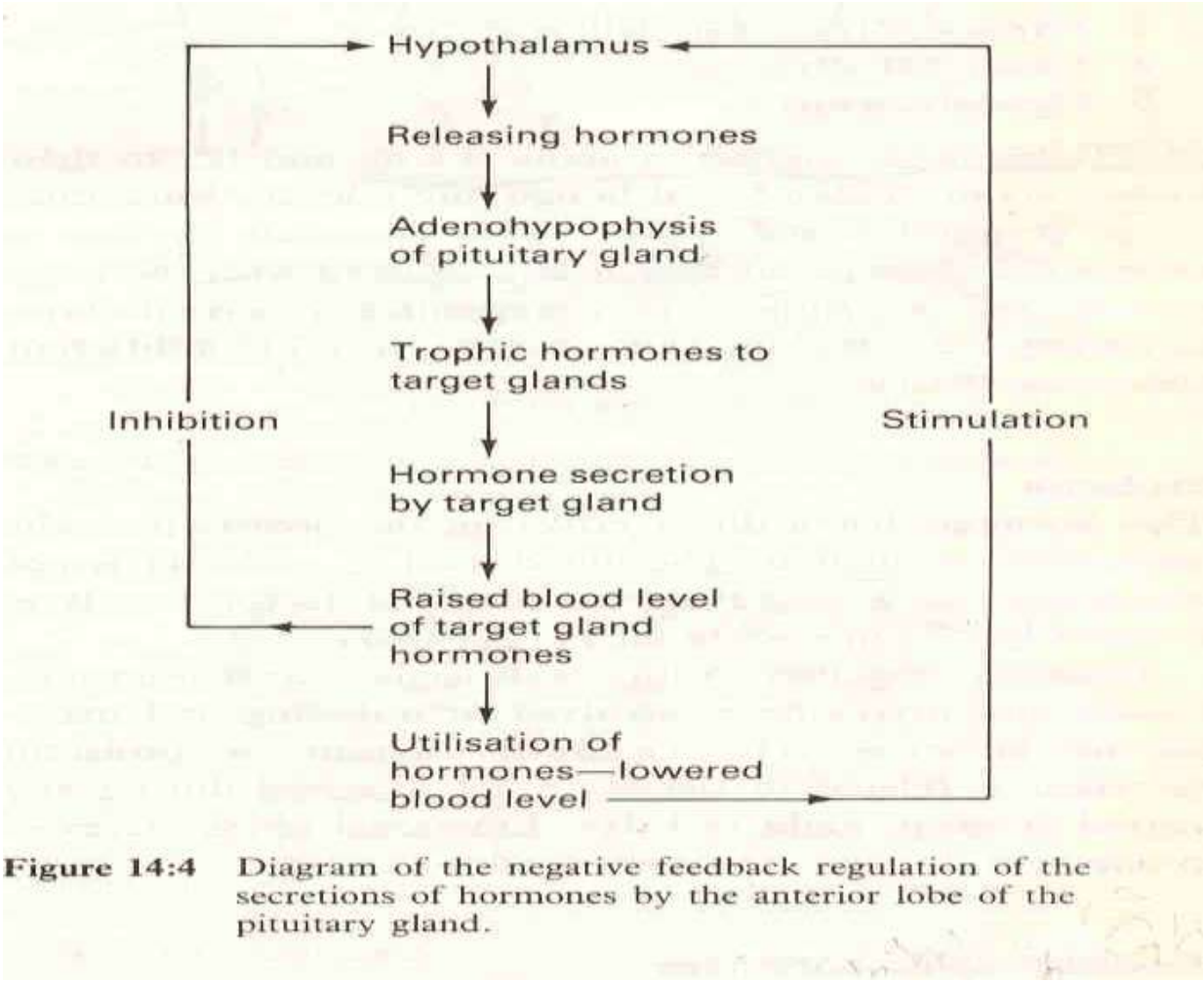
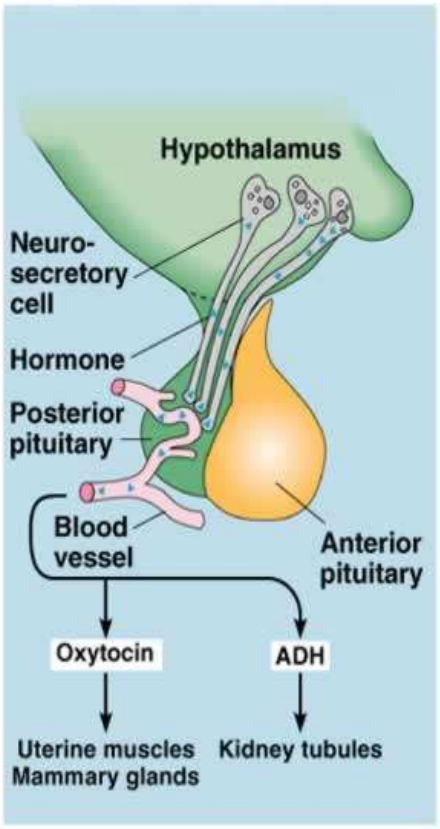
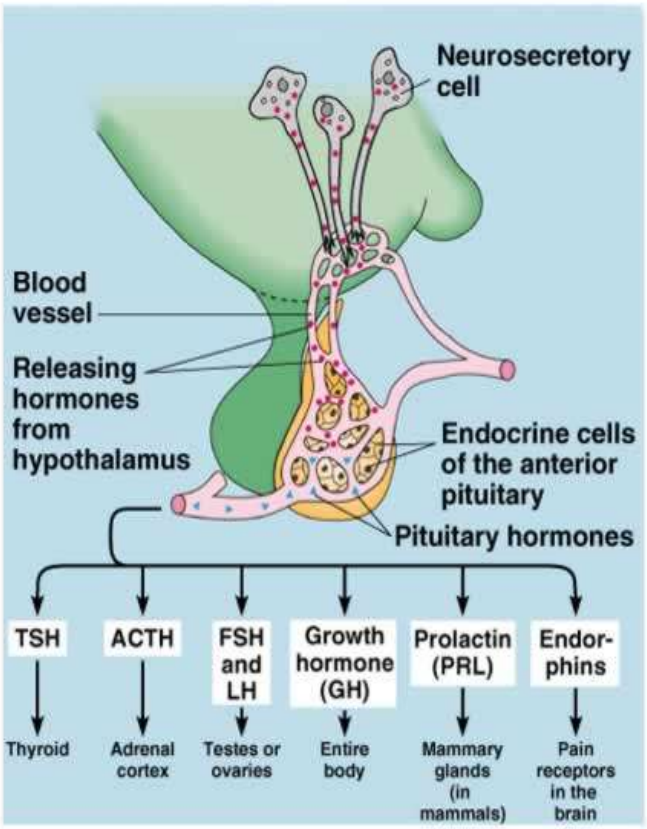


Figure 14:4 Diagram of the negative feedback regulation of the secretions of hormones by the anterior lobe of the pituitary gland.





ANTERIOR PITUITARY GLAND

- **Hormones:**

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
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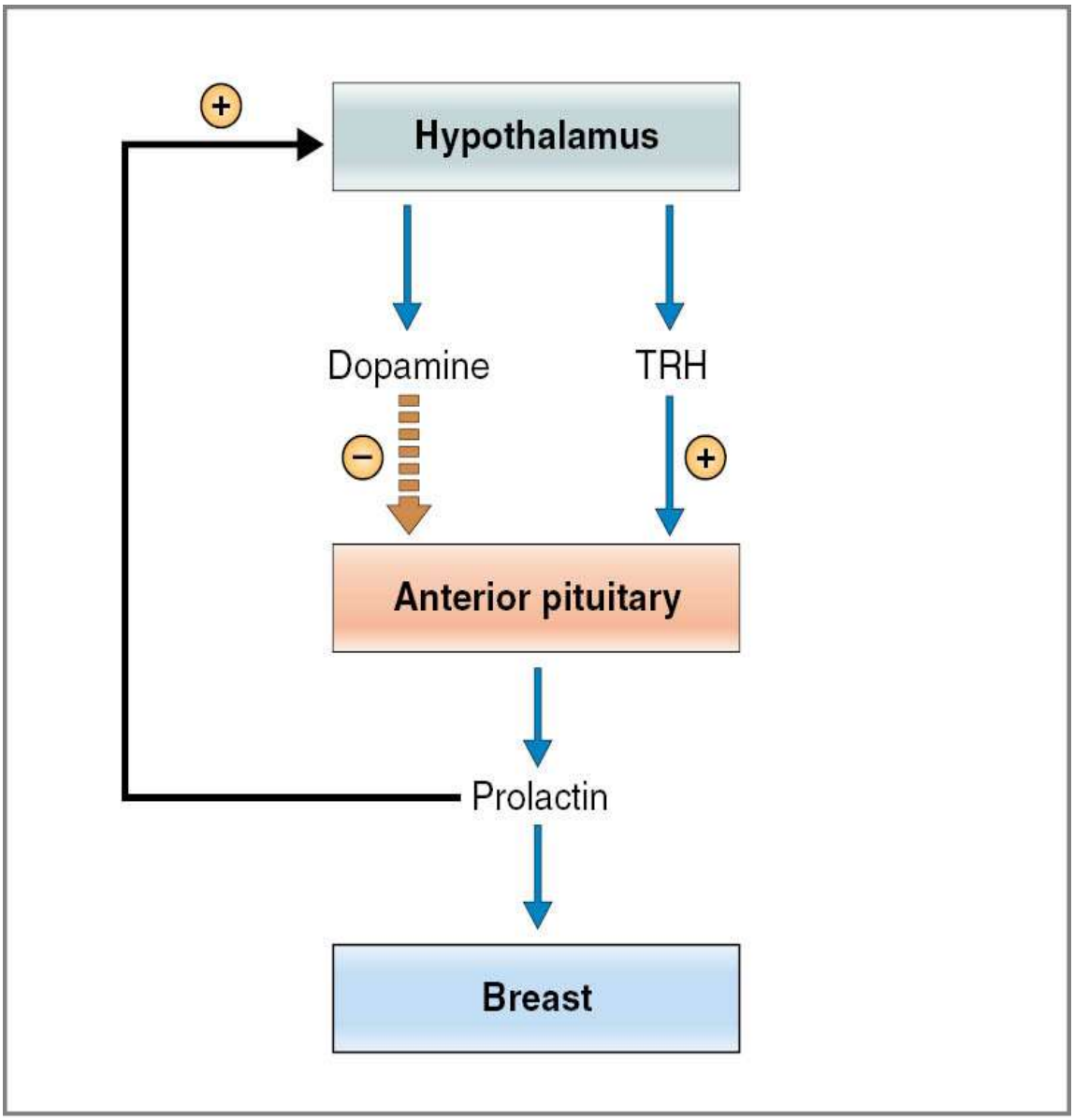
GH (growth hormone)	Most tissue	Promotes protein synthesis and growth; lipolysis and increased blood glucose	Inhibited by somatostatin; stimulated by growth hormone-releasing hormone
FSH (follicle-stimulating hormone)	Gonads	Promotes gamete production and stimulates estrogen production in females	Stimulated 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

PROLACTIN

- **Lactotrophs.(15%)**
- **198 AA.**
- **Related to GH.**

REGULATION OF SECRETION



SOURCES OF DOPAMINE

1- Dopaminergic neurons in the hypothalamus.

2- Dopaminergic neurons in the posterior pituitary.

3- Nonlactotrophs cells of the anterior pituitary.

Table 9-5 Factors Affecting Prolactin Secretion

Stimulatory Factors	Inhibitory Factors
Pregnancy (estrogen)	Dopamine
Breast-feeding	Bromocriptine (dopamine agonist)
Sleep	
Stress	Somatostatin
TRH	Prolactin (negative feedback)
Dopamine antagonists	

ACTION

1- Breast development.

2- Lactogenesis.

(Lactose, lipid, casein)

Parturition.

3- Inhibition of ovulation.

GnRH

ABNORMALITIES

1- Prolactin deficiency.

Failure to lactate.

2- Prolactin excess.

Galactorrhea.

Infertility.

Bromocriptine.

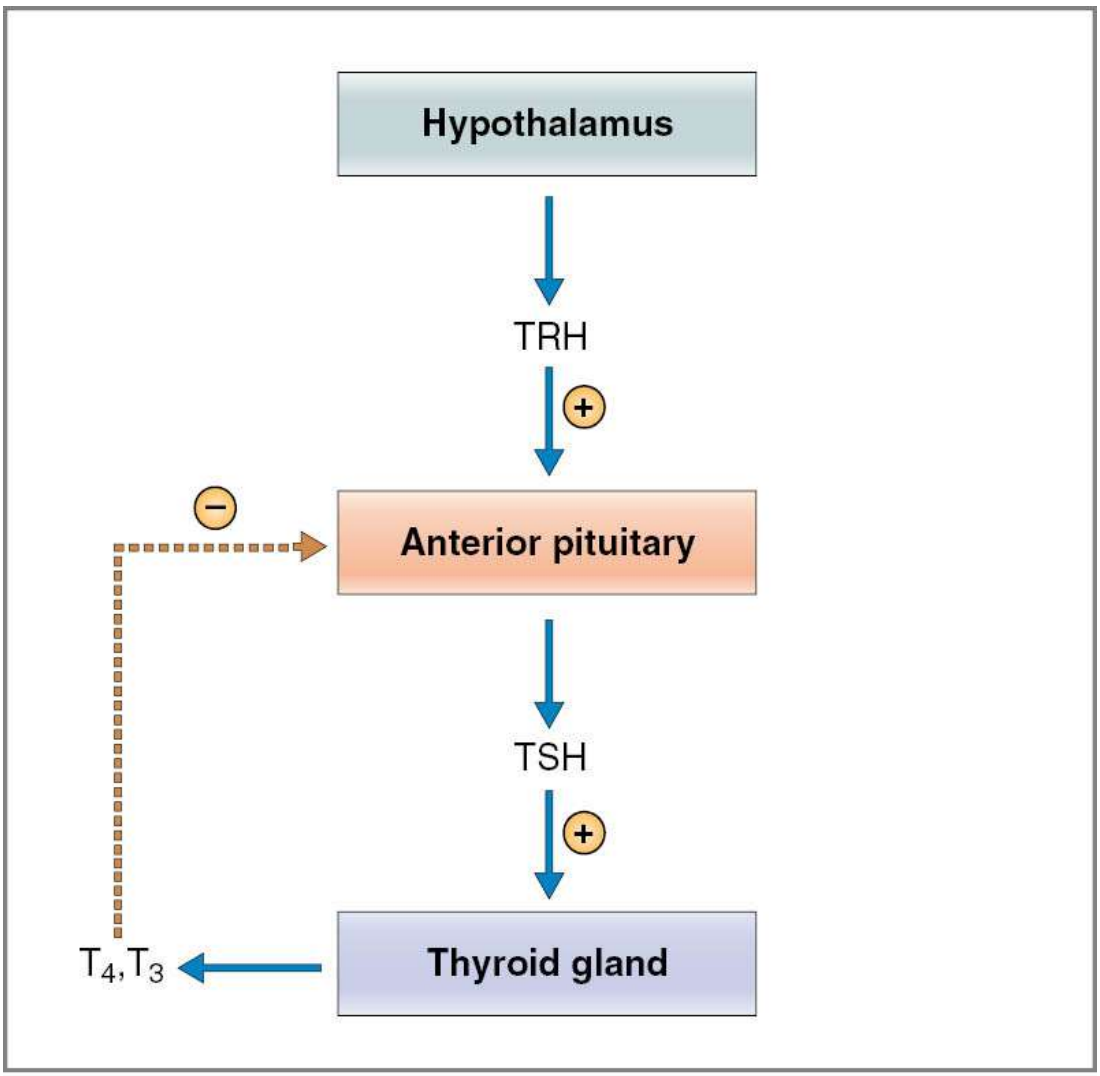
TSH

- **Thyrotrophs.(5%)**
- **Glycoproteins.**
- **α and β.**
- **Related to FSH and LH.**

ABNORMALITIES

- **Hyperthyroidism.**
- **Hypothyroidism.**

REGULATION OF SECRETION



ACTION

1- Increase synthesis and secretion of thyroid hormones.

2- Trophic effect.