

ENDOCRINOLOGY

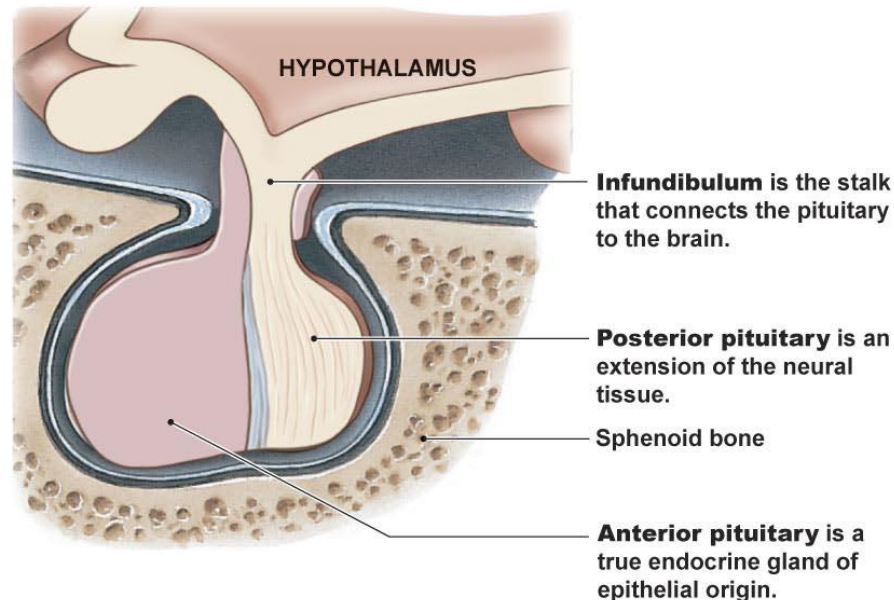
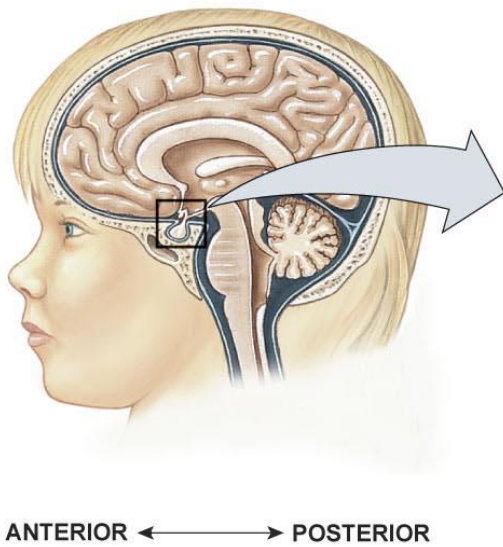
Dr. Hana Alzamil

PHYSIOLOGY OF HYPOTHALAMO-PITUITARY AXIS AND REGULATORY MECHANISMS

- Structure of pituitary gland
 - Anterior pituitary cell types and hormones
 - Posterior pituitary cell types and hormones
- Hypothalamic control of pituitary gland
 - Hypothalamo-hypophysial portal system
 - Hypothalamo-hypophysial tract
- Feedback mechanisms
 - Positive feedback
 - Negative feedback

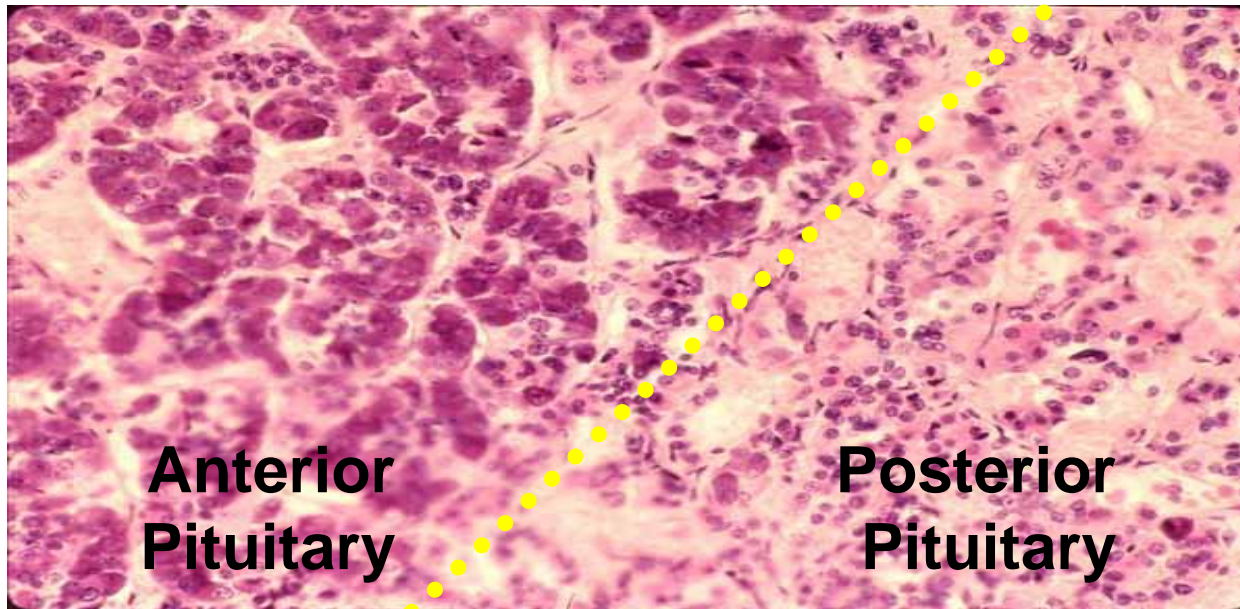
STRUCTURE OF PITUITARY GLAND

- Pituitary gland consist of two lobes
 - Anterior (Adenohypophysis)
 - Posterior (Neurohypophysis)



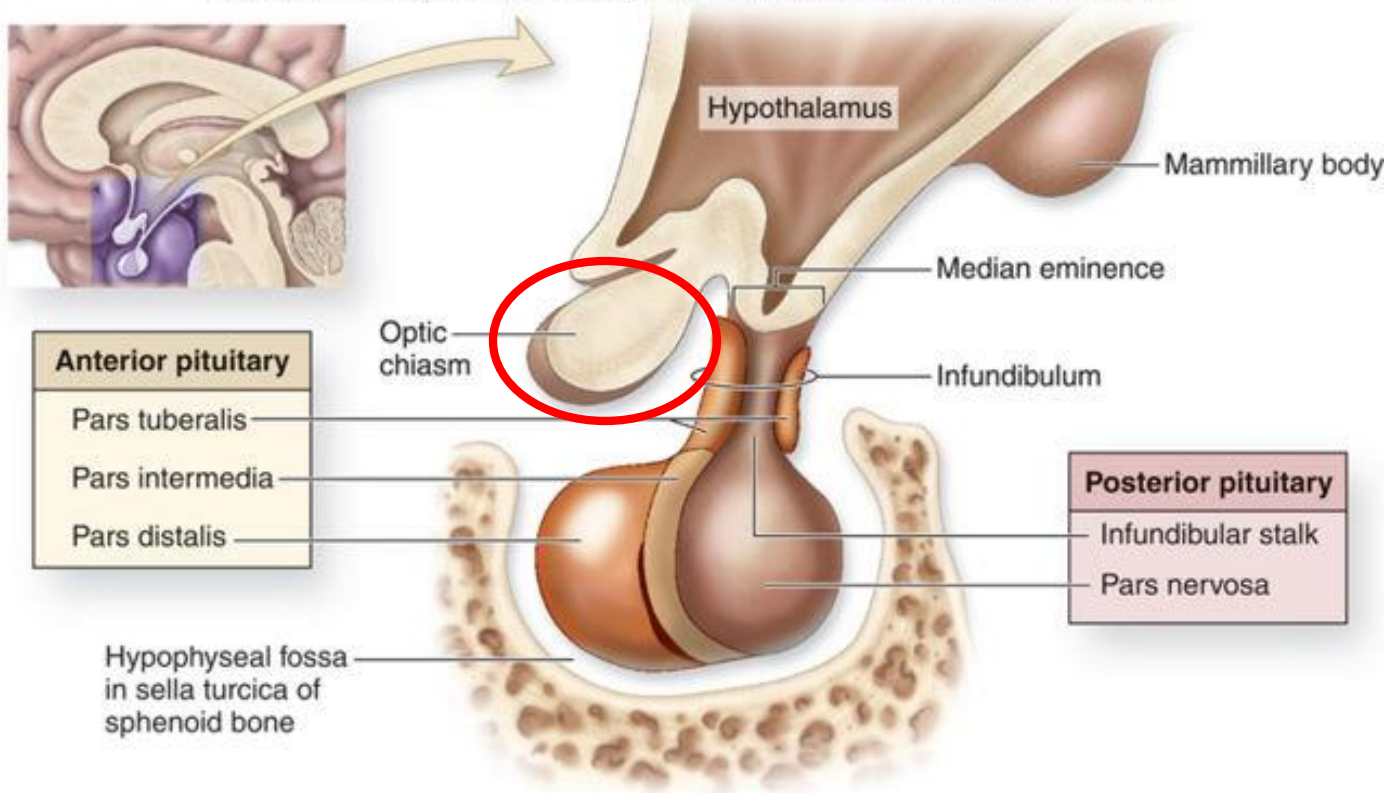
HISTOLOGY OF PITUITARY GLAND

- Anterior pituitary originates from Rathke's pouch (pharyngeal epithelium)
- Posterior pituitary originates from hypothalamus (glial-type cells)



STRUCTURE OF PITUITARY GLAND (RELATION TO OPTIC CHIASM)

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HYPOTHALAMIC CONTROL OF PITUITARY SECRETIONS

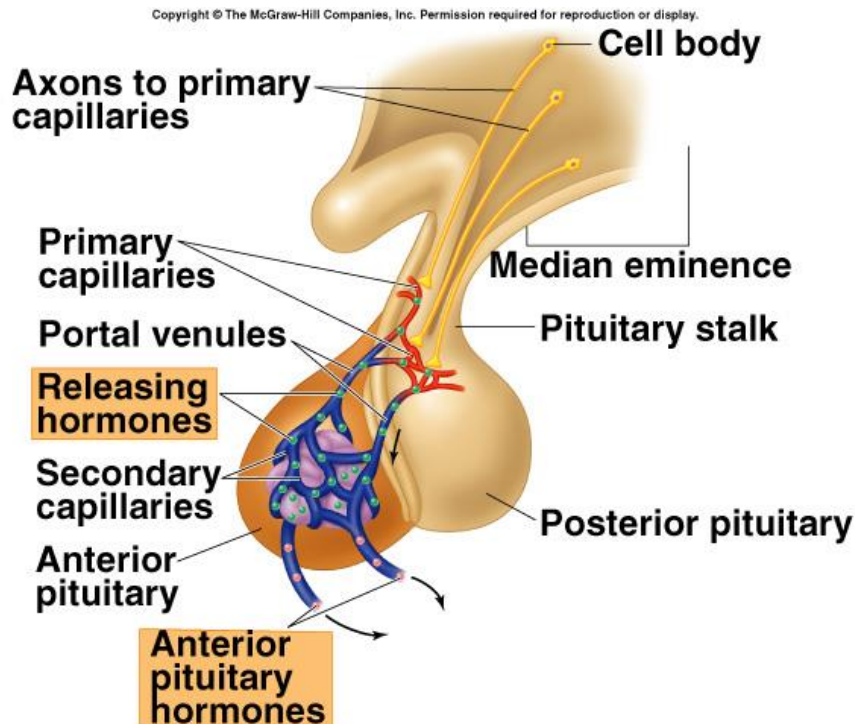
- Almost all secretions by the pituitary are controlled by either
 - Hormonal secretion of hypothalamus
(The anterior pituitary)
or
 - Nervous signals from hypothalamus
(Posterior pituitary)

CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS

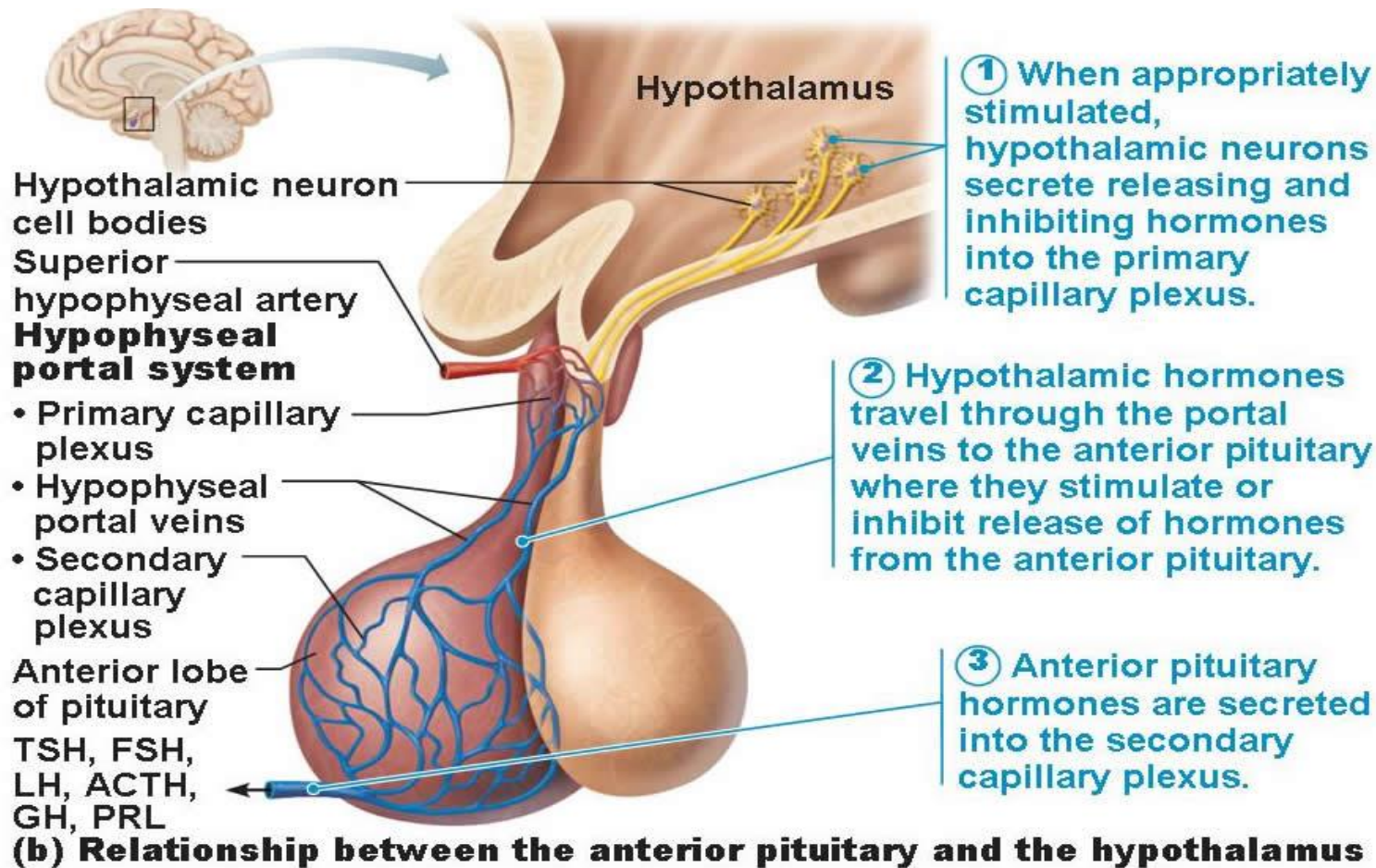
- Special neurons in the hypothalamus synthesize and secrete the hypothalamic releasing and inhibitory hormones that control secretion of anterior pituitary
- Neurons send their nerve fibers to the **median eminence** (extension of hypothalamic tissue into the pituitary stalk)
- Hormones are secreted to the tissue fluids, absorbed into the **hypothalamic-hypophysial portal system** and transported to the sinuses of the anterior pituitary

HYPOTHALAMIC CONTROL OF ANTERIOR PITUITARY GLAND (ADENOHYPHYSIS)

- Anterior pituitary gland is connected to hypothalamus by portal system: “hypothalamic-hypophysial portal vessels”.



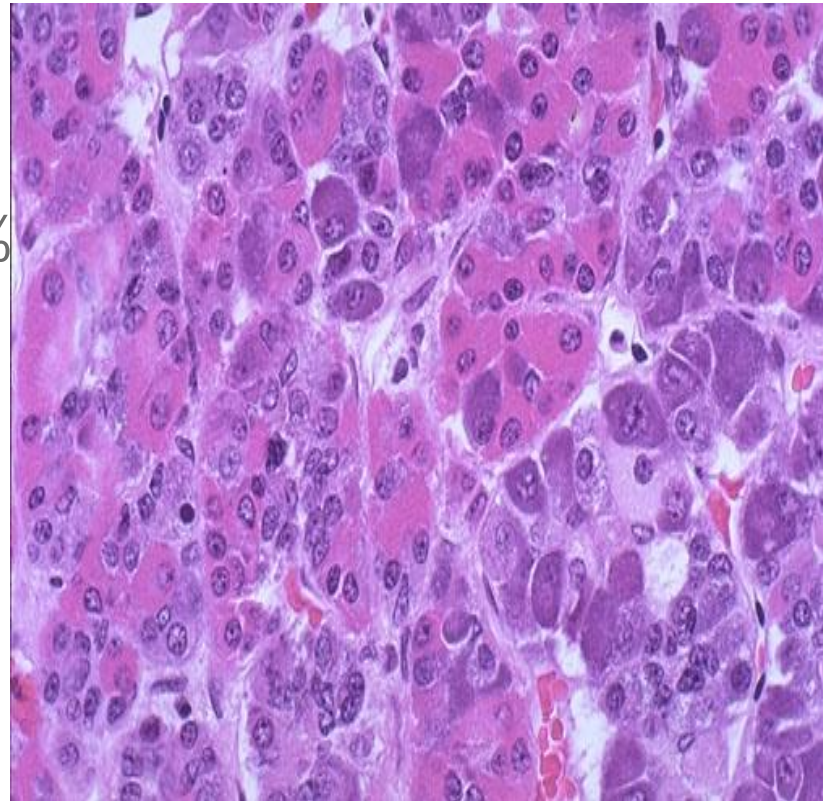
CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS



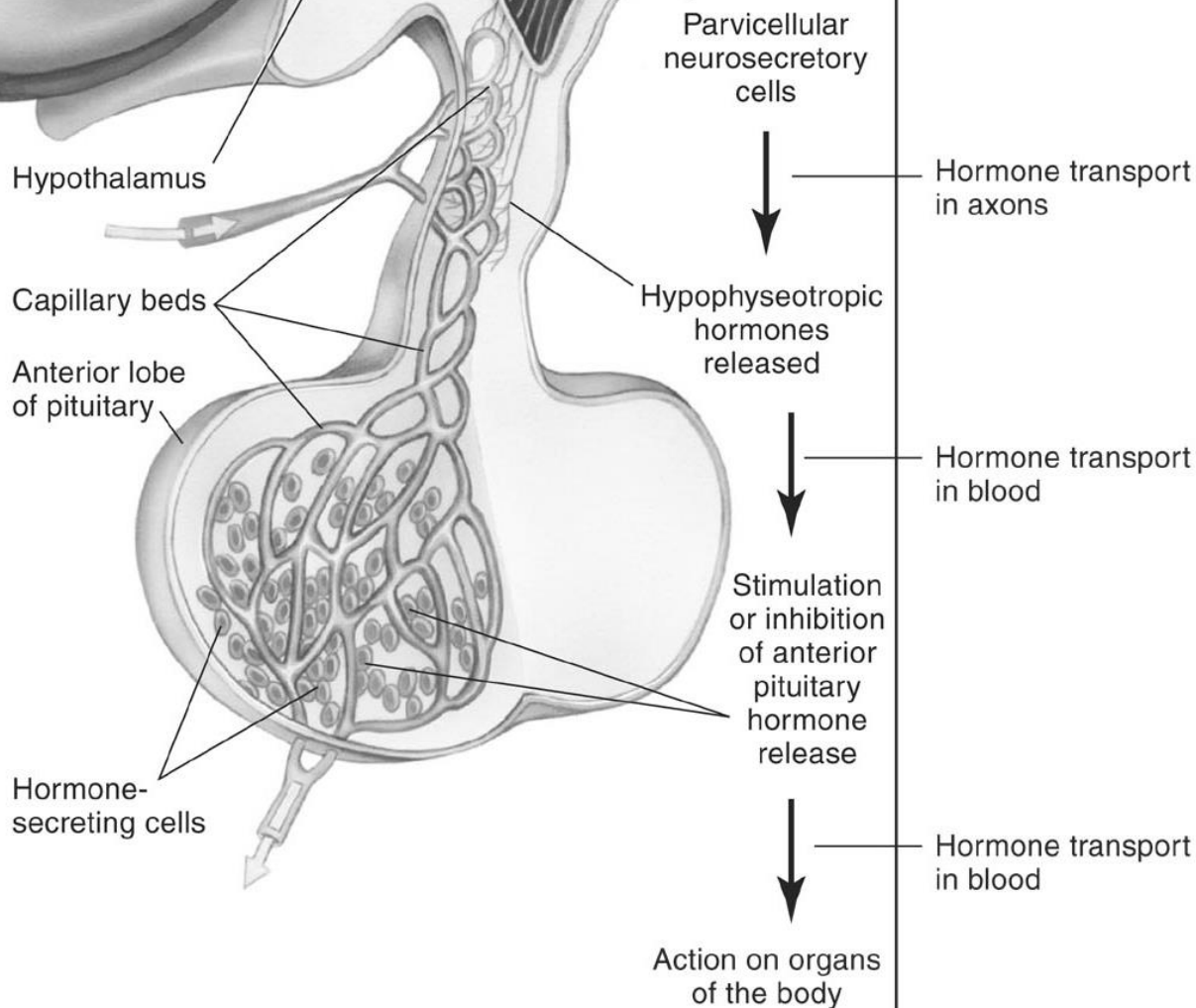
STRUCTURE OF PITUITARY GLAND

○ Anterior pituitary contains 5 cell types:

- Somatotrops: GH 40%
- Corticotrops: ACTH 20%
- Thyrotrops: TSH
- Gonadotropes: LH & FSH
- Lactotrops: PRL



HYPOTHALAMUS AND ANTERIOR PITUITARY



Neurosecretory cells secrete releasing factors into capillaries of the pituitary portal system

Factors transported to the anterior pituitary gland to regulate the secretion of pituitary hormones.

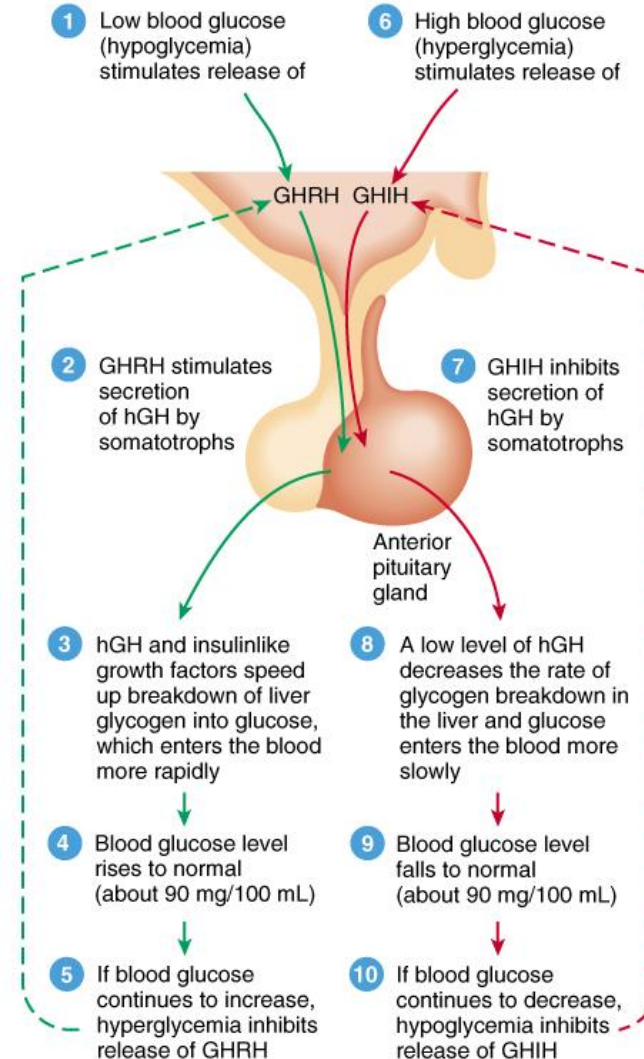
HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

○ Growth hormone releasing hormone (GHRH)

- Stimulates release of growth hormone

○ Growth hormone inhibiting hormone (GHIH) also called **Somatostatin**

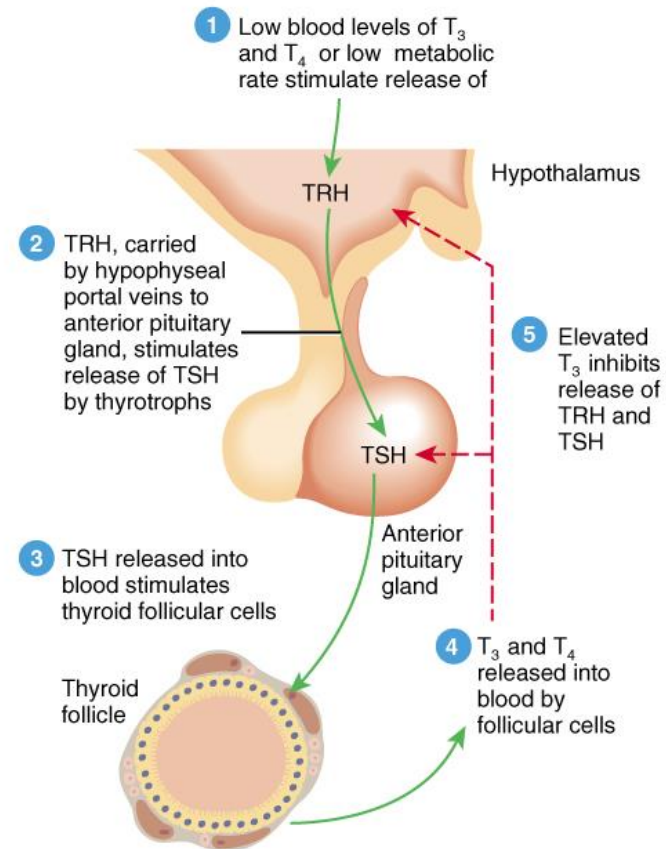
- Inhibits release of growth hormone



HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

○ Thyrotropin-releasing hormone (TRH)

- Stimulates release of thyroid stimulating hormone (TSH)



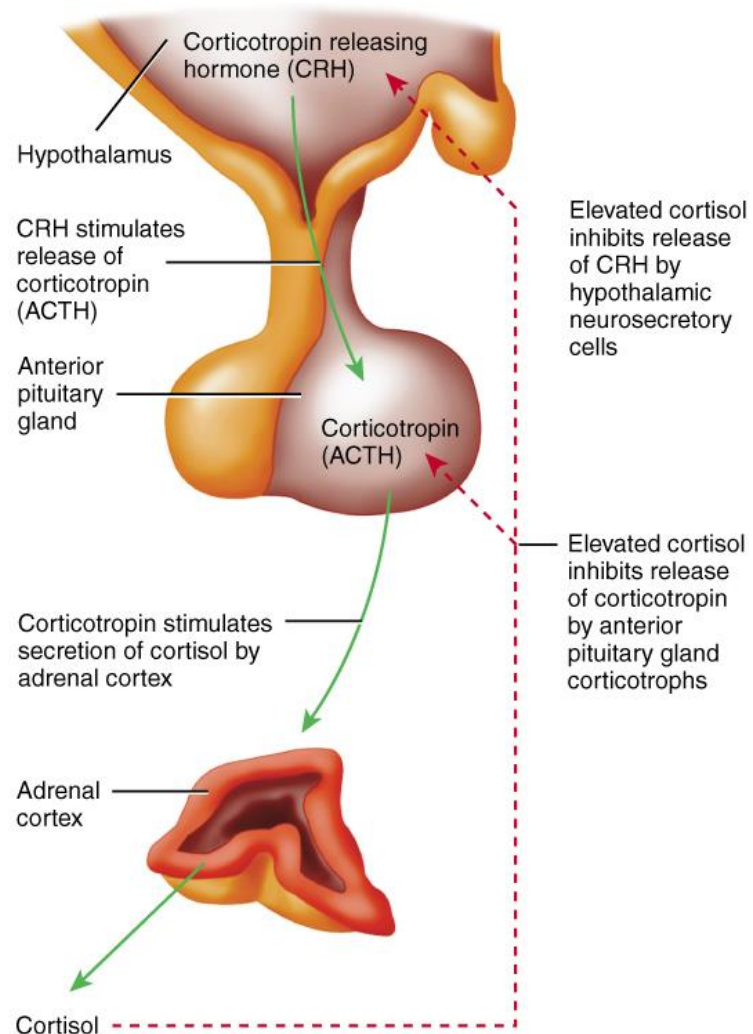
Key:

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

HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

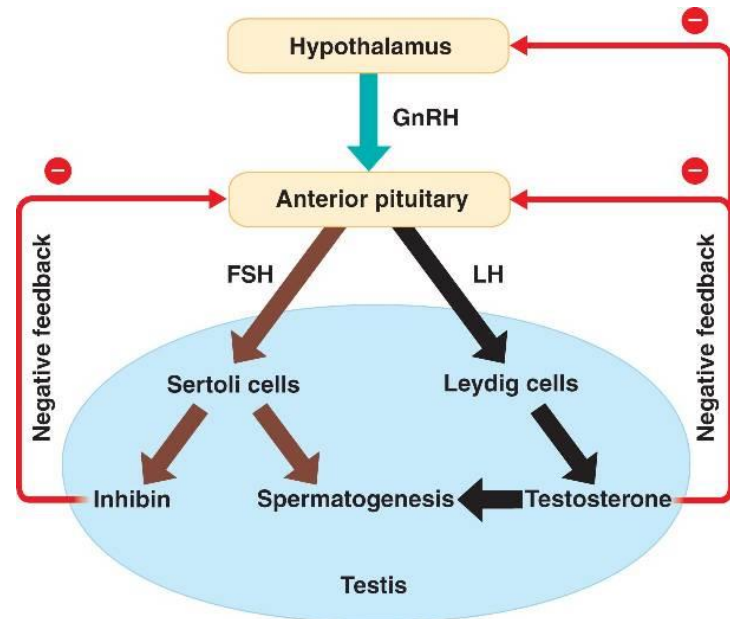
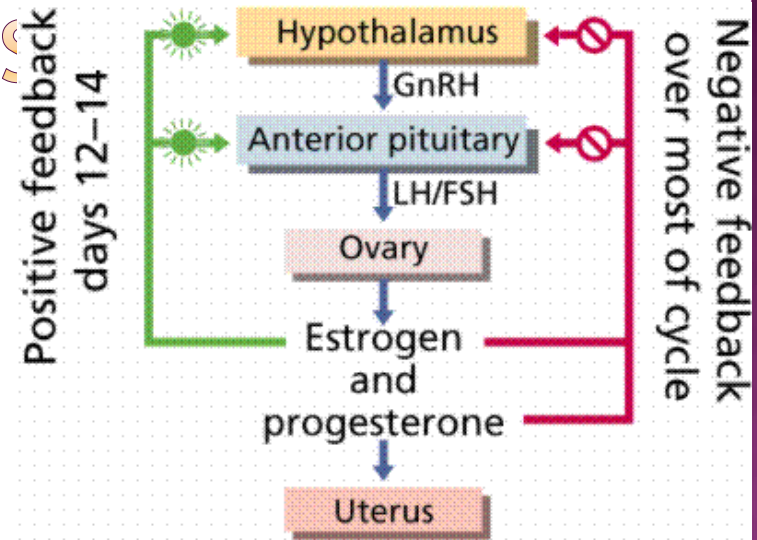
○ Corticotropin-releasing hormone (CRH)

- Stimulates release of adrenocorticotropin hormone (ACTH)



HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

- ⊙ **Gonadotropin releasing hormone (GnRH)** –
- ⊙ causes release of the 2 gonadotropic hormones:
 - Luteinizing (**LH**)
 - follicle-stimulating hormone **FSH**



HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

- **Prolactin inhibitory hormone (PIH)** also known as **Dopamine**
 - Inhibits prolactin secretion

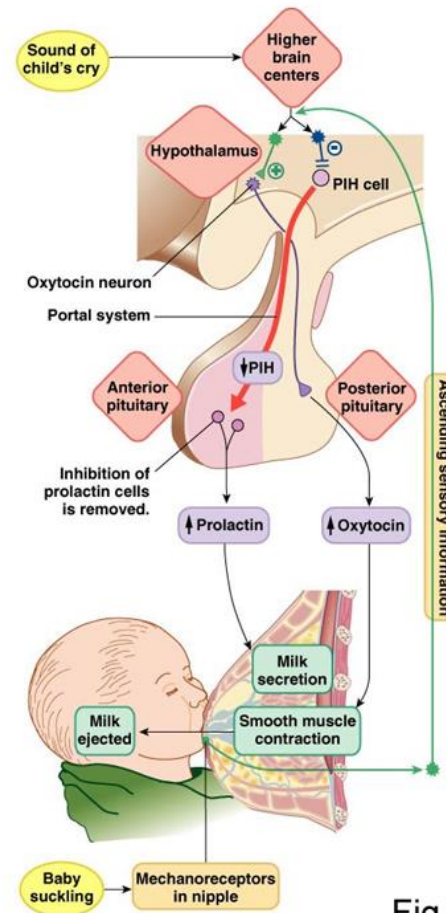


Fig. 26-23

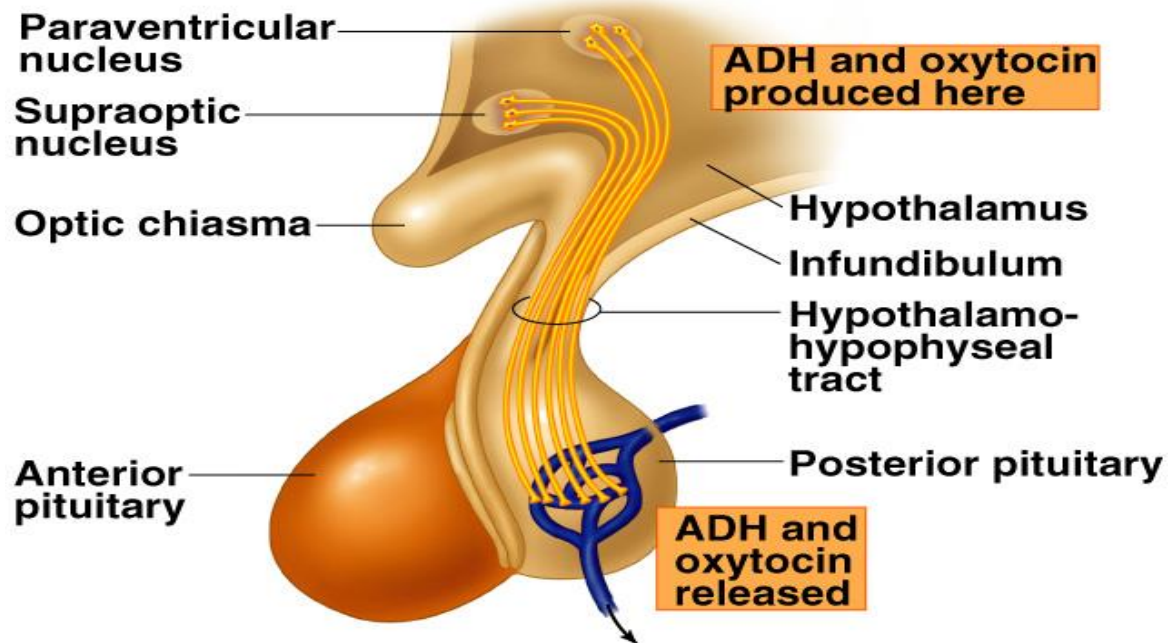
POSTERIOR PITUITARY GLAND

(Neurohypophysis)

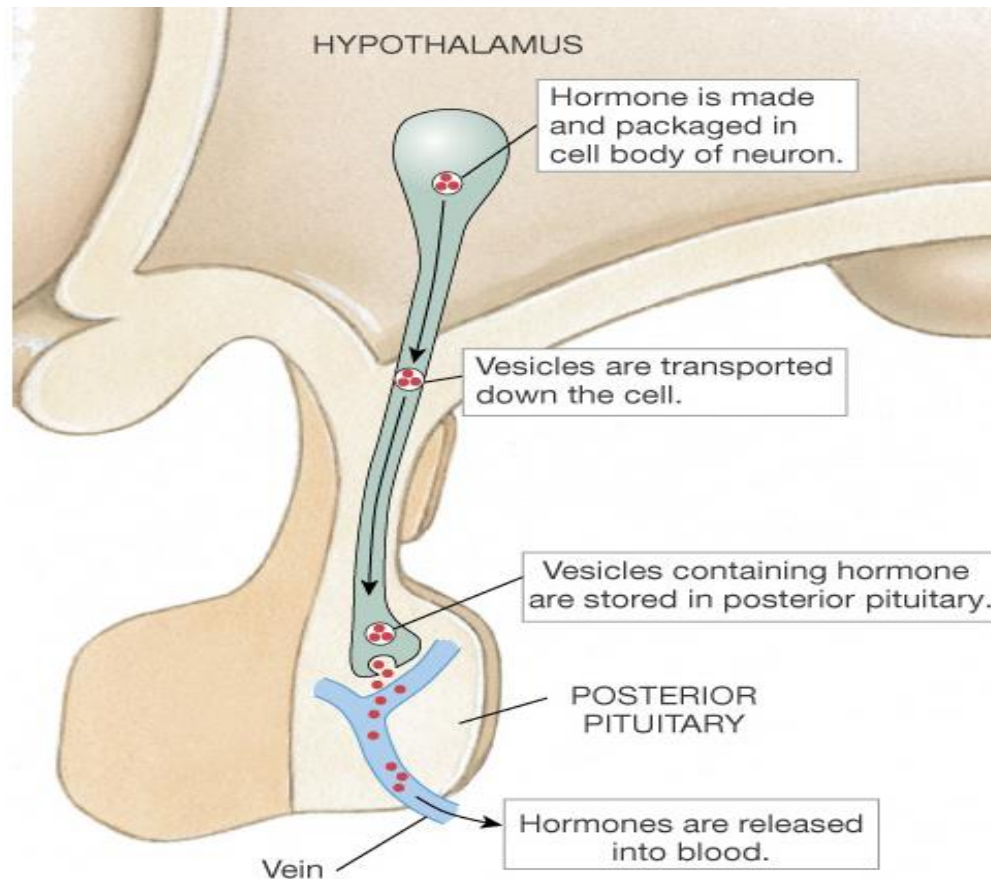
HYPOTHALAMIC CONTROL OF POSTERIOR PITUITARY GLAND (NEUROHYPOPHYSIS)

- Hormones synthesized in the **supraoptic** and **paraventricular** nuclei of the hypothalamus and released in posterior pituitary

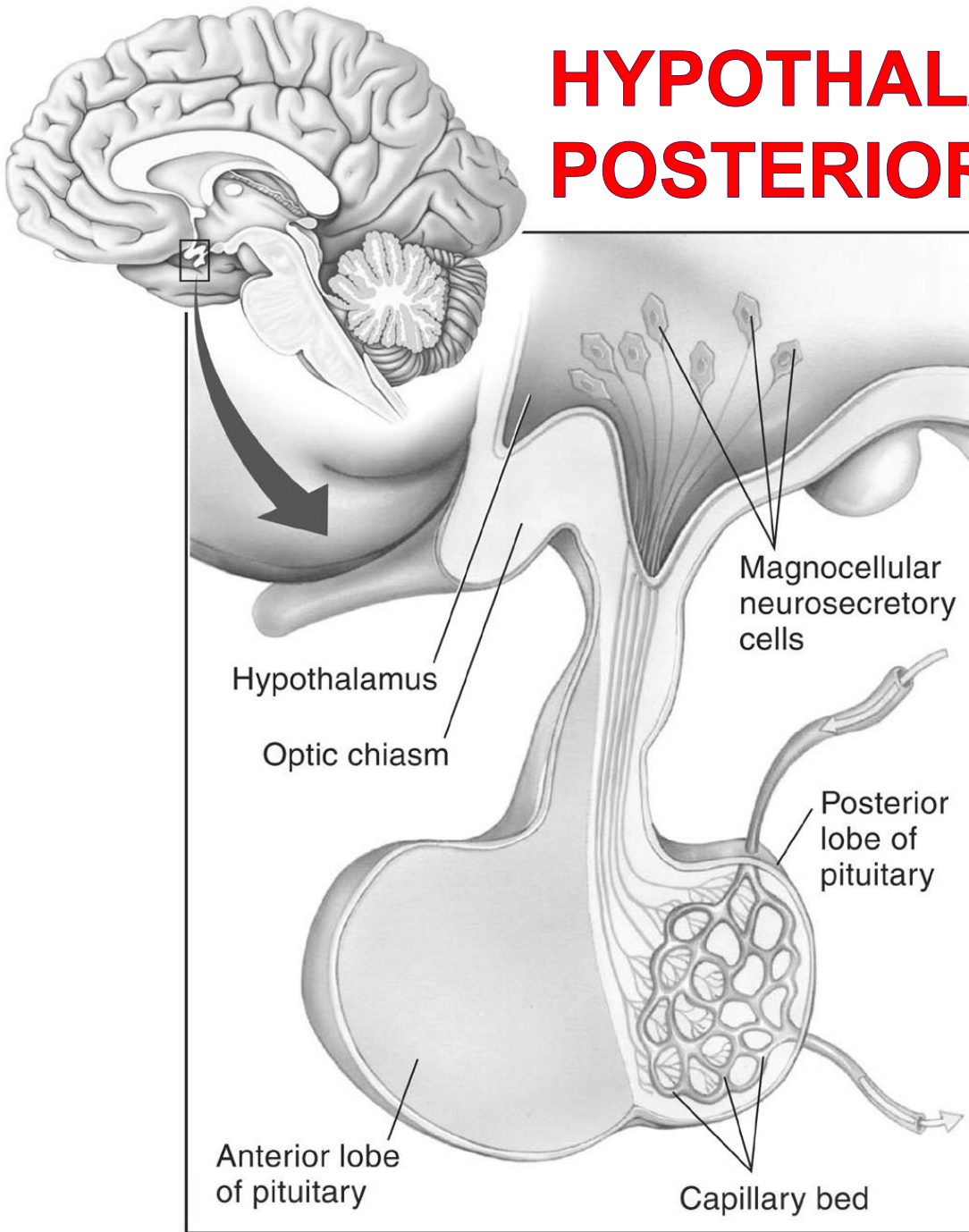
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SECRETION OF POSTERIOR PITUITARY HORMONES

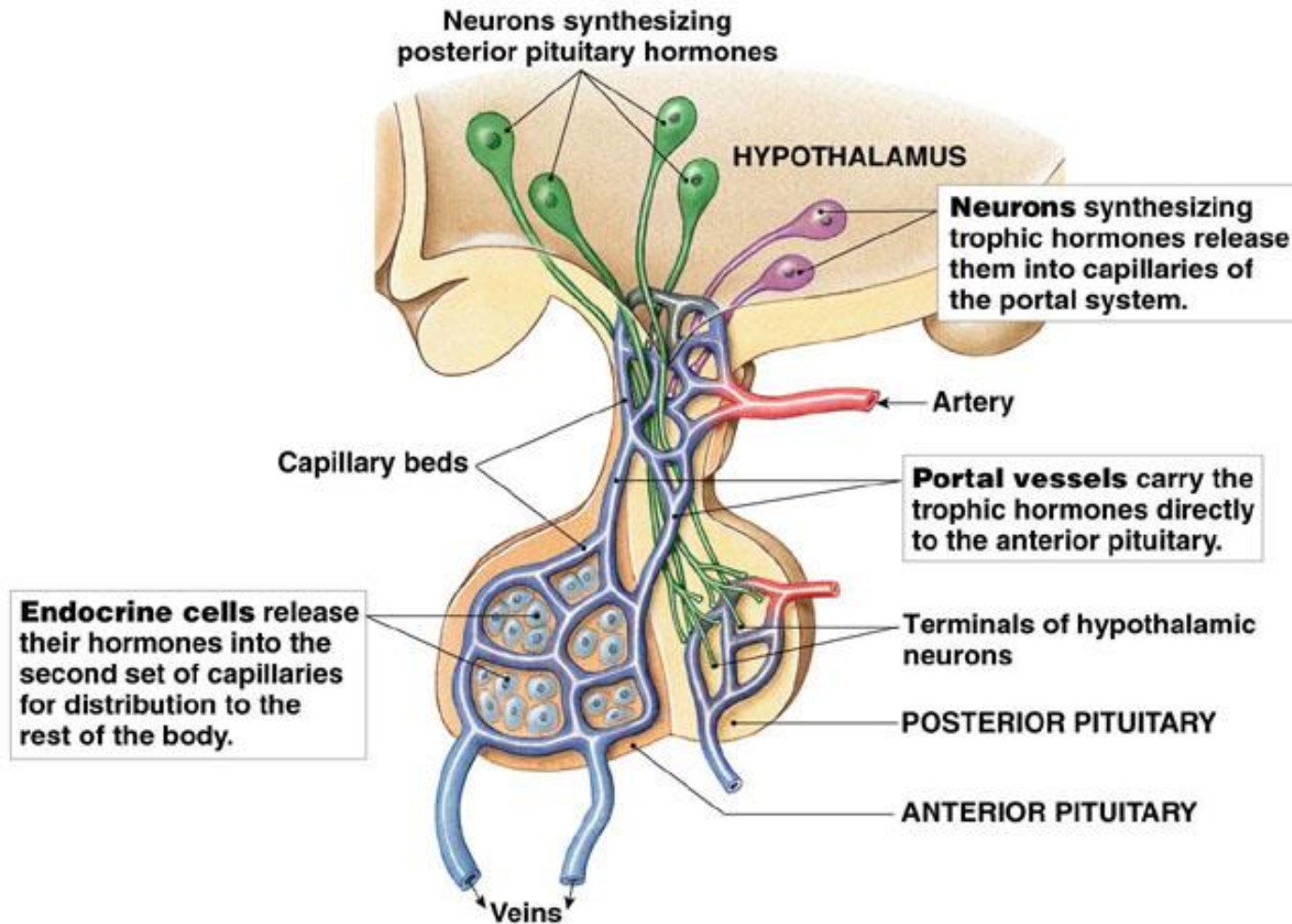


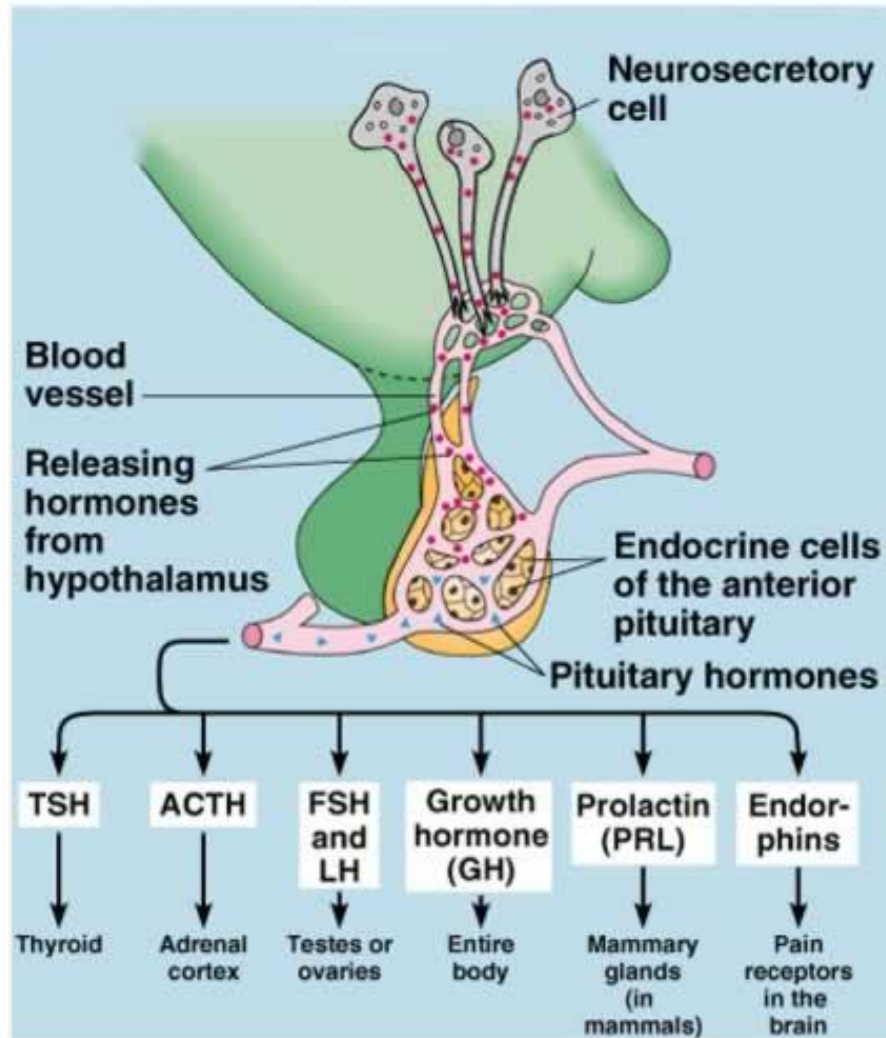
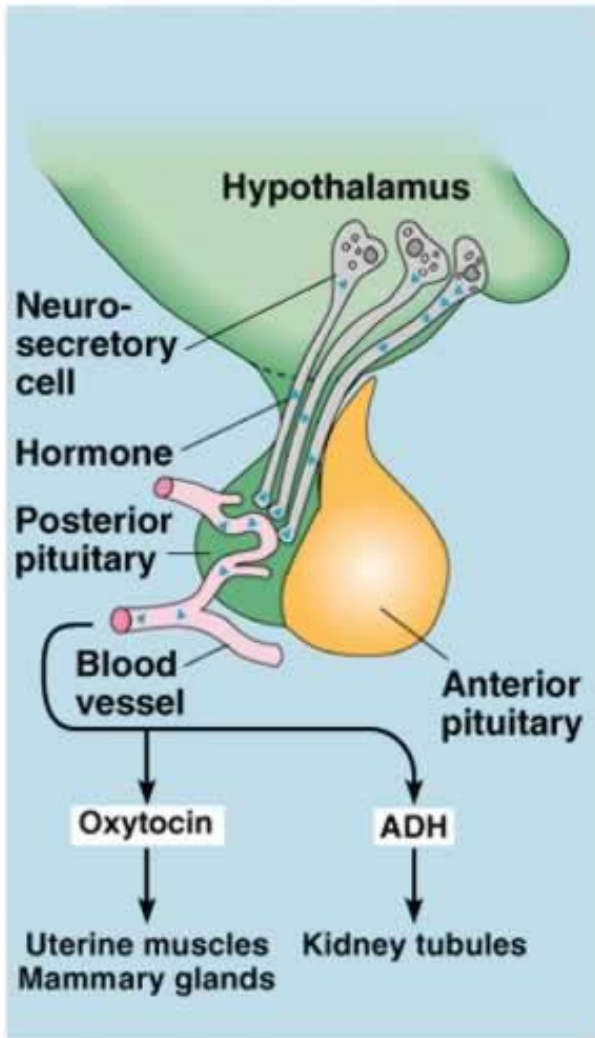
HYPOTHALAMUS AND POSTERIOR PITUITARY



Magnocellular neurons in paraventricular and supraoptic nuclei secrete **oxytocin** and **vasopressin** directly into capillaries in the posterior lobe

SUMMARY OF HYPOTHALAMIC CONTROL OF PITUITARY GLAND





FEEDBACK MECHANISM

Positive feedback

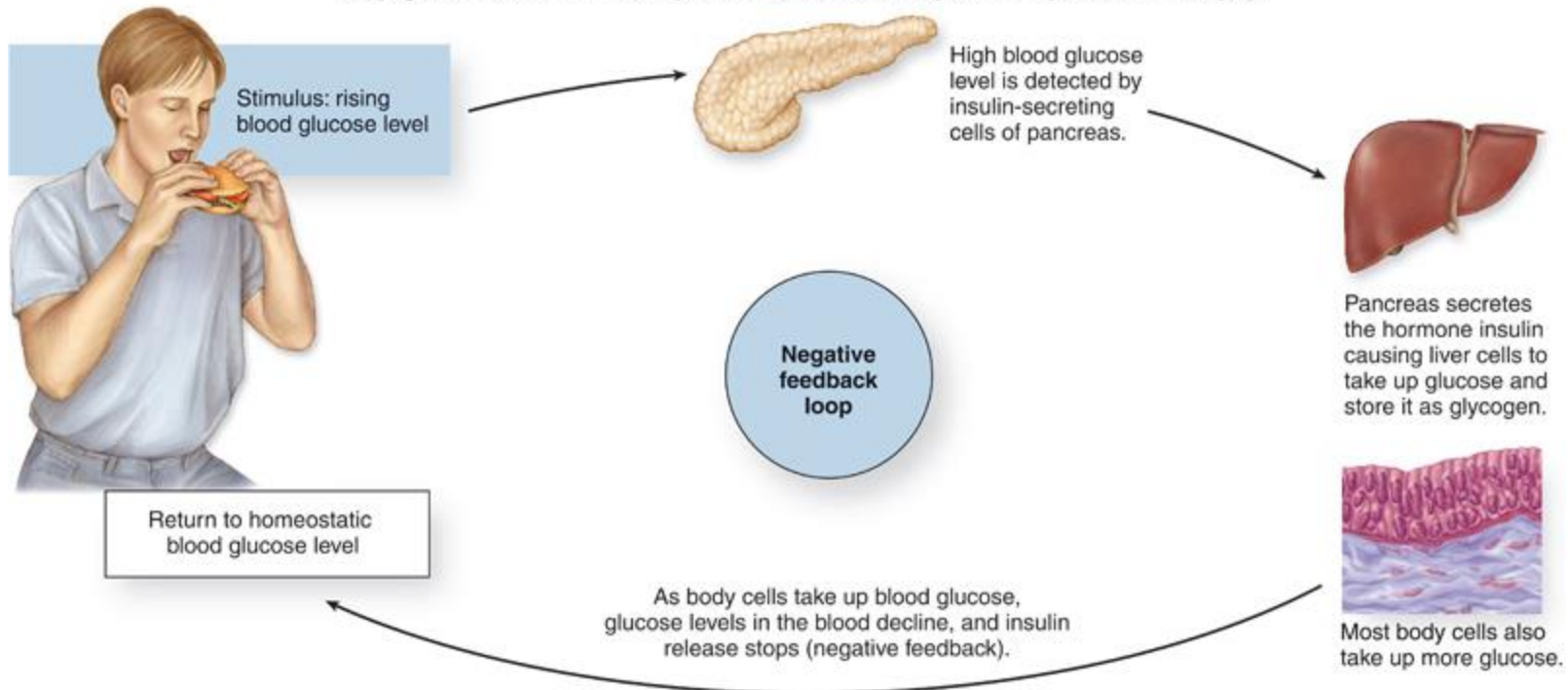
- Release of hormone A stimulates the release of hormone B
- Hormone B stimulates further release of hormone A

Negative feedback

- Release of hormone A stimulates the release of hormone B
- Hormone B inhibits the release of hormone A

NEGATIVE FEEDBACK

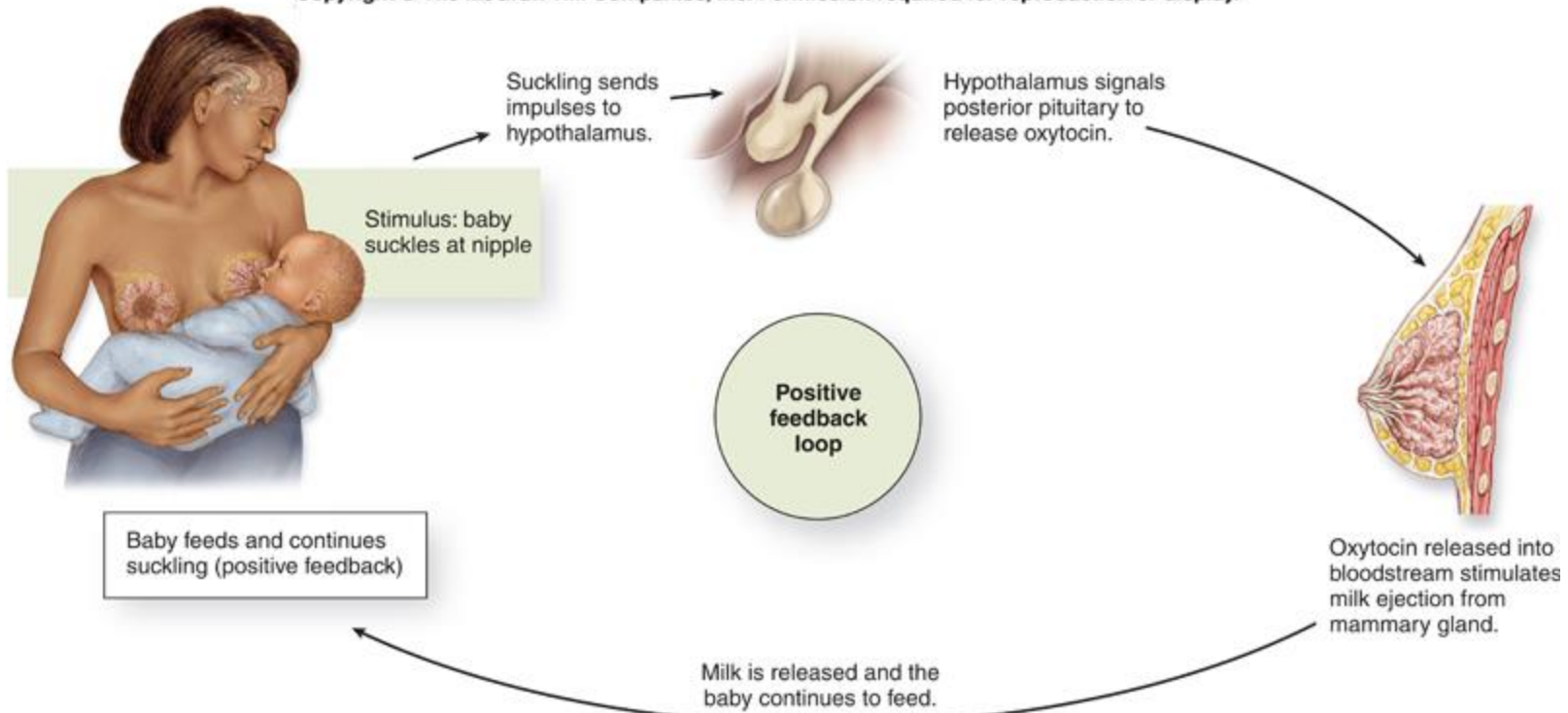
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(a) Negative feedback

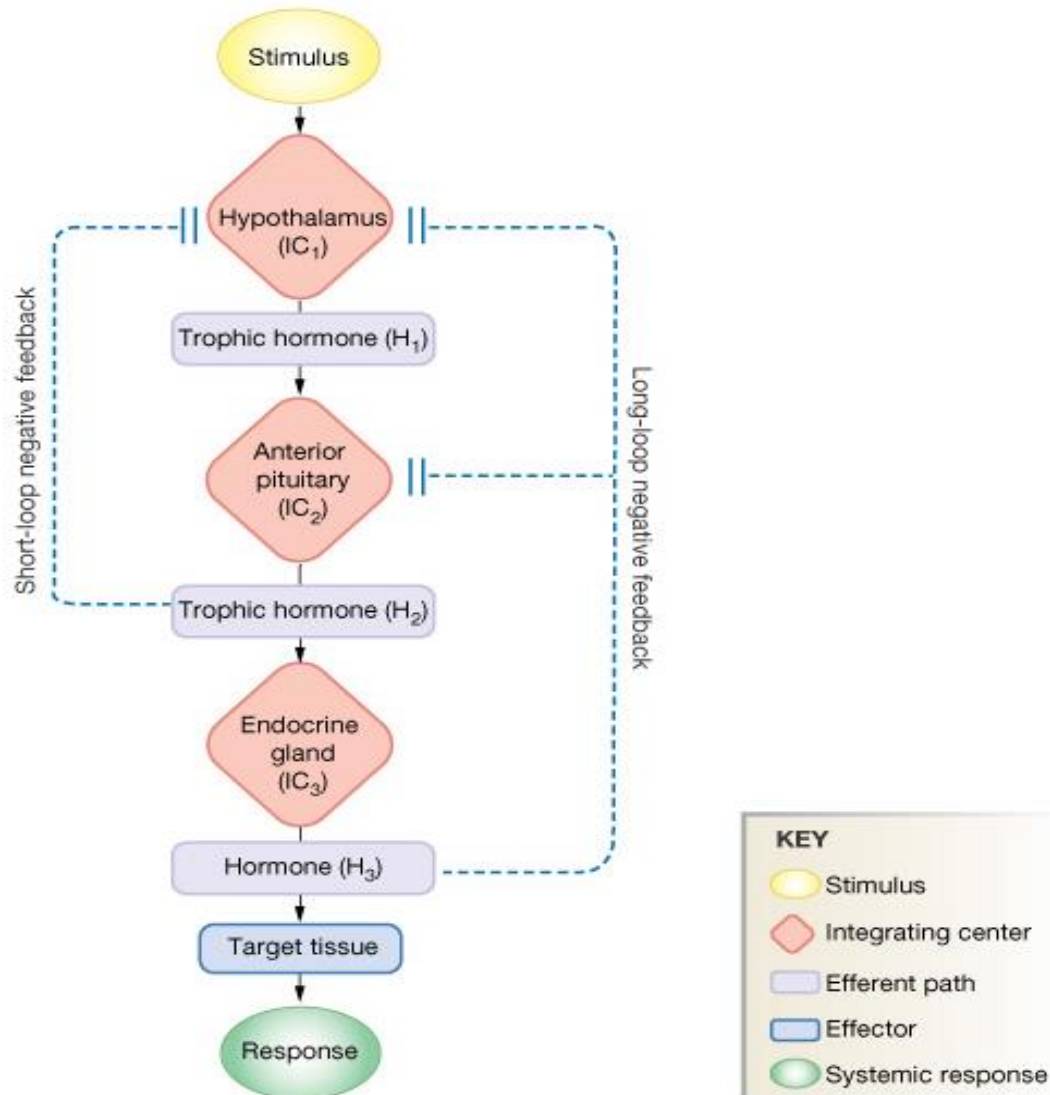
POSITIVE FEEDBACK

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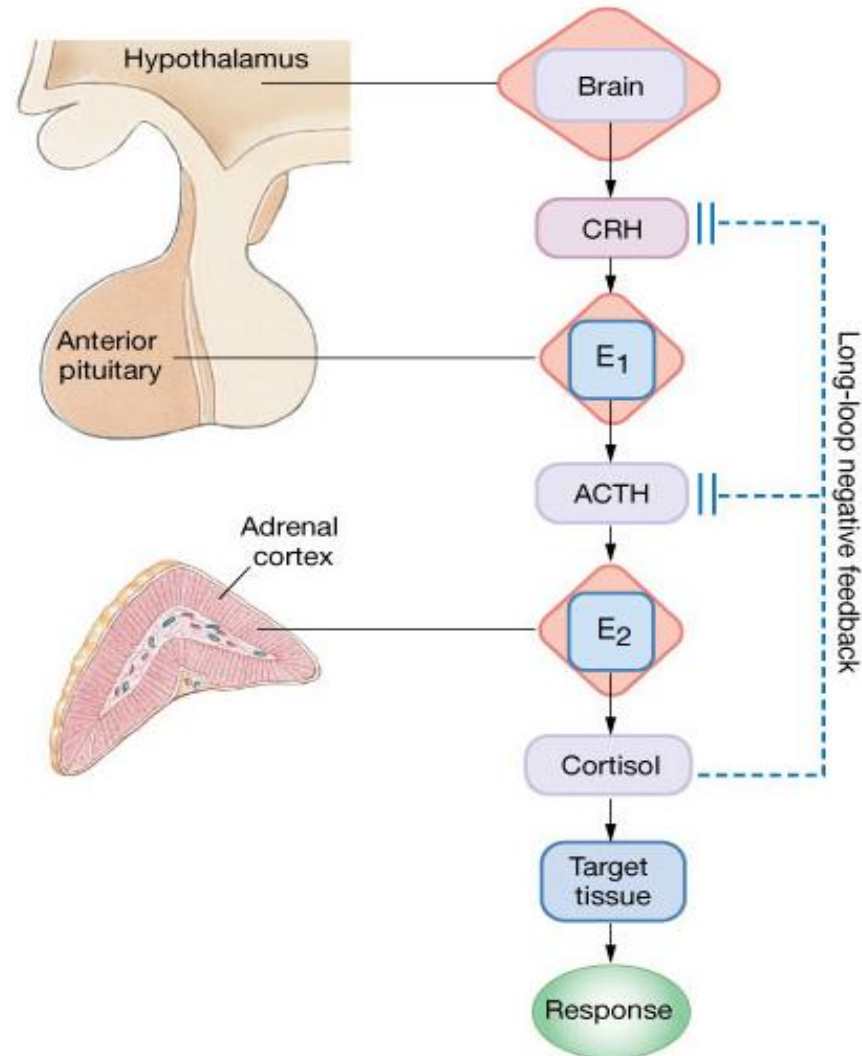


(b) Positive feedback

NEGATIVE FEEDBACK MECHANISM: LONG & SHORT LOOP REFLEXES

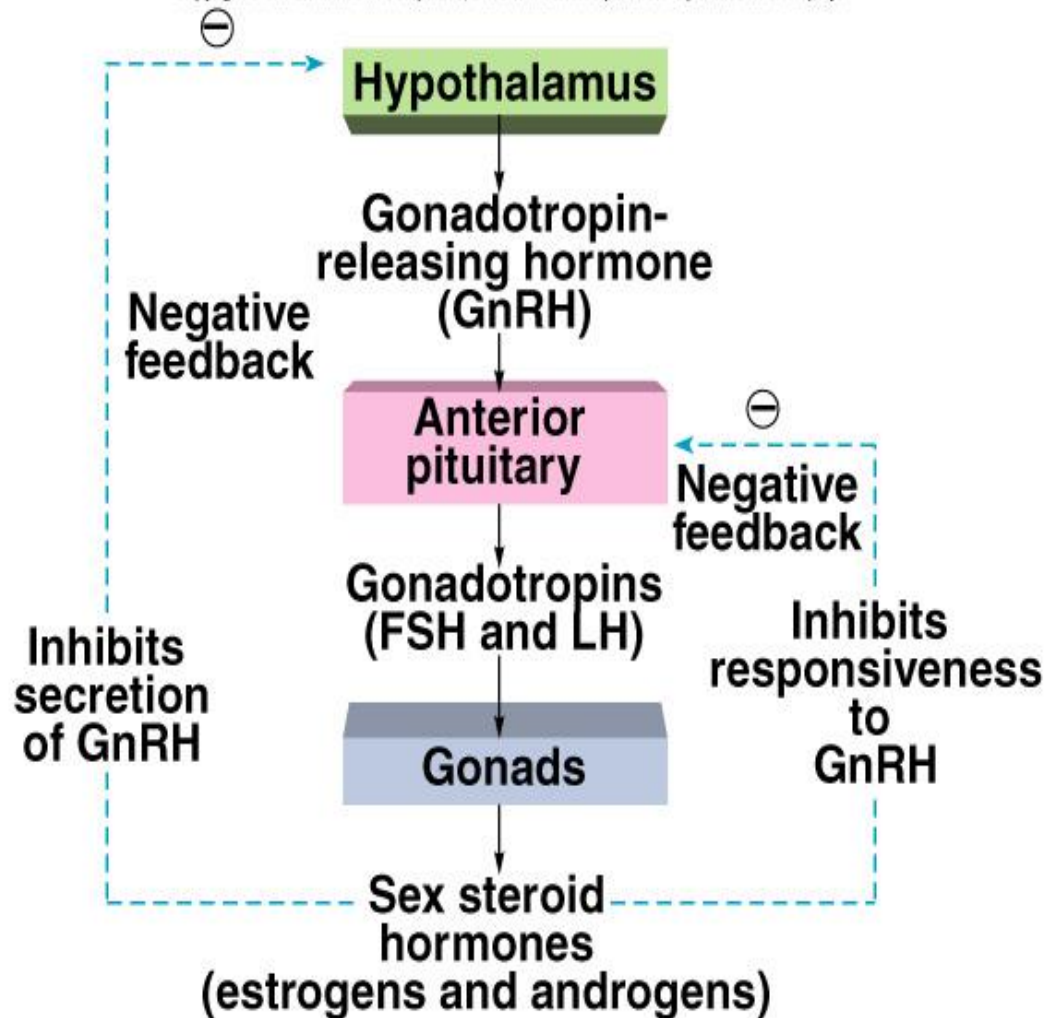


NEGATIVE FEEDBACK MECHANISM CORTISOL



NEGATIVE FEEDBACK MECHANISM SEX STEROIDS

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