Endocrinology

PHYSIOLOGY OF HYPOTHALAMO-PITUITARY AXIS AND REGULATORY MECHANISMS

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PHYSIOLOGY OF HYPOTHALAMO-PITUITARY AXIS & REGULATORY MECHANISMS

- Structure of pituitary gland:

  Anterior pituitary cell types and hormones.
  Posterior pituitary cell types and hormones.

- Hypothalamic control of pituitary gland:

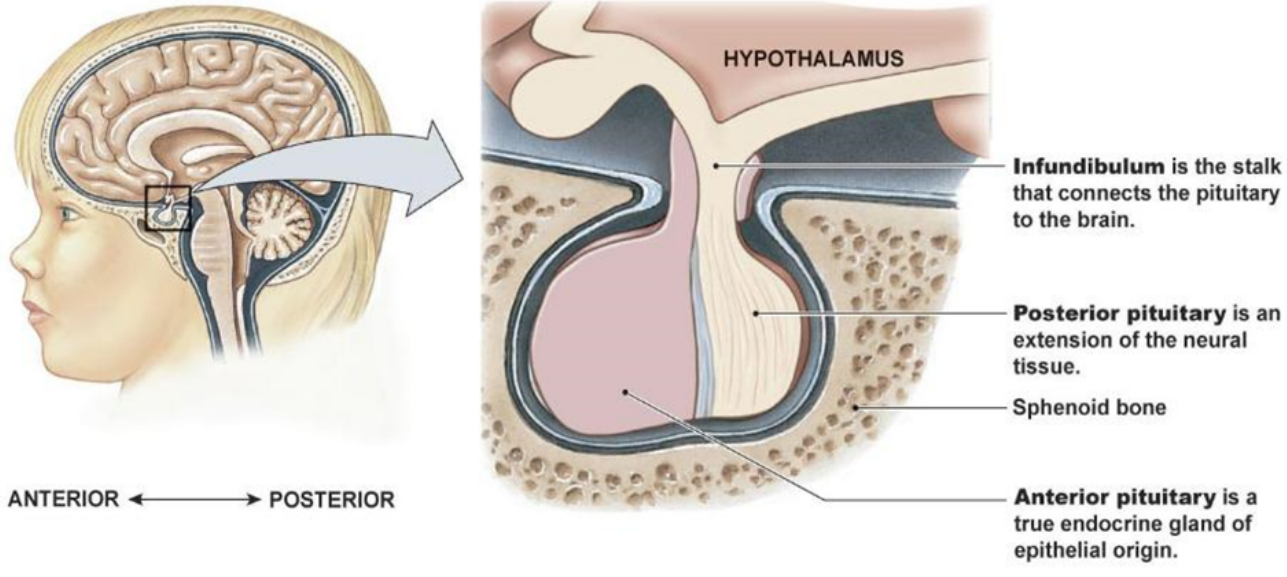
  Hypothalamo-hypophysial portal system.
  Hypothalamo-hypophysial tract.

- Feedback mechanisms:

  Positive feedback.
  Negative feedback.

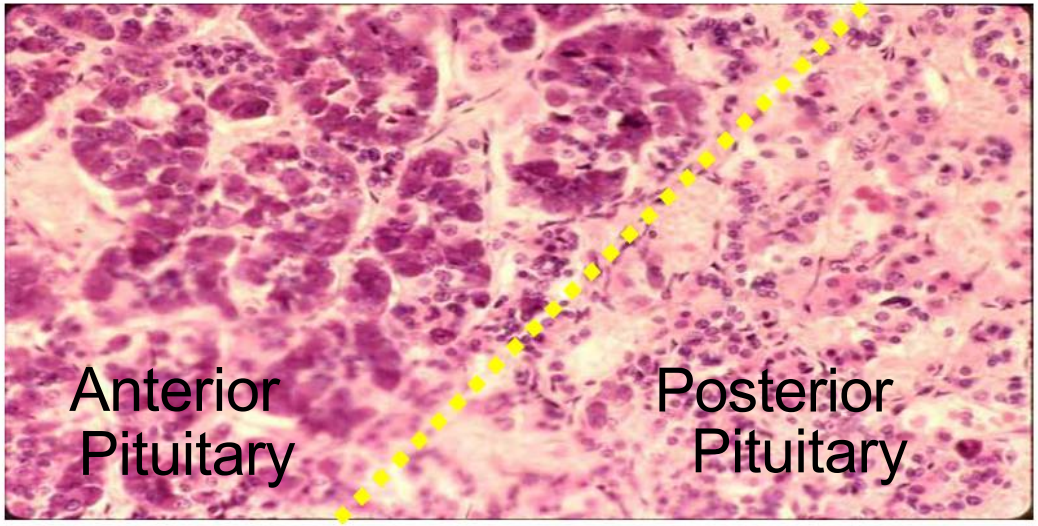
STRUCTURE OF PITUITARY GLAND

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

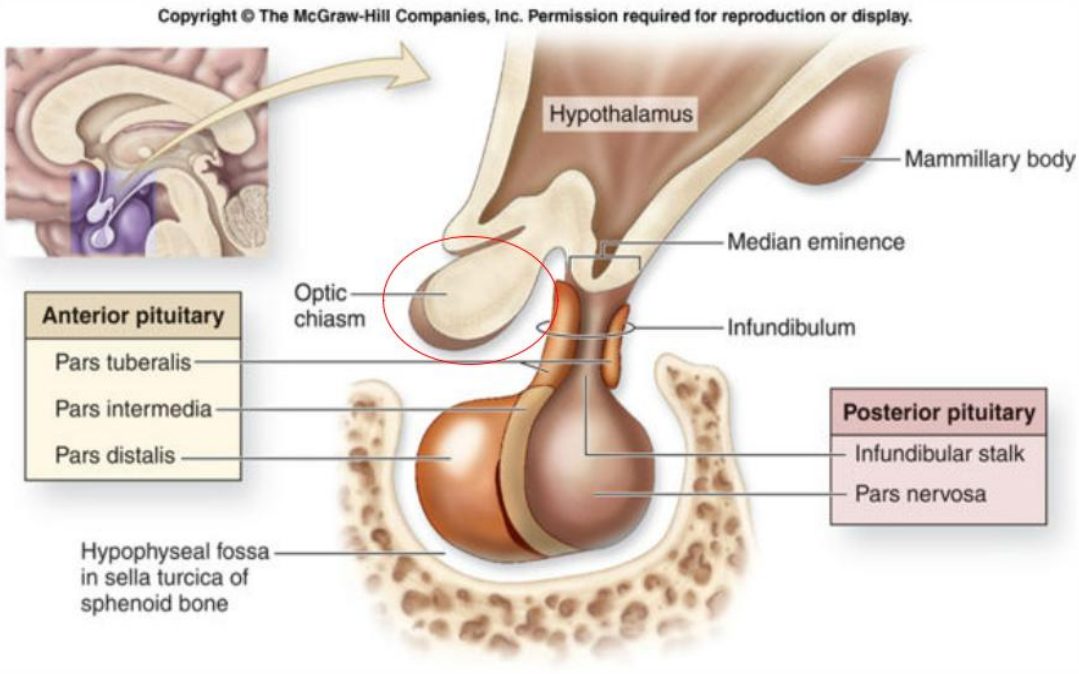


HISTOLOGY OF PITUITARY GLAND

- 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]



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
(The Posterior pituitary)

CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS

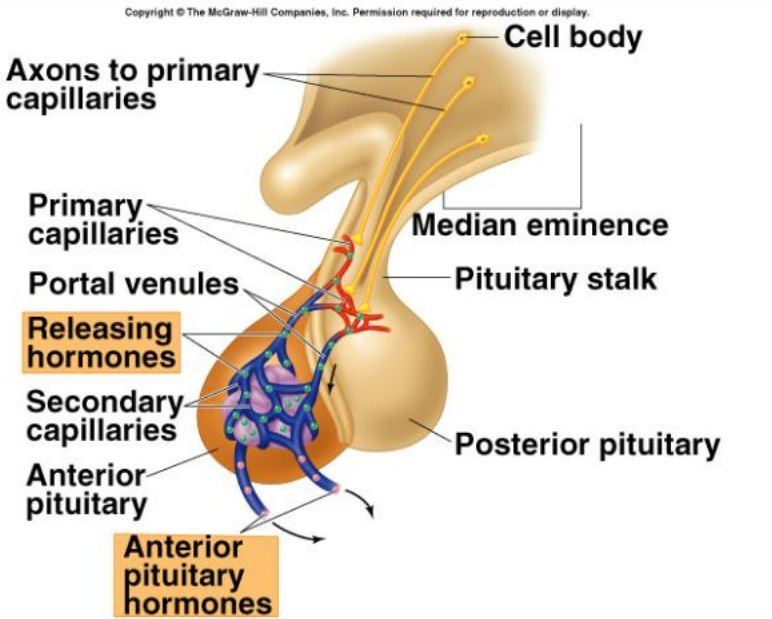
◉ Special neurons in the hypothalamus synthesize and secrete the hypothalamic releasing and inhibitory hormones that control secretion of anterior pituitary.

◉ Neurons send their nerve fibers to the median eminence (extension of hypothalamic tissue into the pituitary stalk).

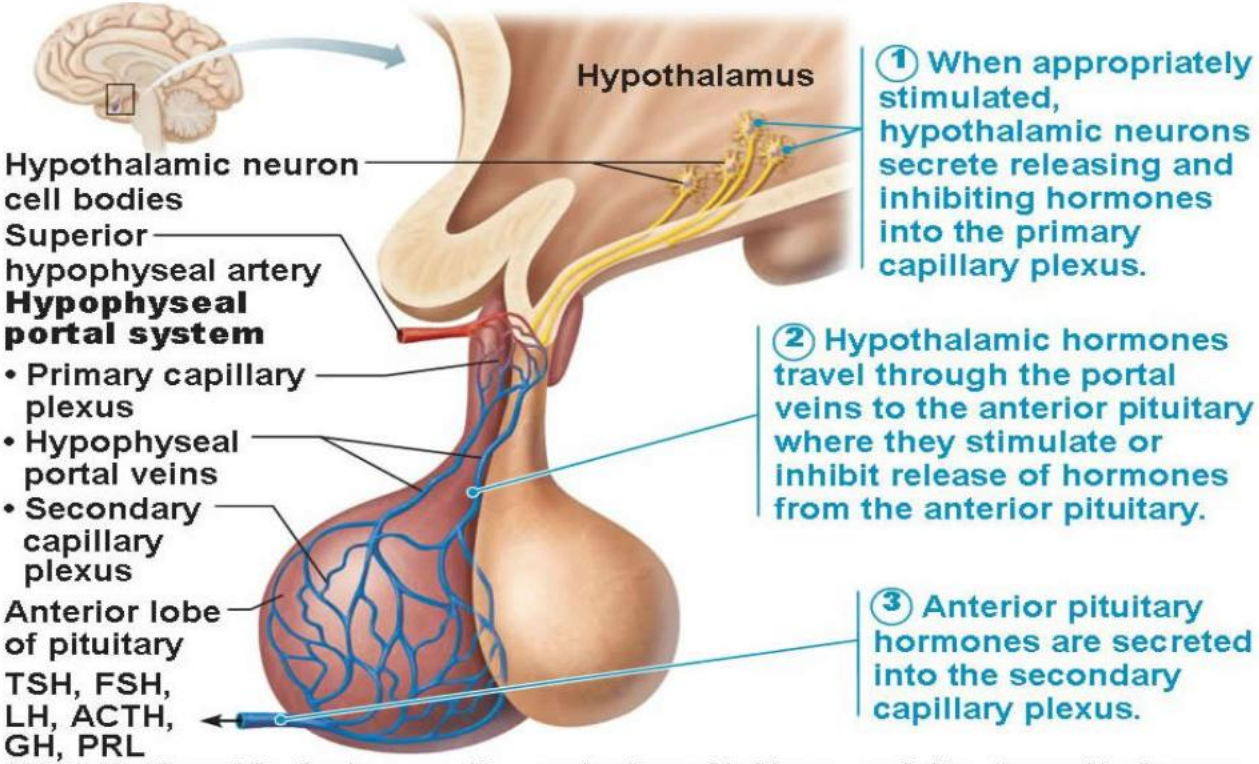
◉ Hormones are secreted to the tissue fluids, absorbed into the hypothalamic-hypophysial portal system and transported to the sinuses of the anterior pituitary.

HYPOTHALAMIC CONTROL OF ANTERIOR PITUITARY GLAND (ADENOHYPOPHYSIS)

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



CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS

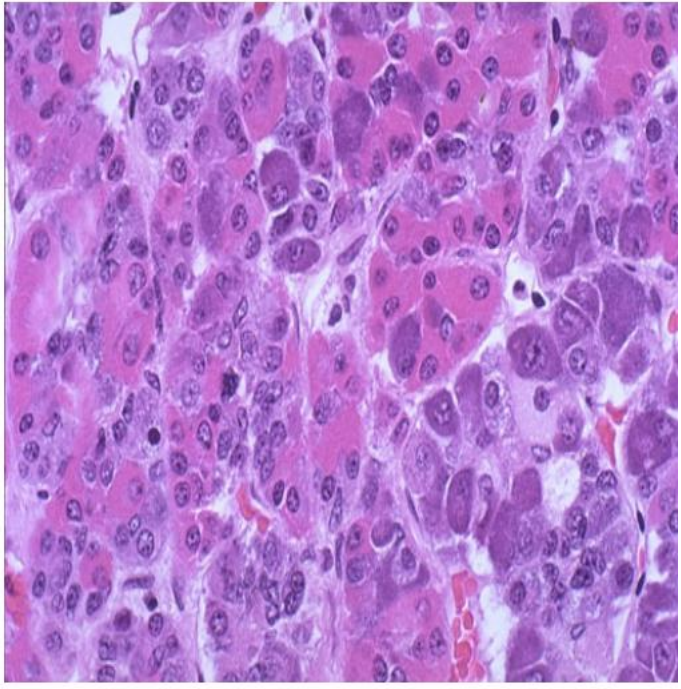


(b) Relationship between the anterior pituitary and the hypothalamus

STRUCTURE OF PITUITARY GLAND

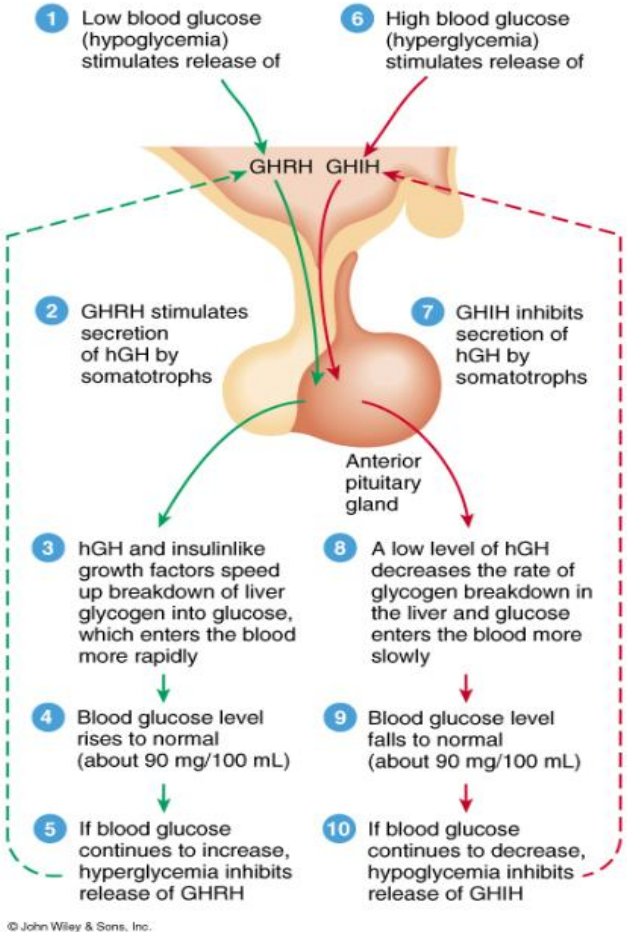
- Anterior pituitary contains 5 cell types:

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



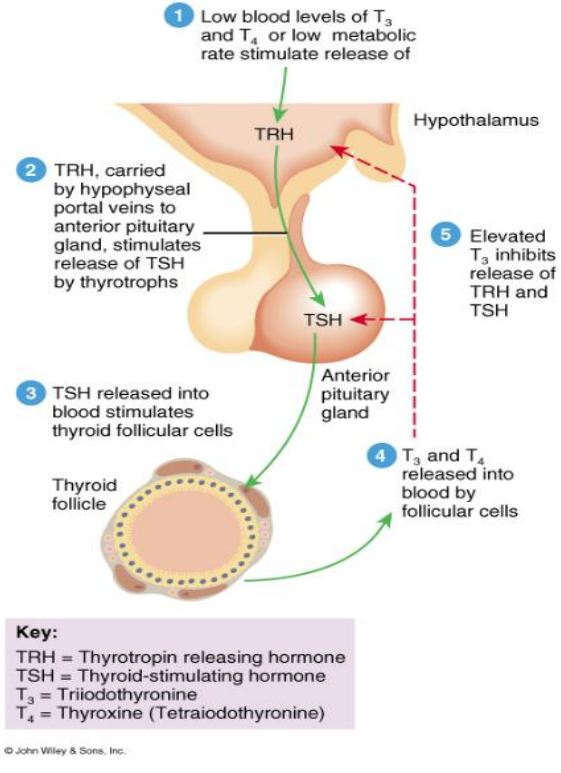
HYPOTHALAMIC RELEASING & INHIBITING HORMONES

- Growth hormone releasing hormone (GHRH):
  - Stimulates release of growth hormone.
- Growth hormone inhibiting hormone (GHIH), also called Somatostatin:
  - Inhibits release of growth hormone.



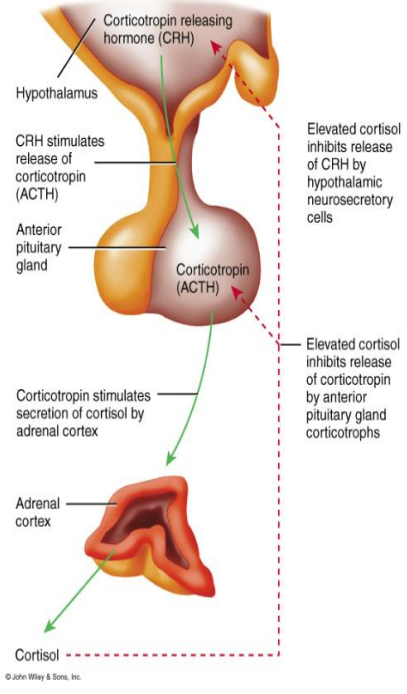
HYPOTHALAMIC RELEASING & INHIBITING HORMONES

- Thyrotropin-releasing hormone (TRH):
  - Stimulates release of thyroid stimulating hormone (TSH).



HYPOTHALAMIC RELEASING & INHIBITING HORMONES

- Corticotropin-releasing hormone (CRH):
  - Stimulates release of adrenocorticotropin hormone (ACTH)



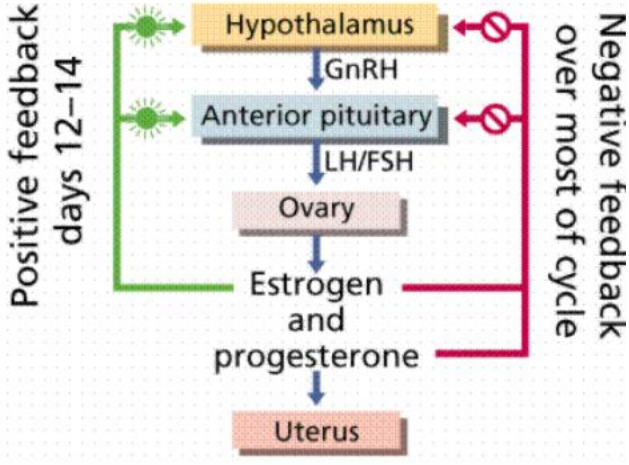
HYPOTHALAMIC RELEASING & INHIBITING HORMONE

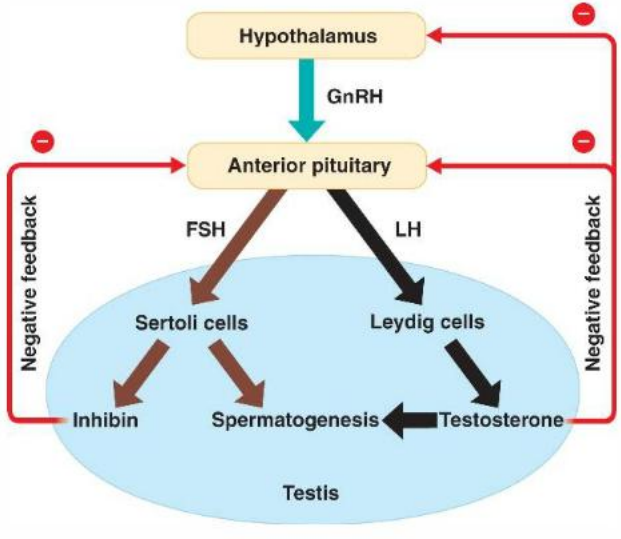
- Gonadotropin releasing hormone (GnRH).

- causes release of the 2 gonadotropic hormones:

- Luteinizing (LH).

- Follicle-stimulating hormone (FSH).





HYPOTHALAMIC RELEASING & INHIBITING HORMONES

- Prolactin Iinhibitory hormone (PIH) also known as;

Dopamine

- Inhibits prolactin secretion

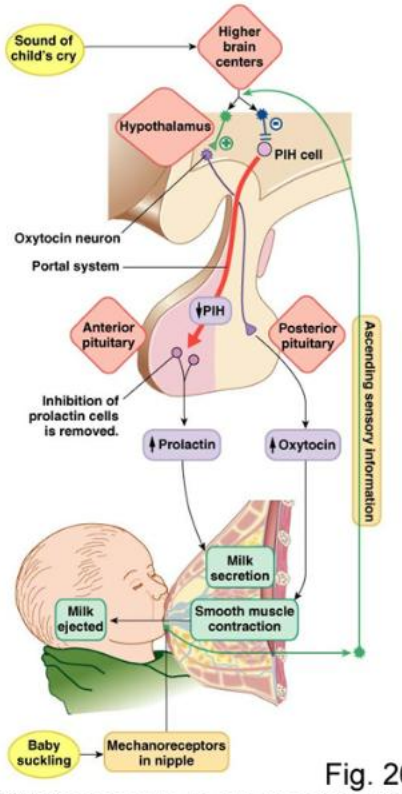


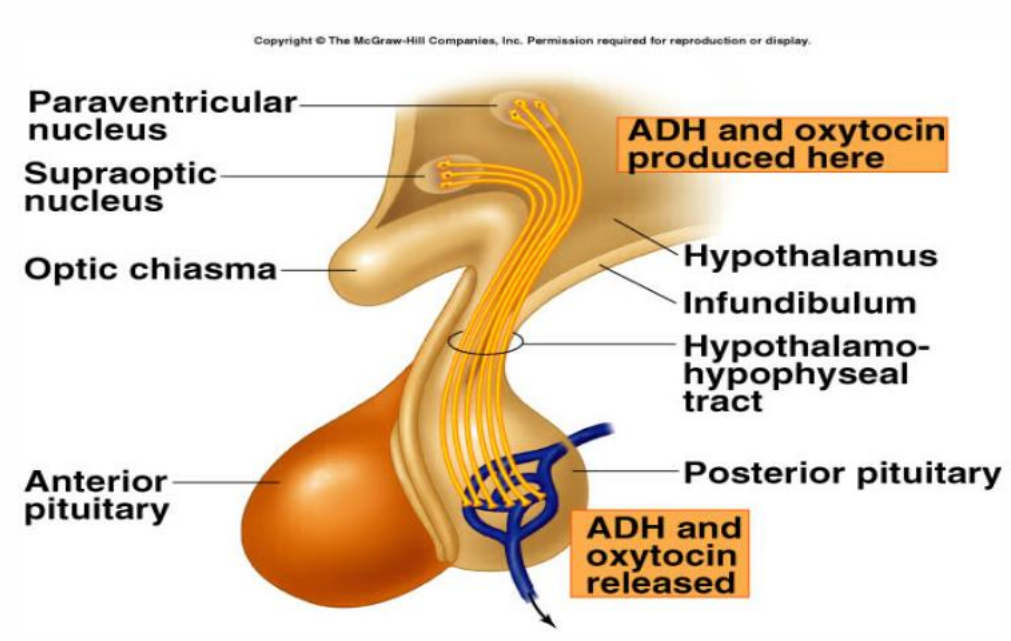
Fig. 26-23

POSTERIOR PITUITARY GLAND

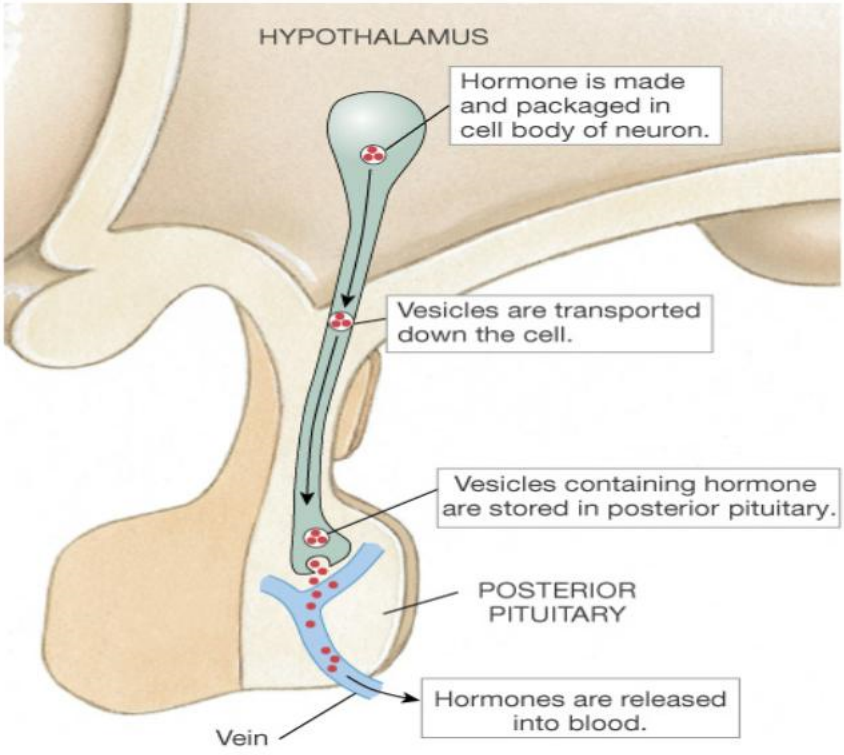
(Neurohypophysis)

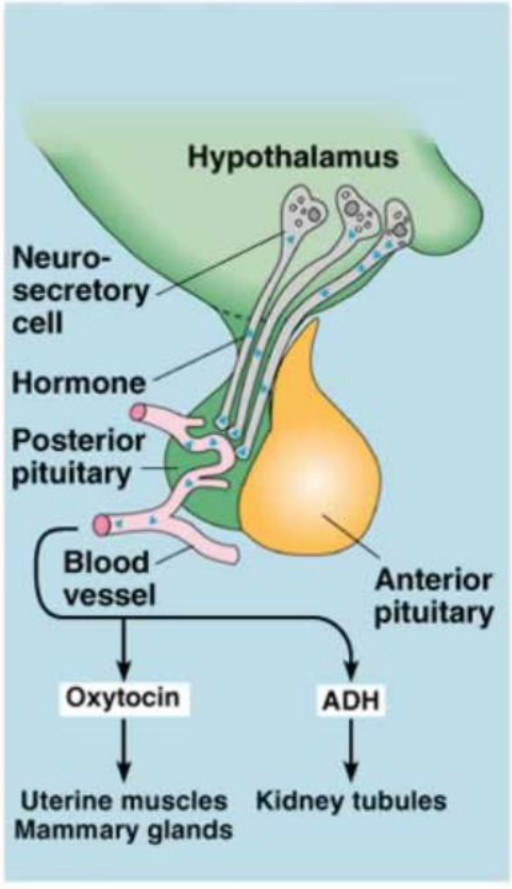
HYPOTHALAMIC CONTROL OF POSTERIOR PITUITARY GLAND (NEUROHYPOPHYSIS)

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



SECRETION OF POSTERIOR PITUITARY HORMONES





FEEDBACK MECHANISM

Positive feedback

- Release of hormone (A) stimulates the release of hormone (B).

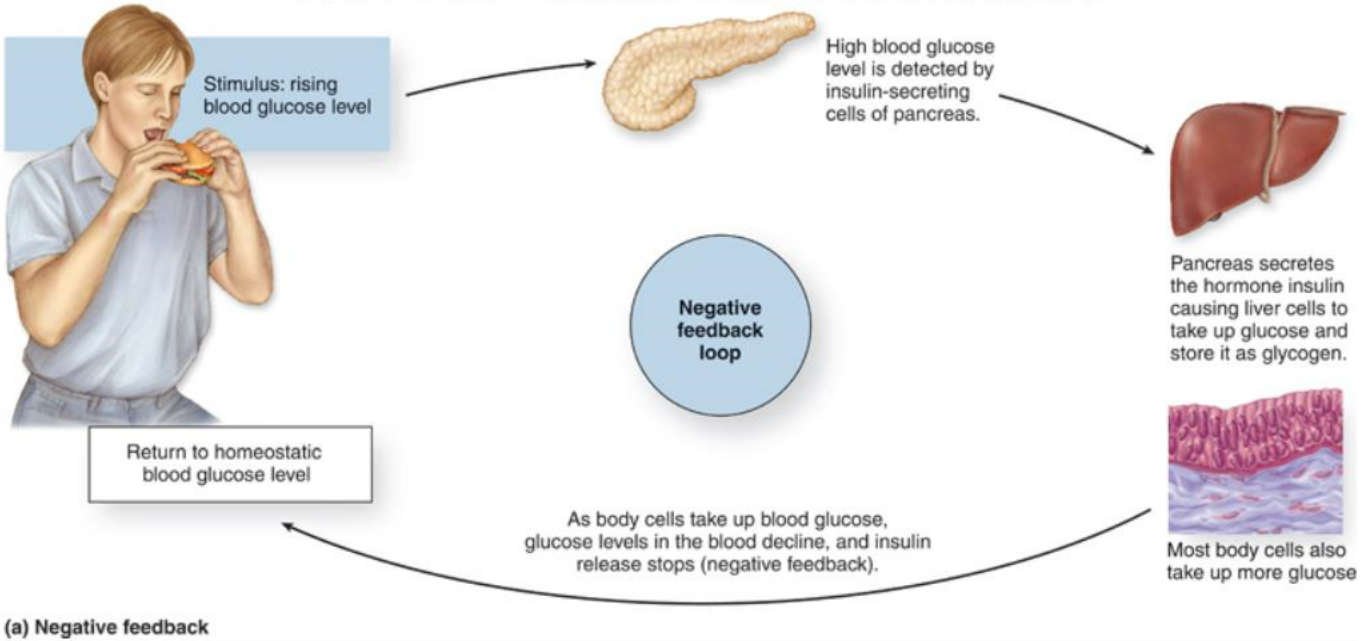
- Hormone (B) stimulates further release of hormone (A).

Negative feedback

- Release of hormone (A) stimulates the release of hormone (B).

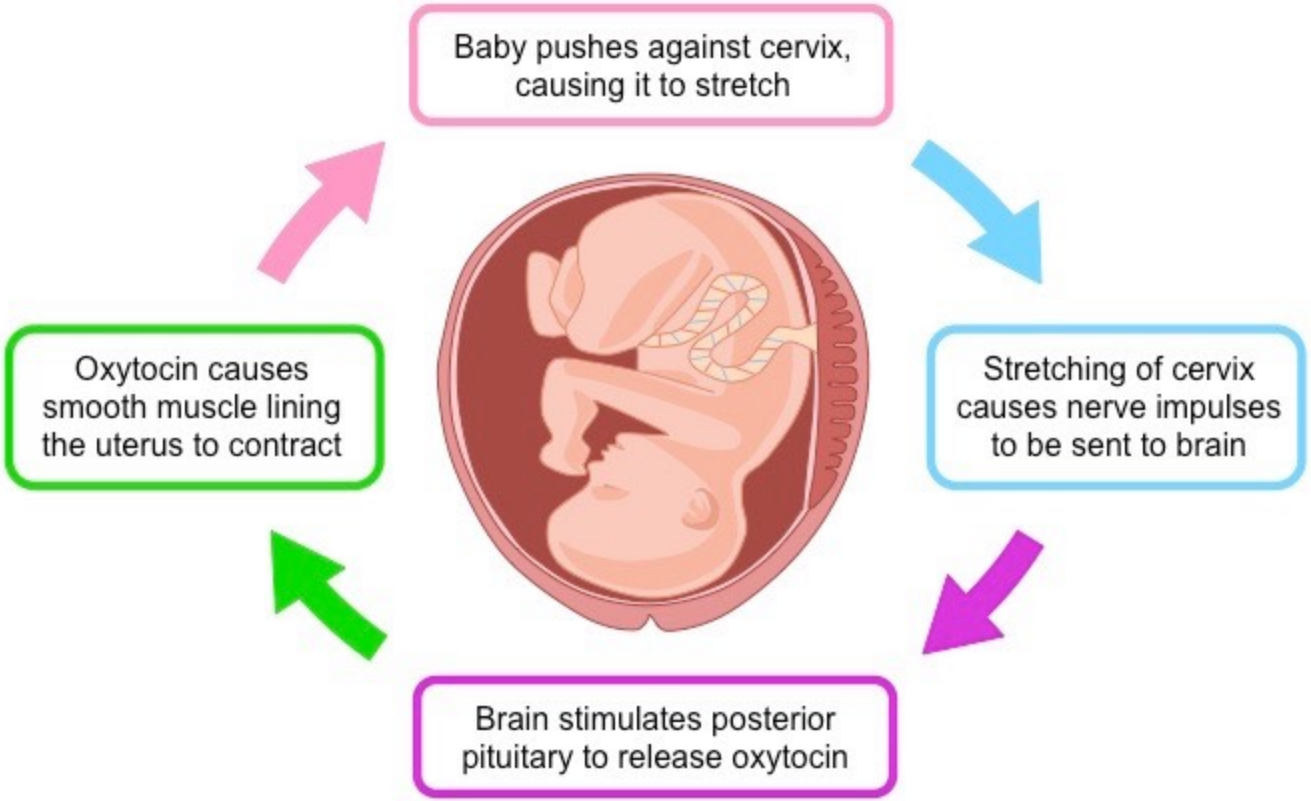
- Hormone (B) inhibits the release of hormone (A).

NEGATIVE FEEDBACK

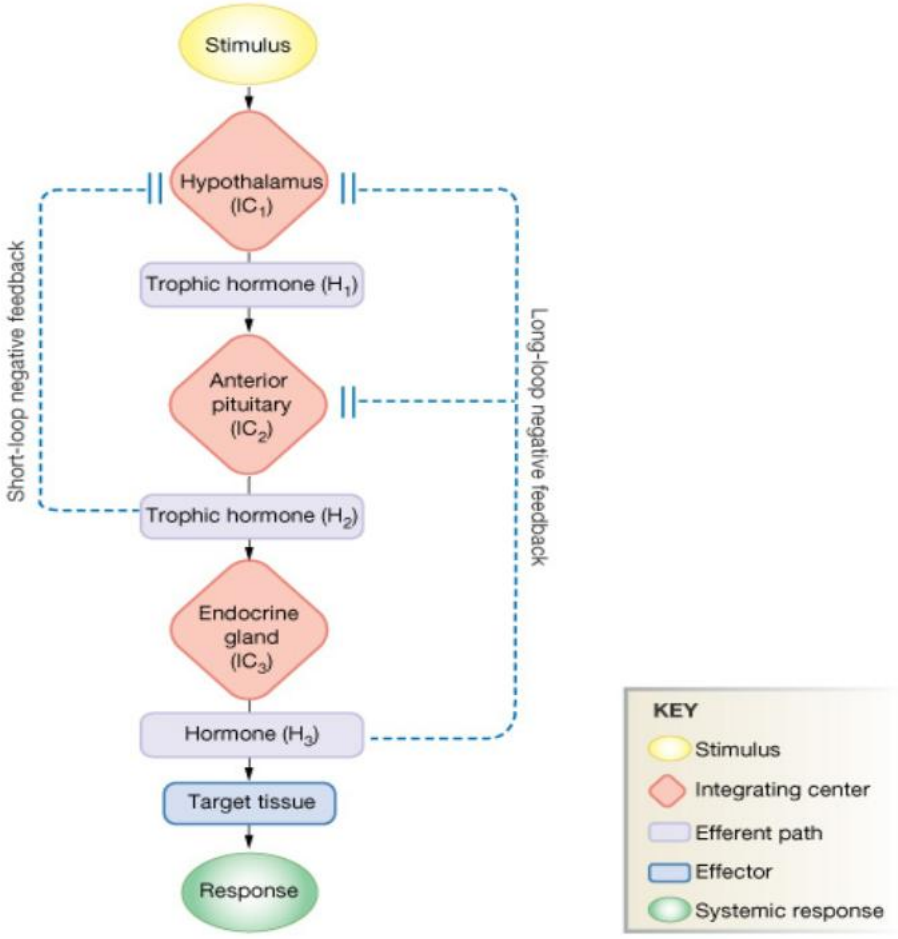


(a) Negative feedback

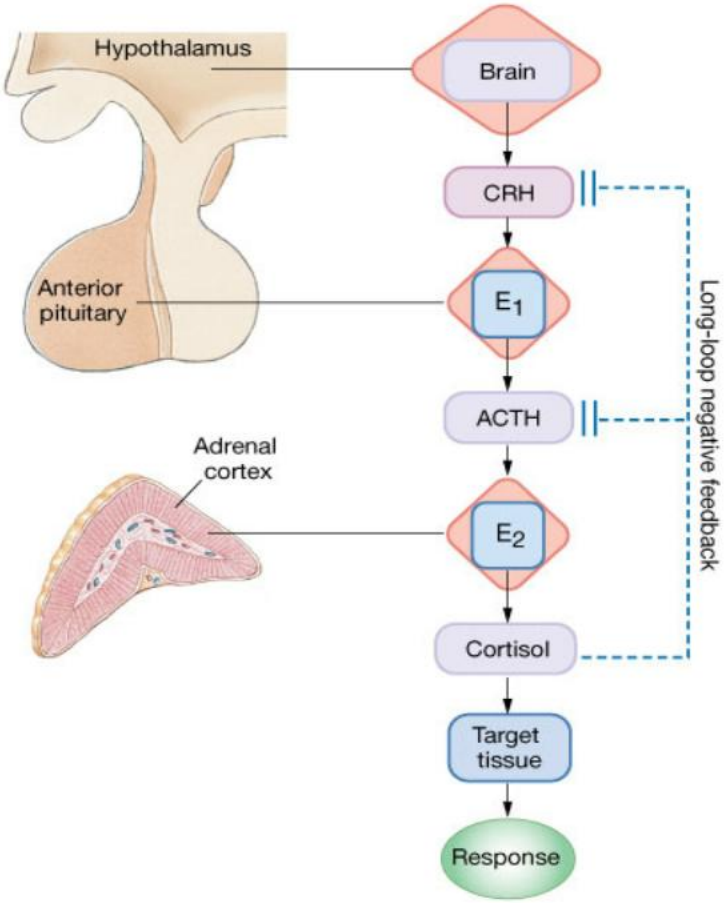
POSITIVE FEEDBACK



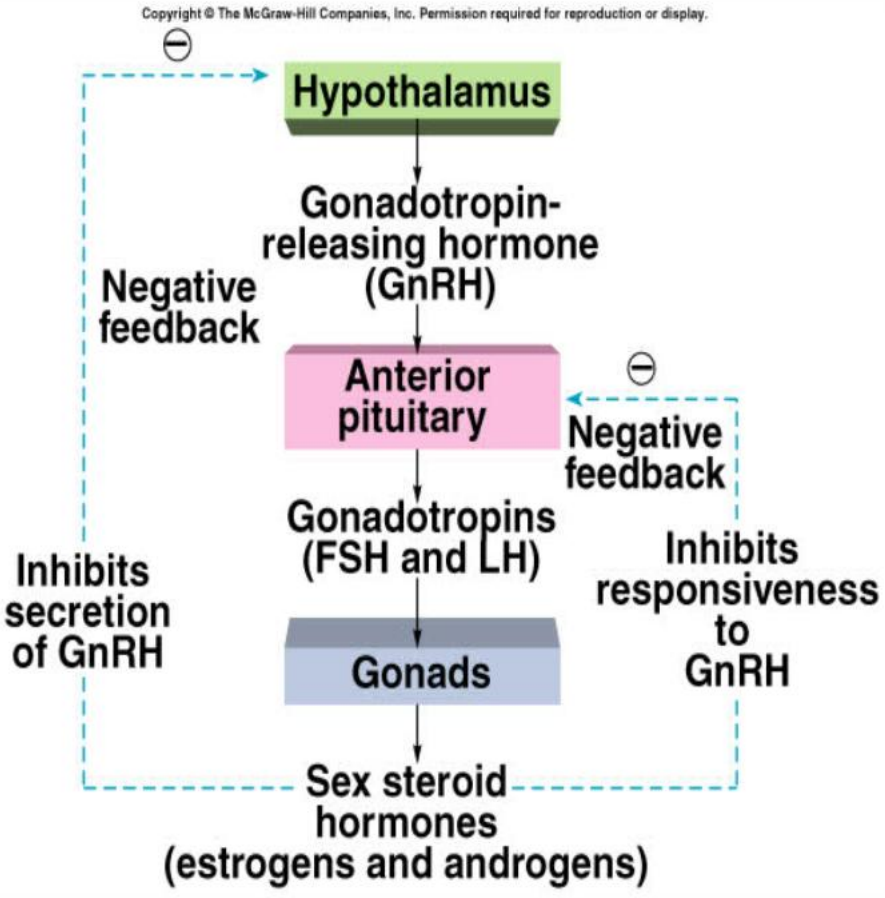
NEGATIVE FEEDBACK MECHANISM: Long and short loop reflexes



Negative feedback control mechanism of CORTISOL



Negative feedback mechanism of sex steroid hormones

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