ENDOCRINOLOGY

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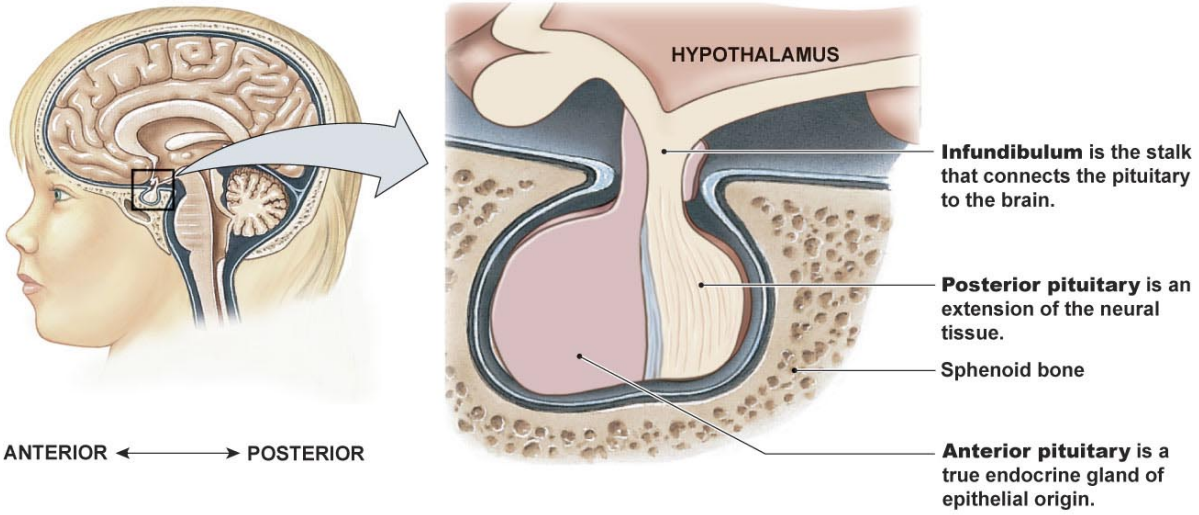
PHYSIOLOGY OF HYPOTHALAMO-PITUITARY AXIS AND REGULATORY MECHANISMS

- 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

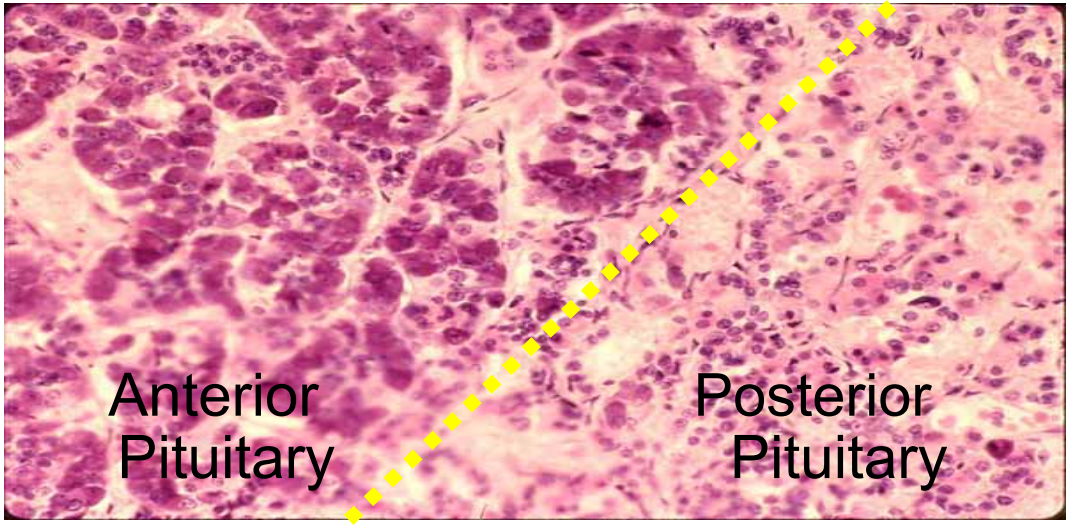
STRUCTURE OF PITUITARY GLAND

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

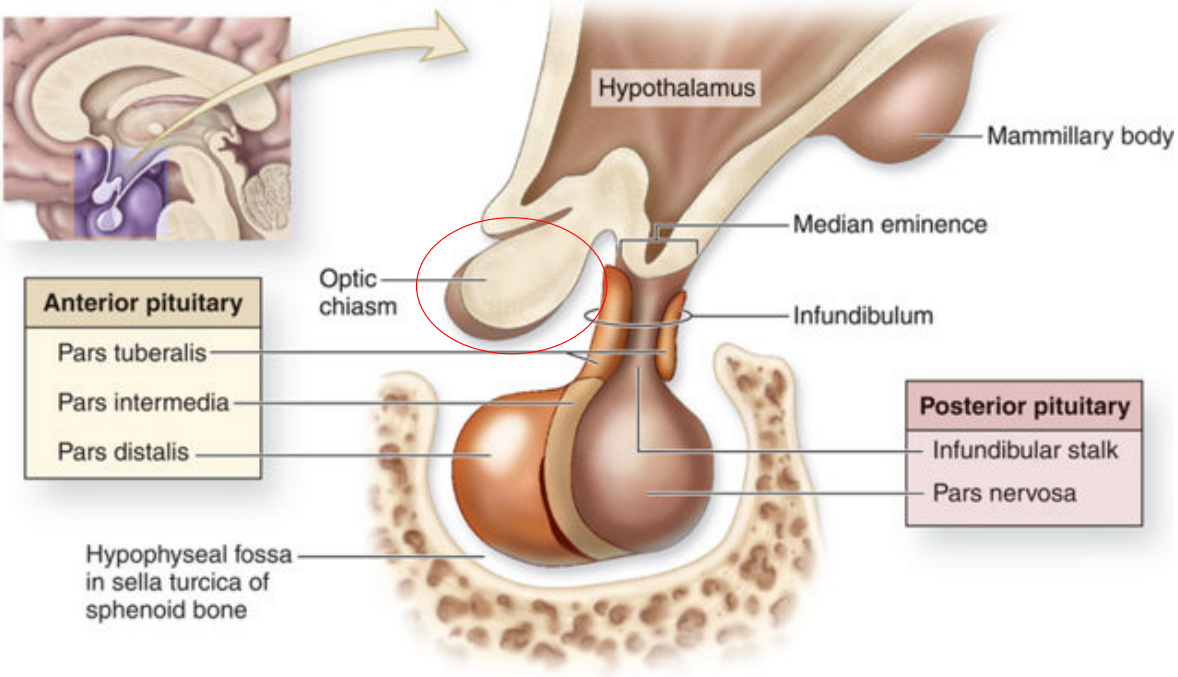


HISTOLOGY OF PITUITARY GLAND

- 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)



HYPOTHALAMIC CONTROL OF PITUITARY SECRETIONS

- Almost all secretions by the pituitary are controlled by either

  Hormonal secretion of hypothalamus
  (The anterior pituitary)
  or

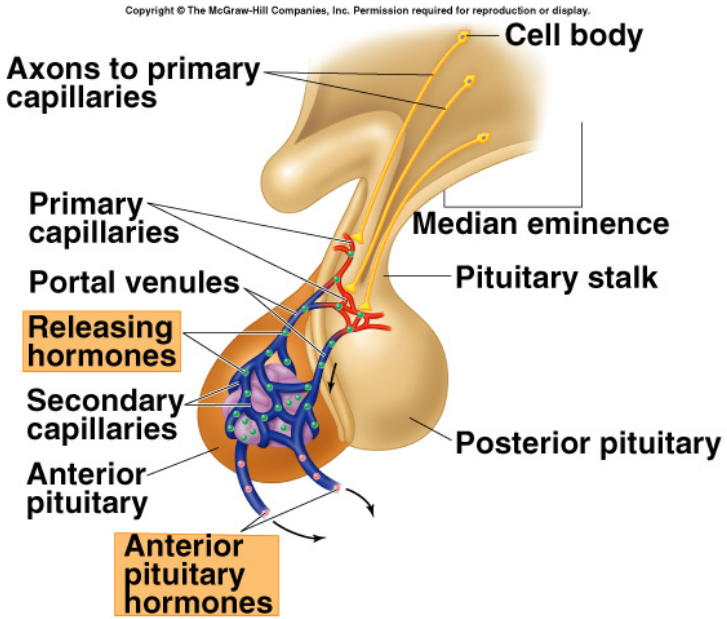
  Nervous signals from hypothalamus
  (Posterior pituitary)

CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS

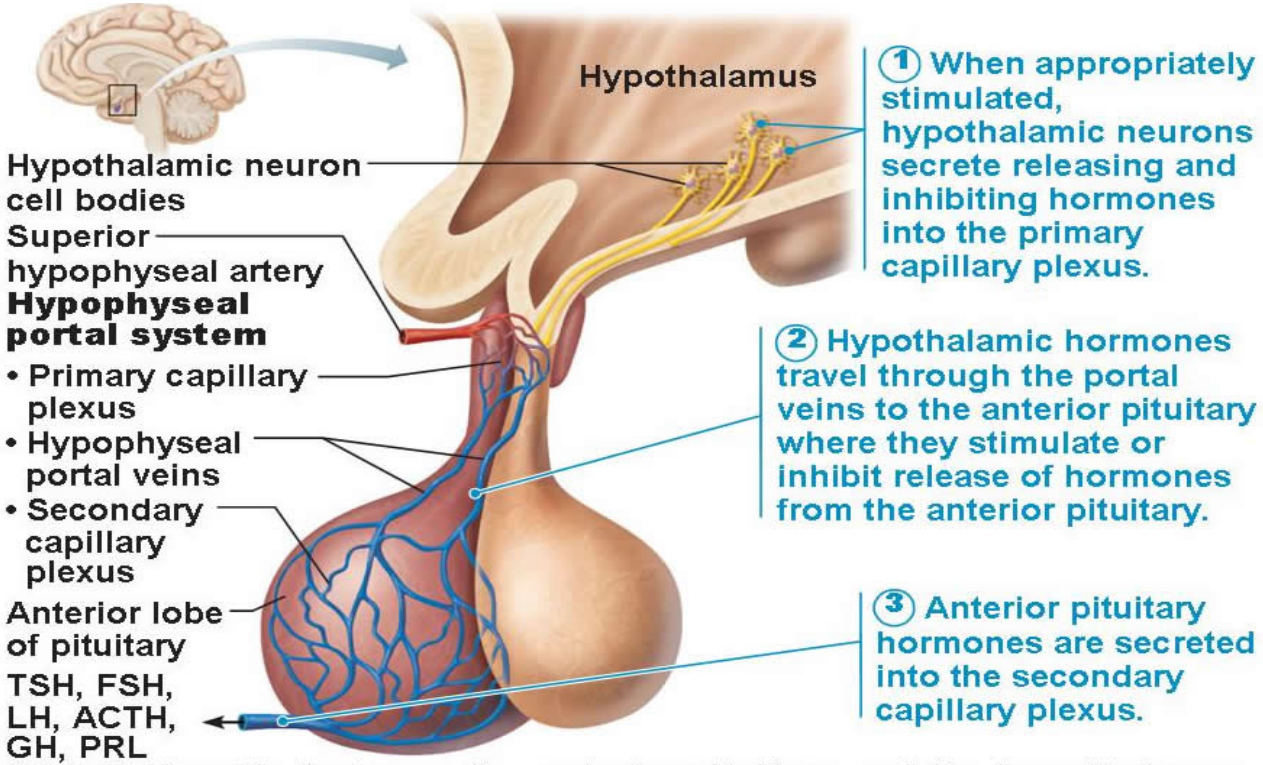
- Special neurons in the hypothalamus synthesize and secrete the hypothalamic releasing and inhibitory hormones that control secretion of anterior pituitary
- Neurons send their nerve fibers to the median eminence (extension of hypothalamic tissue into the pituitary stalk)
- Hormones are secreted to 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 (ADENOHYPOPHYSIS)

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



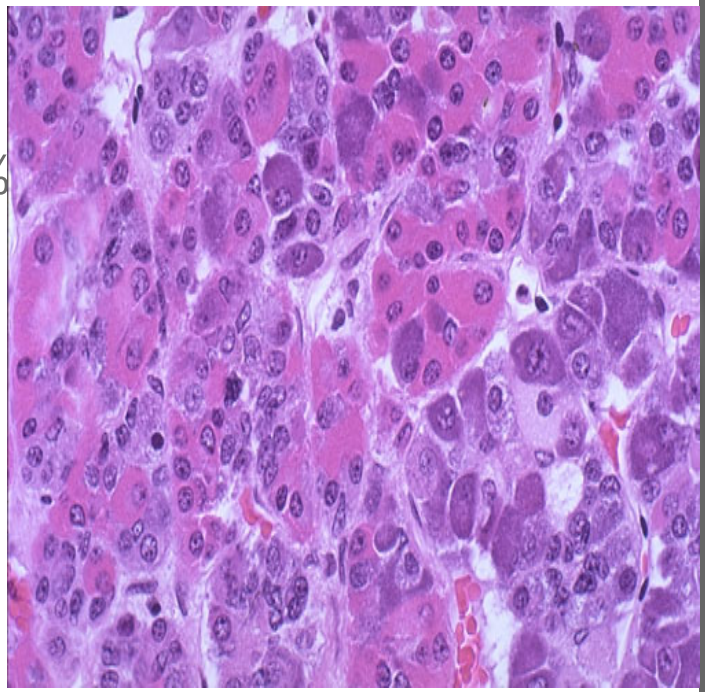
CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS



(b) Relationship between the anterior pituitary and the hypothalamus

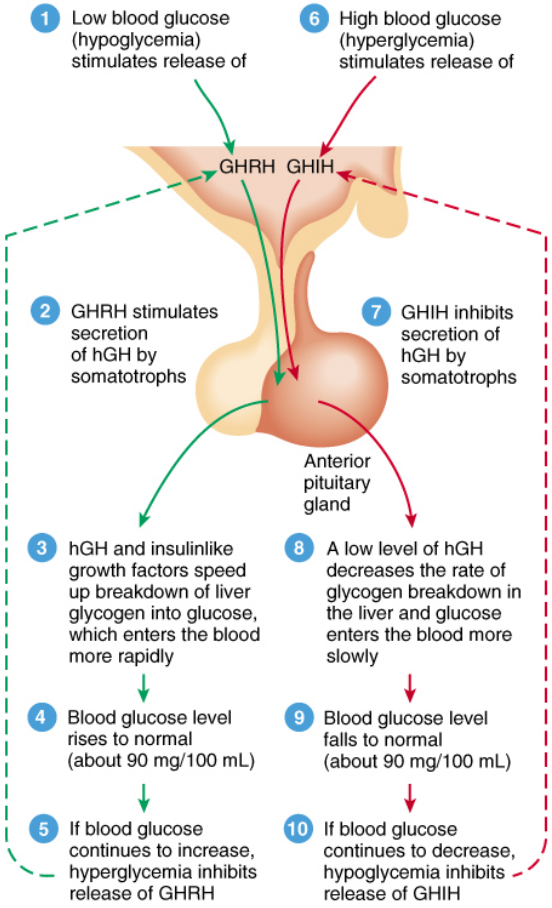
STRUCTURE OF PITUITARY GLAND

- Anterior pituitary contains 5 cell types:
  - Somatotrops: GH 40%
  - Corticotrops: ACTH 20%
  - Thyrotropes: TSH
  - Gonadotropes: LH & FSH
  - Lactotrops: PRL



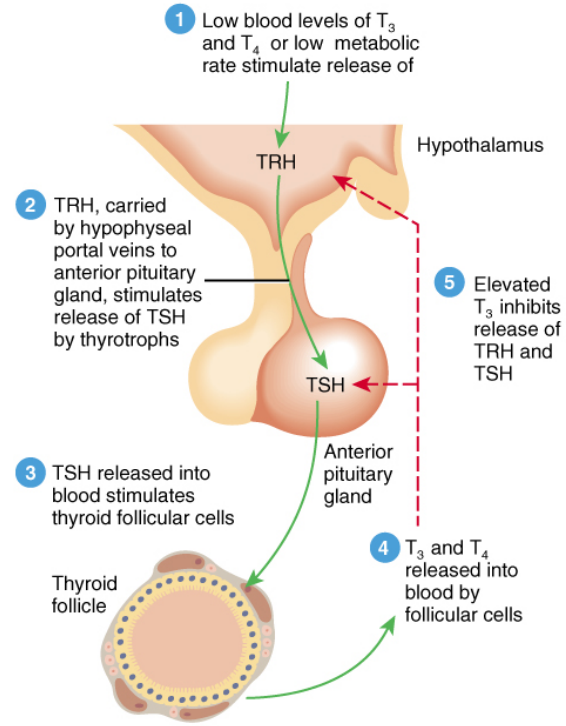
HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

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



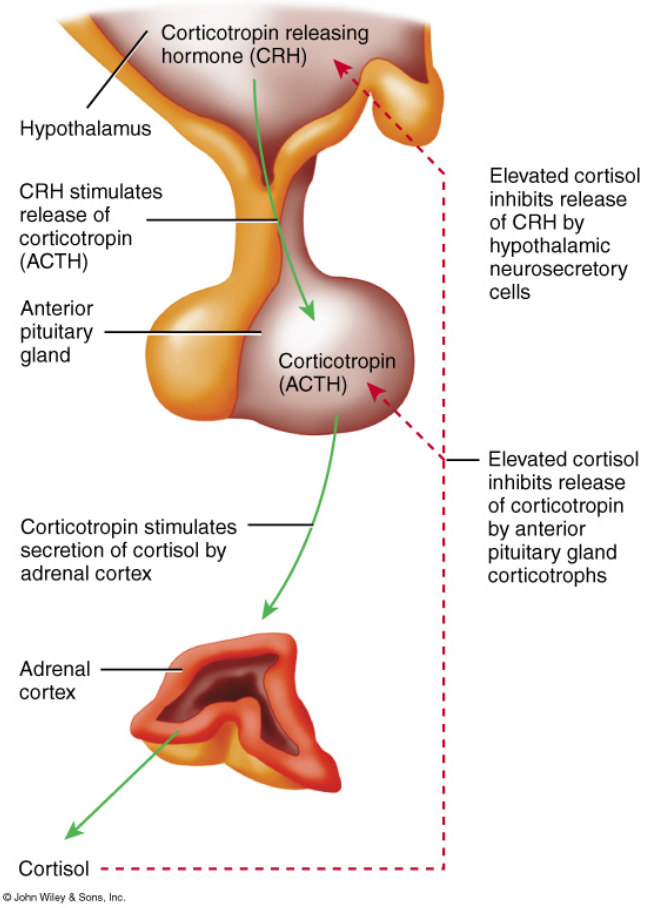
HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

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



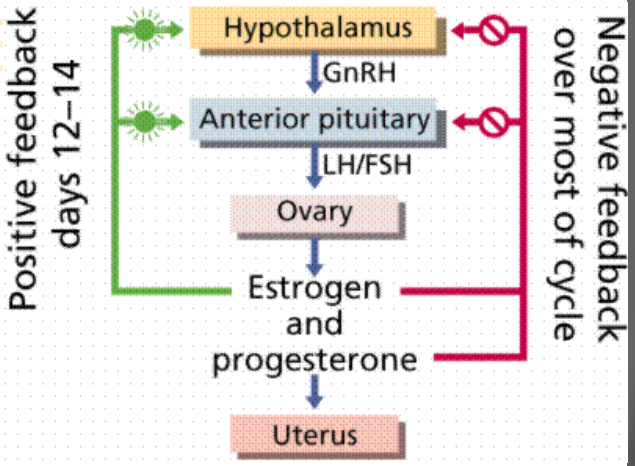
HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

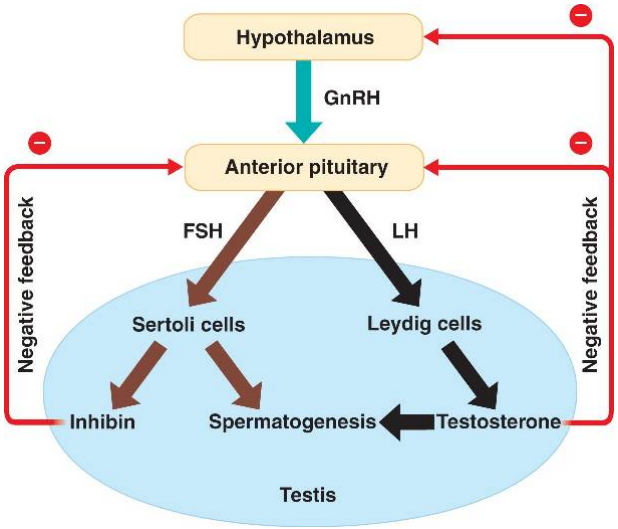
- Corticotropin-releasing hormone (CRH)
  - Stimulates release of adrenocorticotropin hormone (ACTH)



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

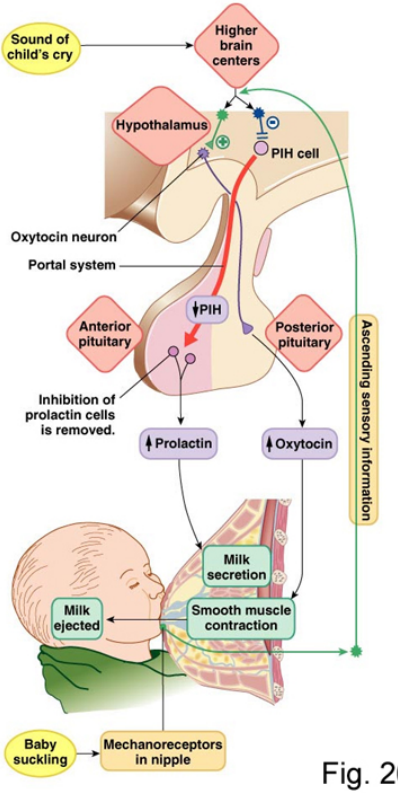


Fig. 26-23

CLINICAL APPLICATION

- What will happen if pituitary gland is removed from its normal position and transplanted to other part of the body?

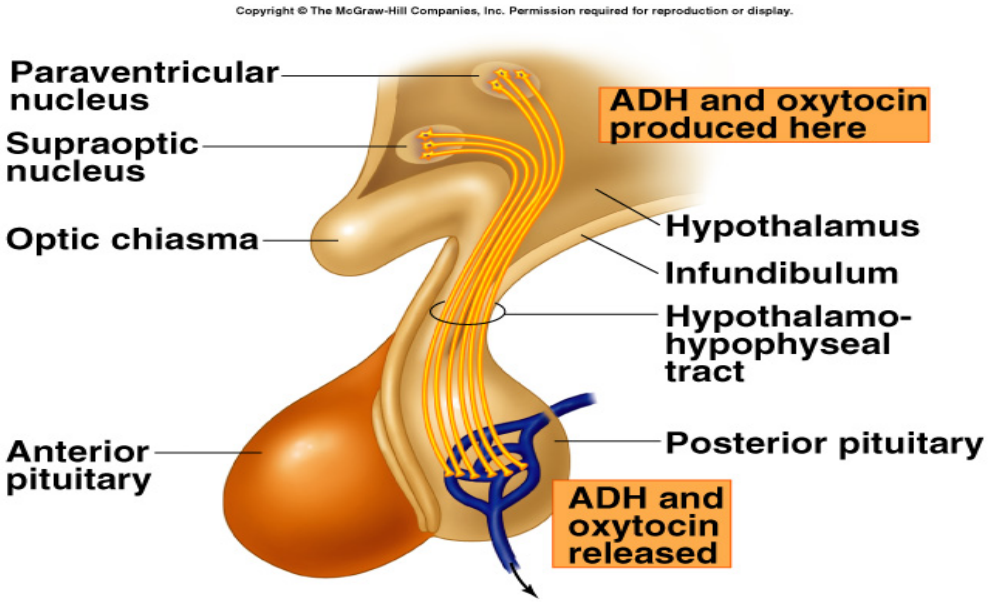
Release of all hormones will stop.
Release of some hormones will decrease to very low levels
Release of some hormones will increase.

POSTERIOR PITUITARY GLAND

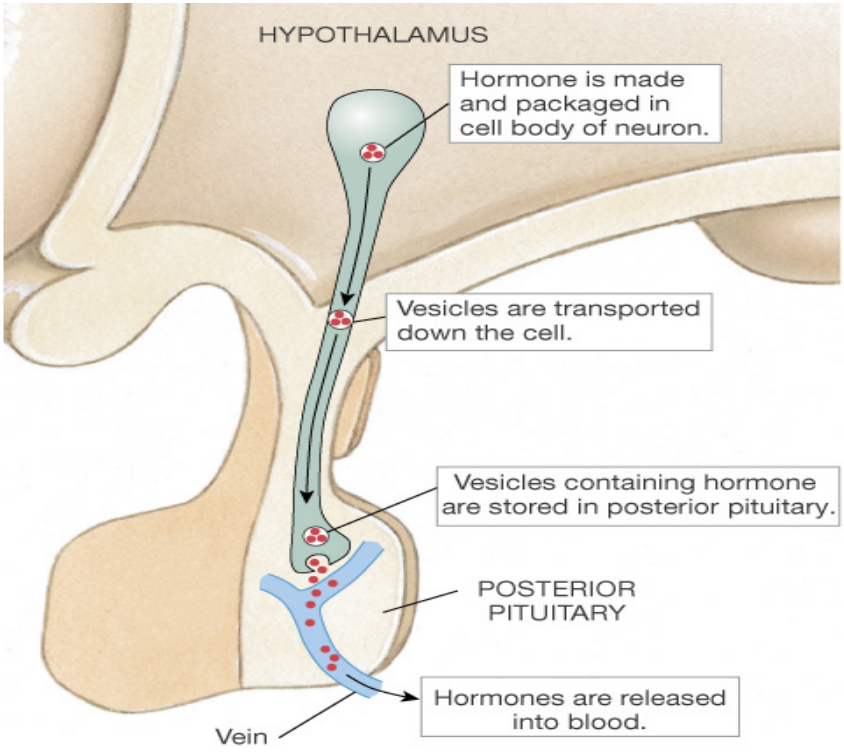
(Neurohypophysis)

HYPOTHALAMIC CONTROL OF POSTERIOR PITUITARY GLAND (NEUROHYPOPHYSIS)

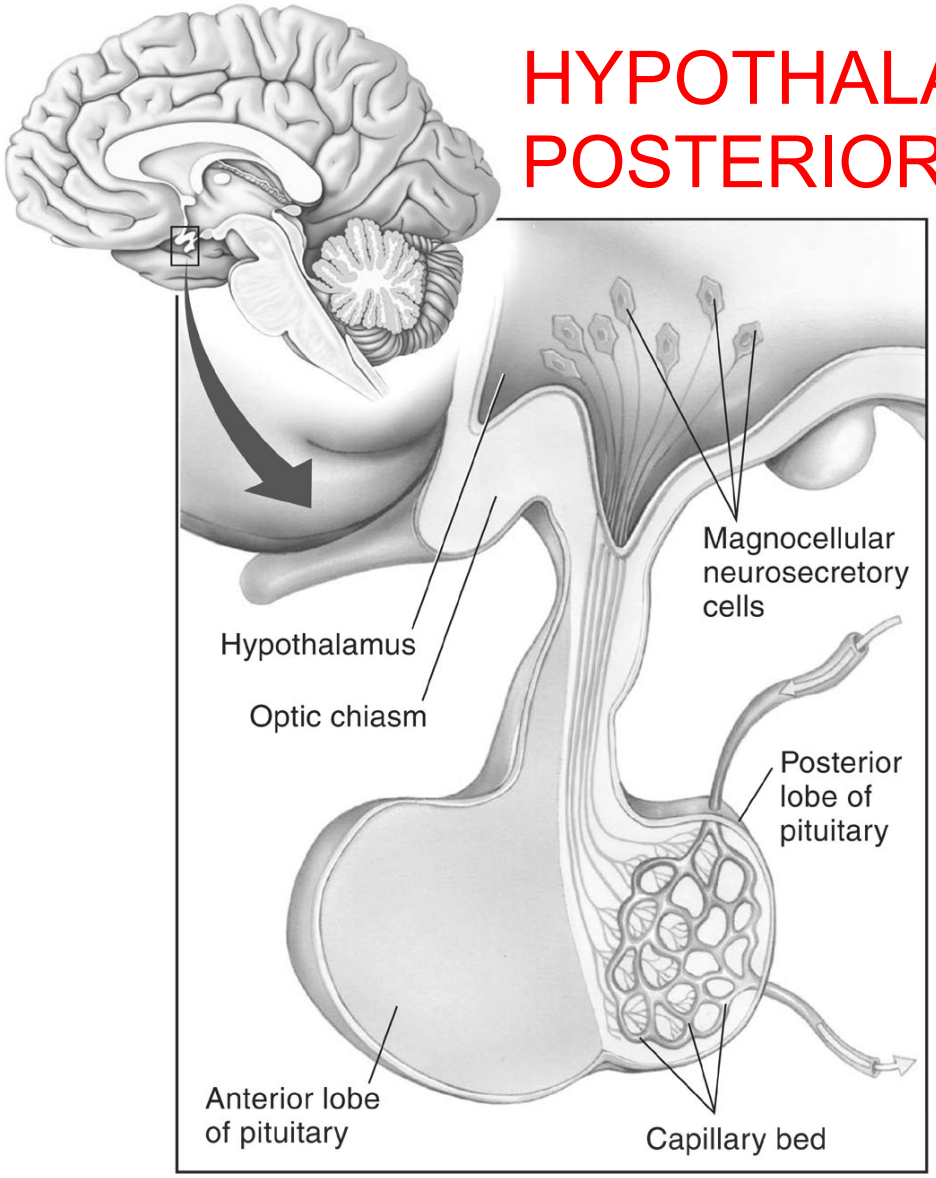
- Hormones synthesized in the supraoptic and paraventricular nuclei of the hypothalamus and released in posterior pituitary



SECRETION OF POSTERIOR PITUITARY HORMONES



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

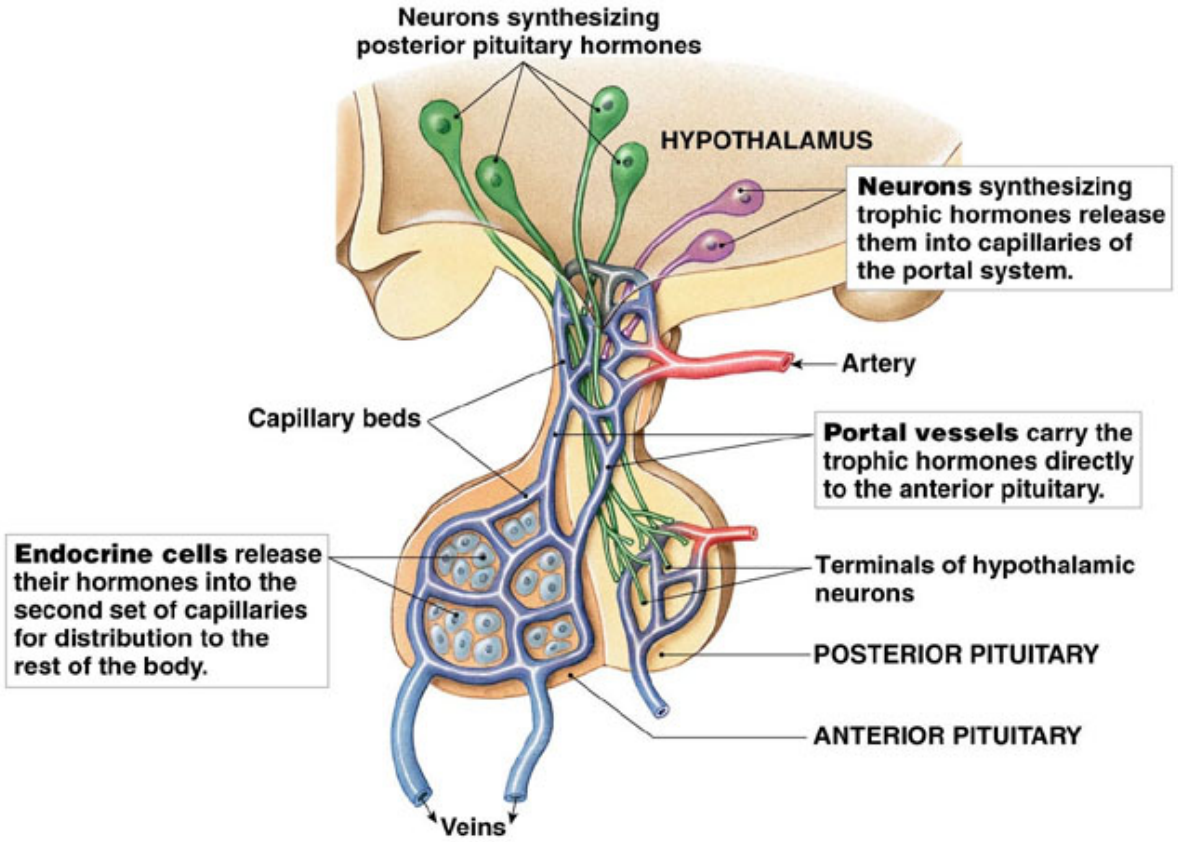
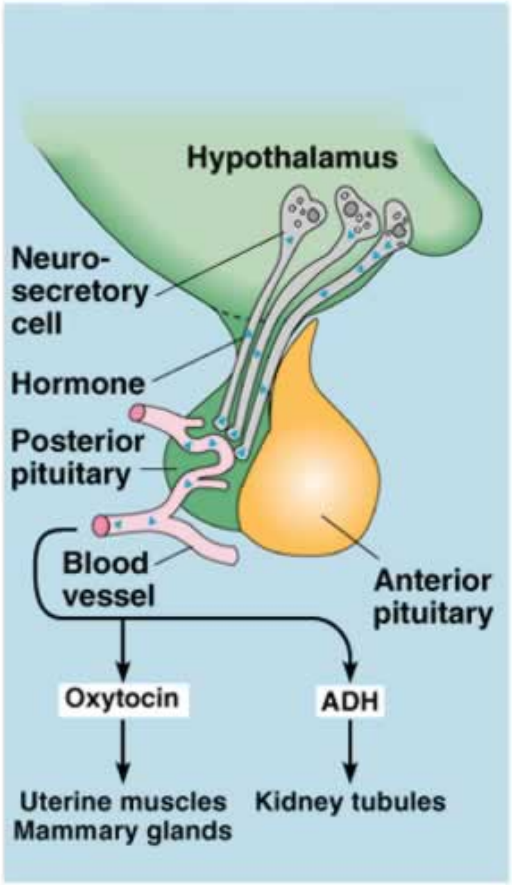
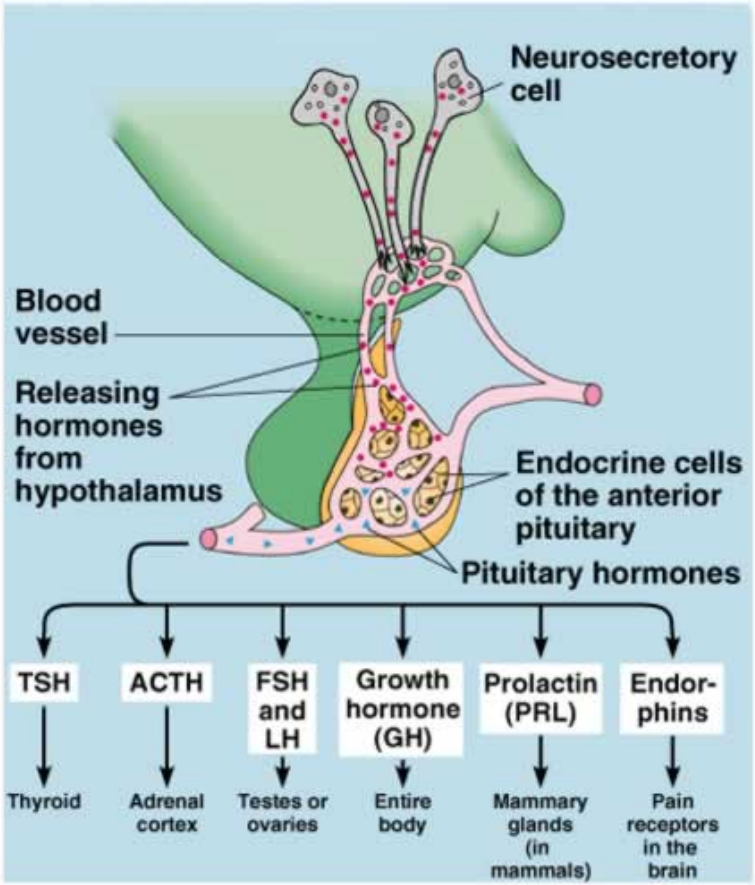


Fig. 7-16

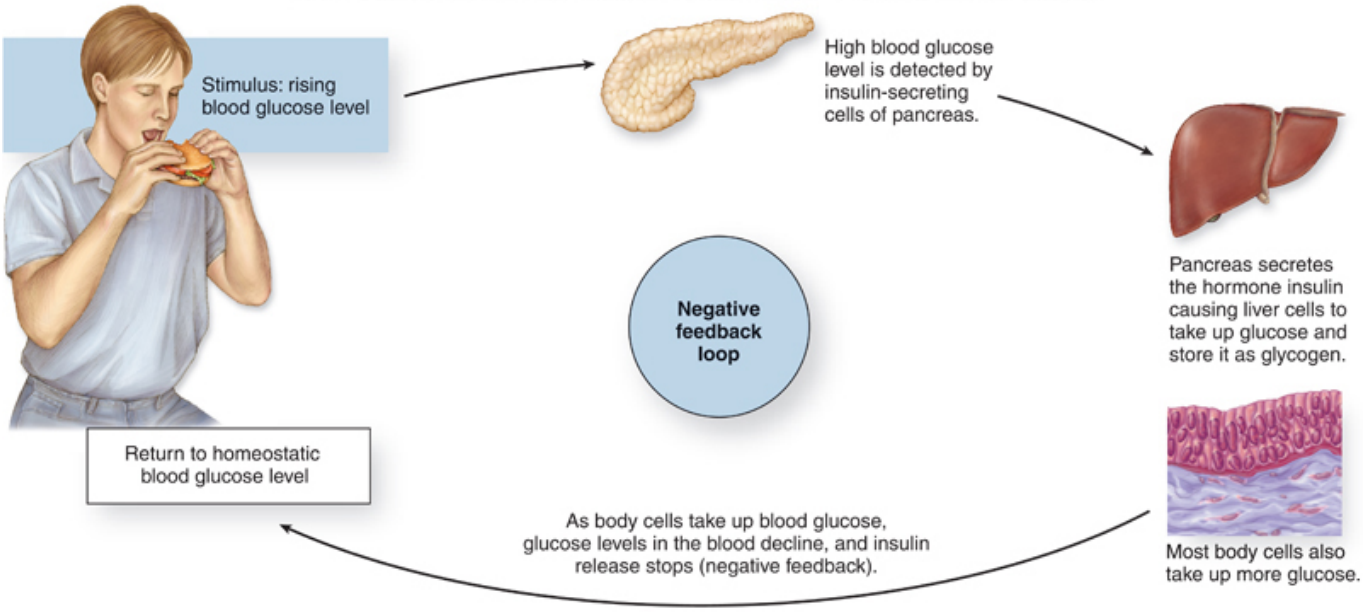




FEEDBACK MECHANISM

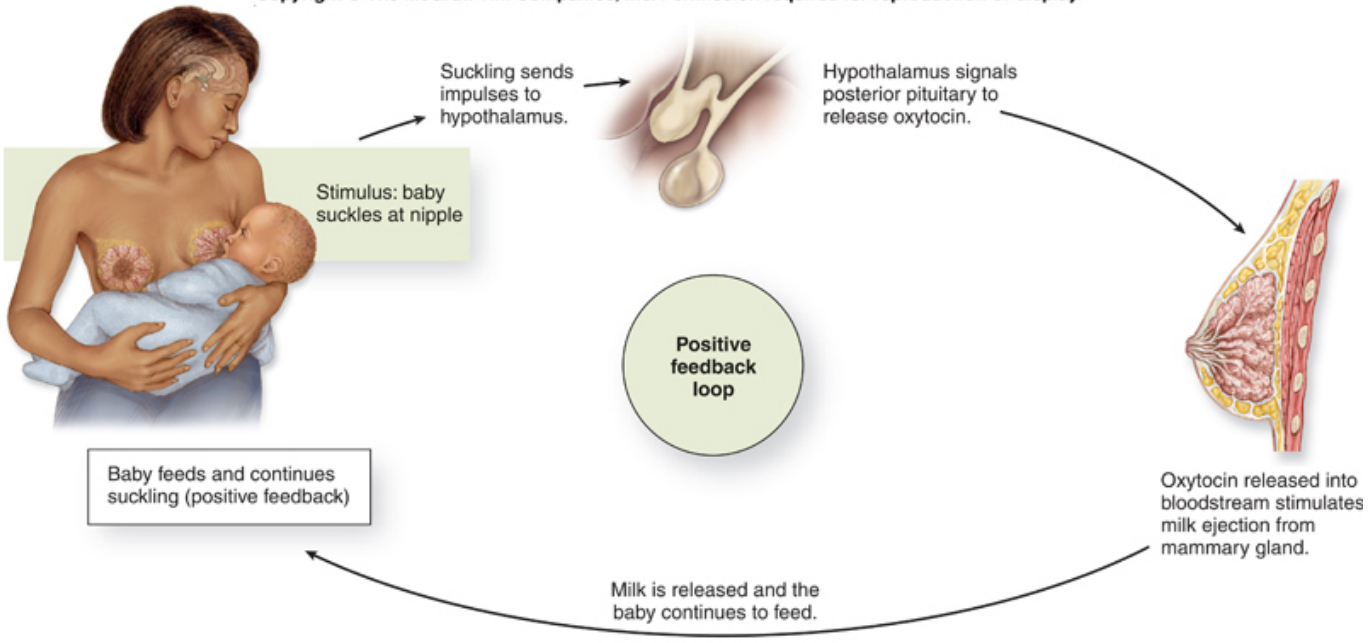
Positive feedback	Negative feedback
Release of hormone A stimulates the release of hormone B Hormone B stimulates further release of hormone A	Release of hormone A stimulates the release of hormone B Hormone B inhibits the release of hormone A

NEGATIVE FEEDBACK



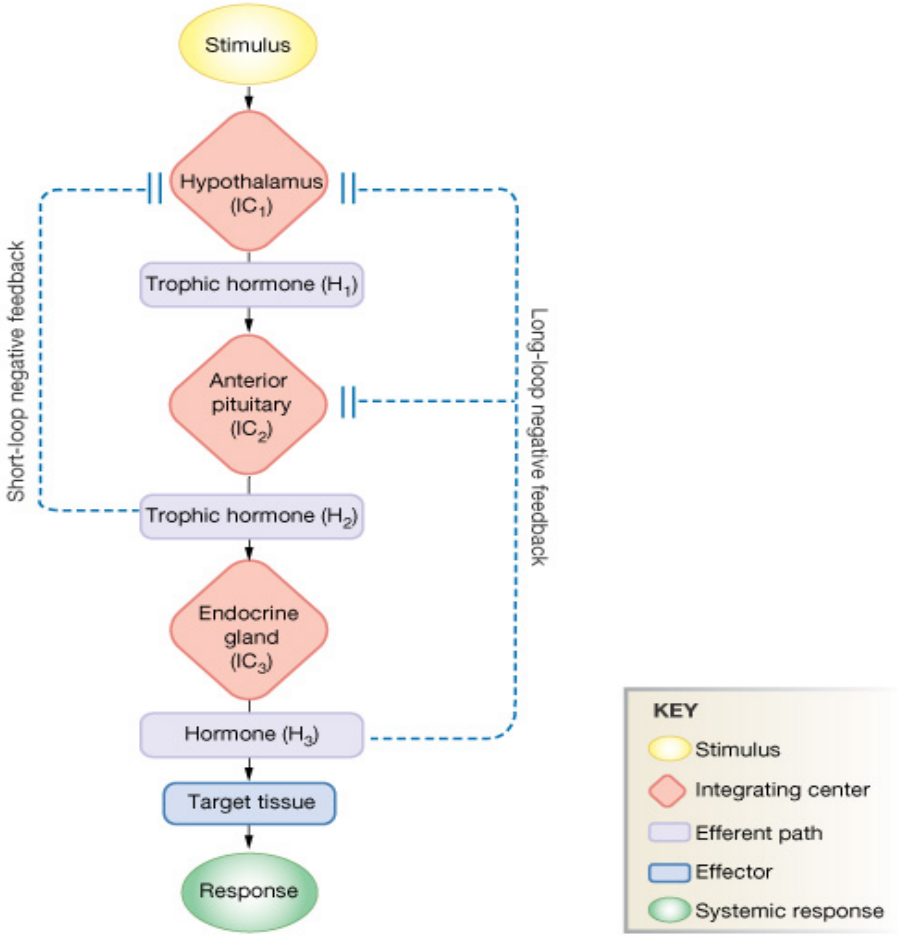
(a) Negative feedback

POSITIVE FEEDBACK

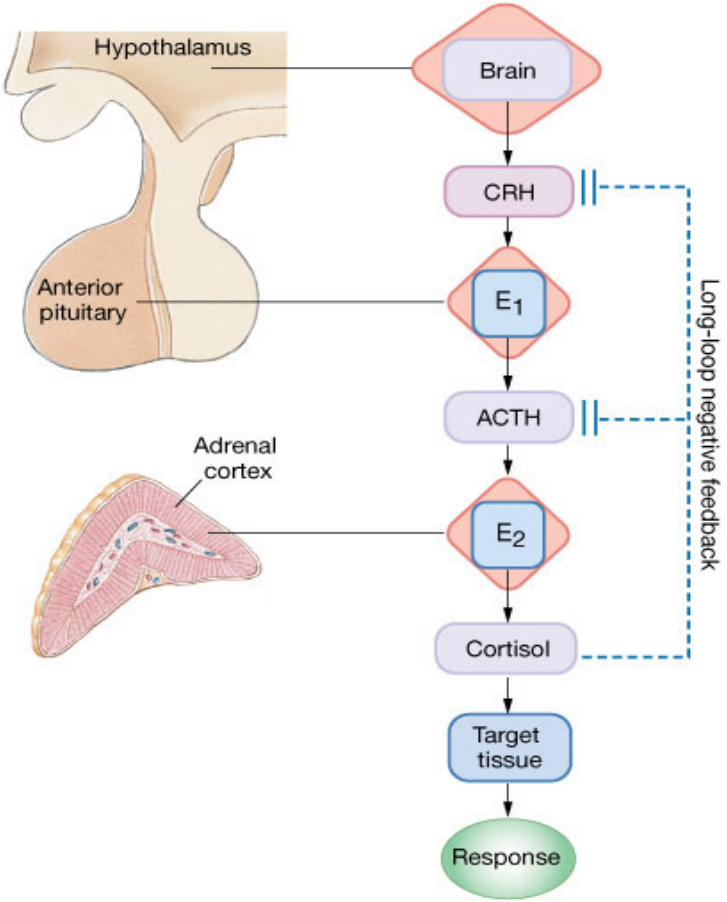


(b) Positive feedback

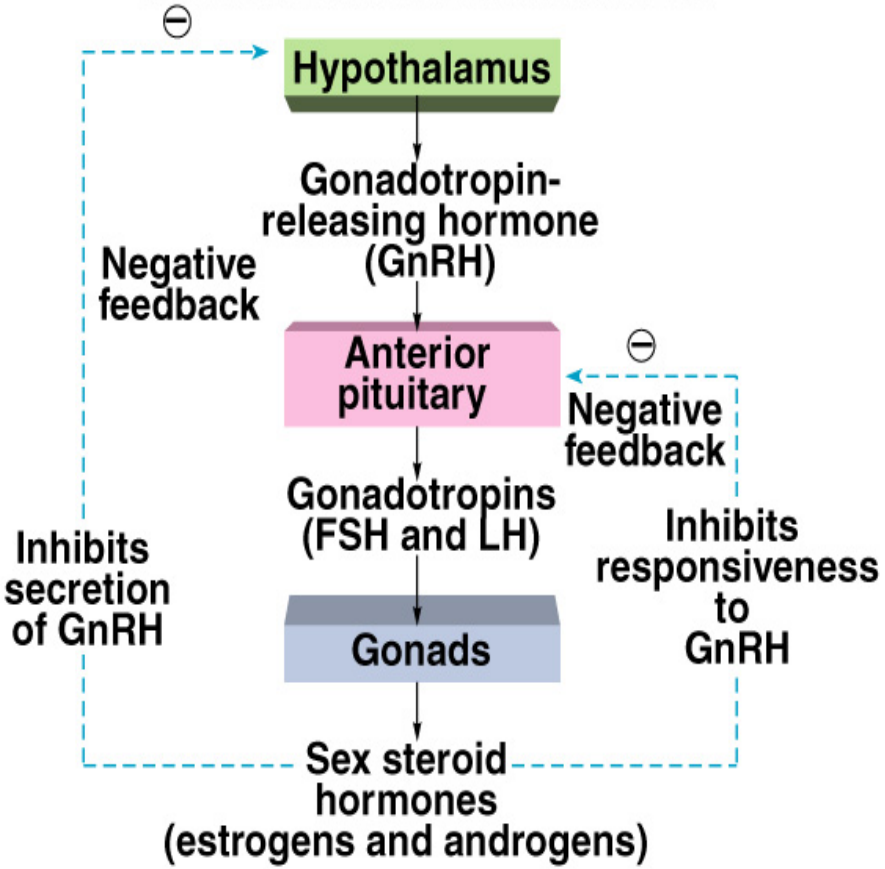
NEGATIVE FEEDBACK MECHANISM: LONG & SHORT LOOP REFLEXES



NEGATIVE FEEDBACK MECHANISM CORTISOL



NEGATIVE FEEDBACK MECHANISM SEX STEROIDS



Thank you