

ENDOCRINOLOGY

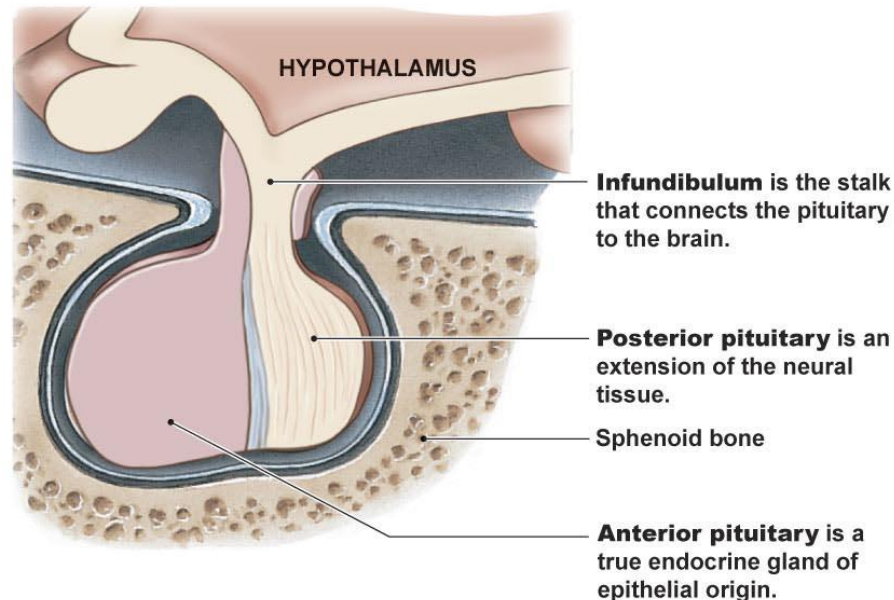
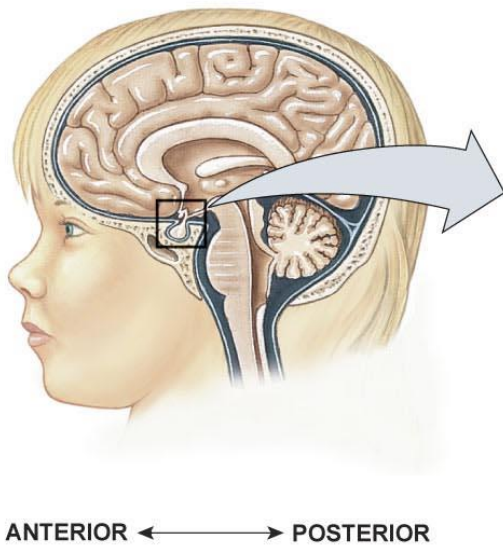
Dr. Hana Alzamil

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

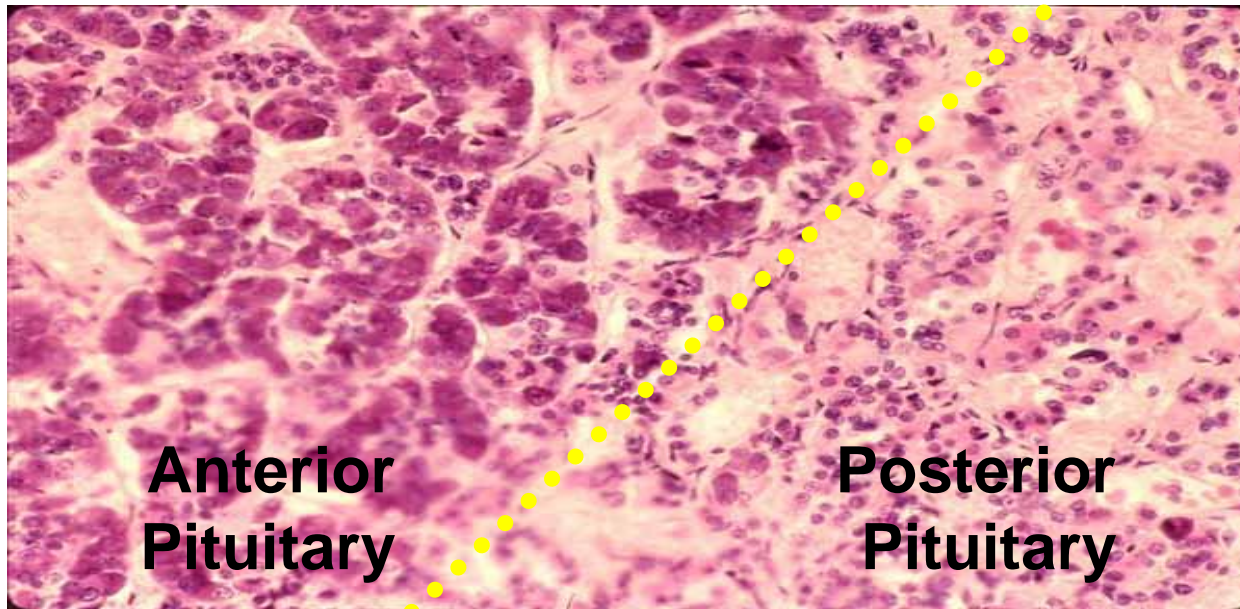
STRUCTURE OF PITUITARY GLAND

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



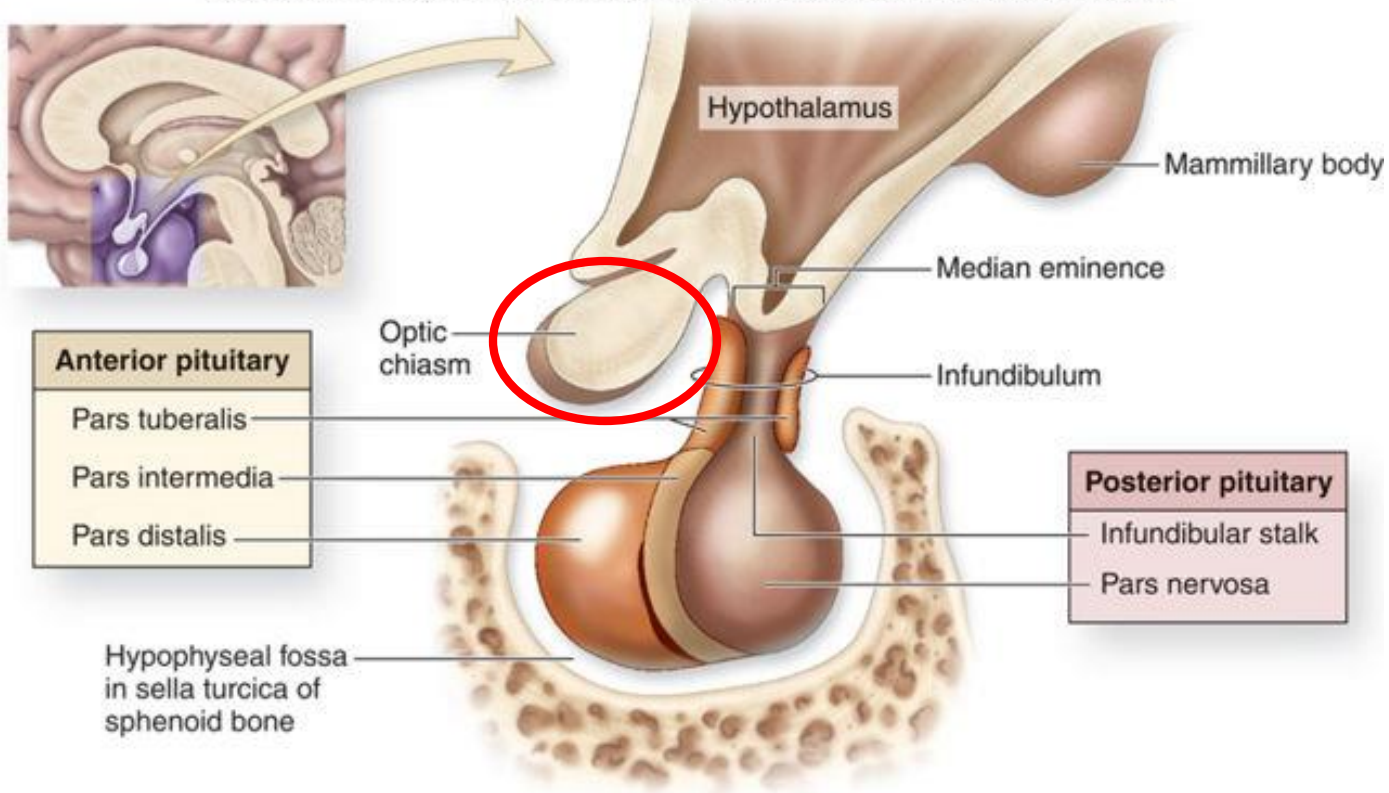
HISTOLOGY OF PITUITARY GLAND

- 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)

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



HYPOTHALAMIC CONTROL OF PITUITARY SECRETIONS

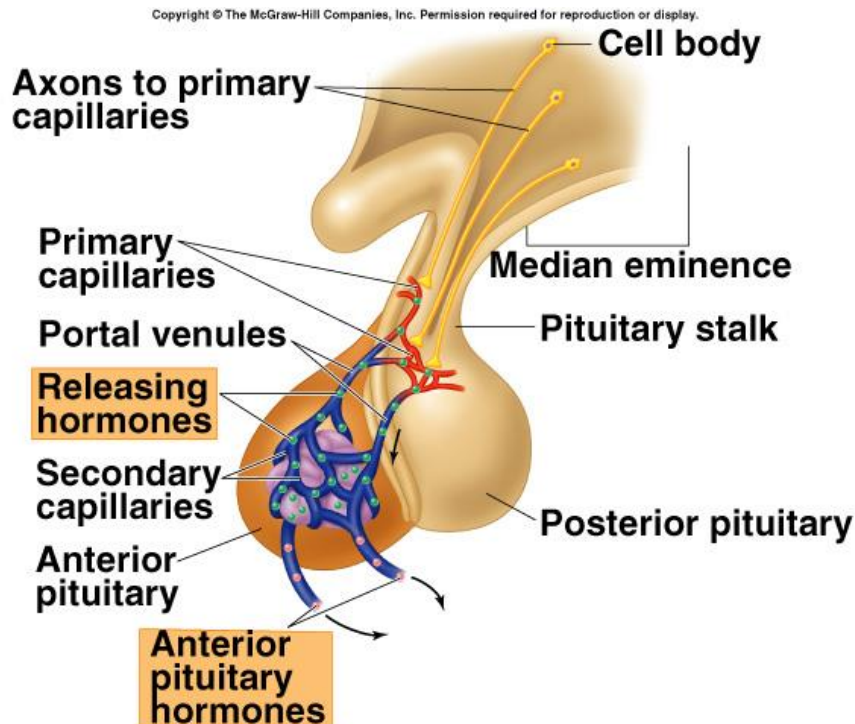
- Almost all secretions by the pituitary are controlled by either
 - Hormonal secretion of hypothalamus
(The anterior pituitary)
or
 - Nervous signals from hypothalamus
(Posterior pituitary)

CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS

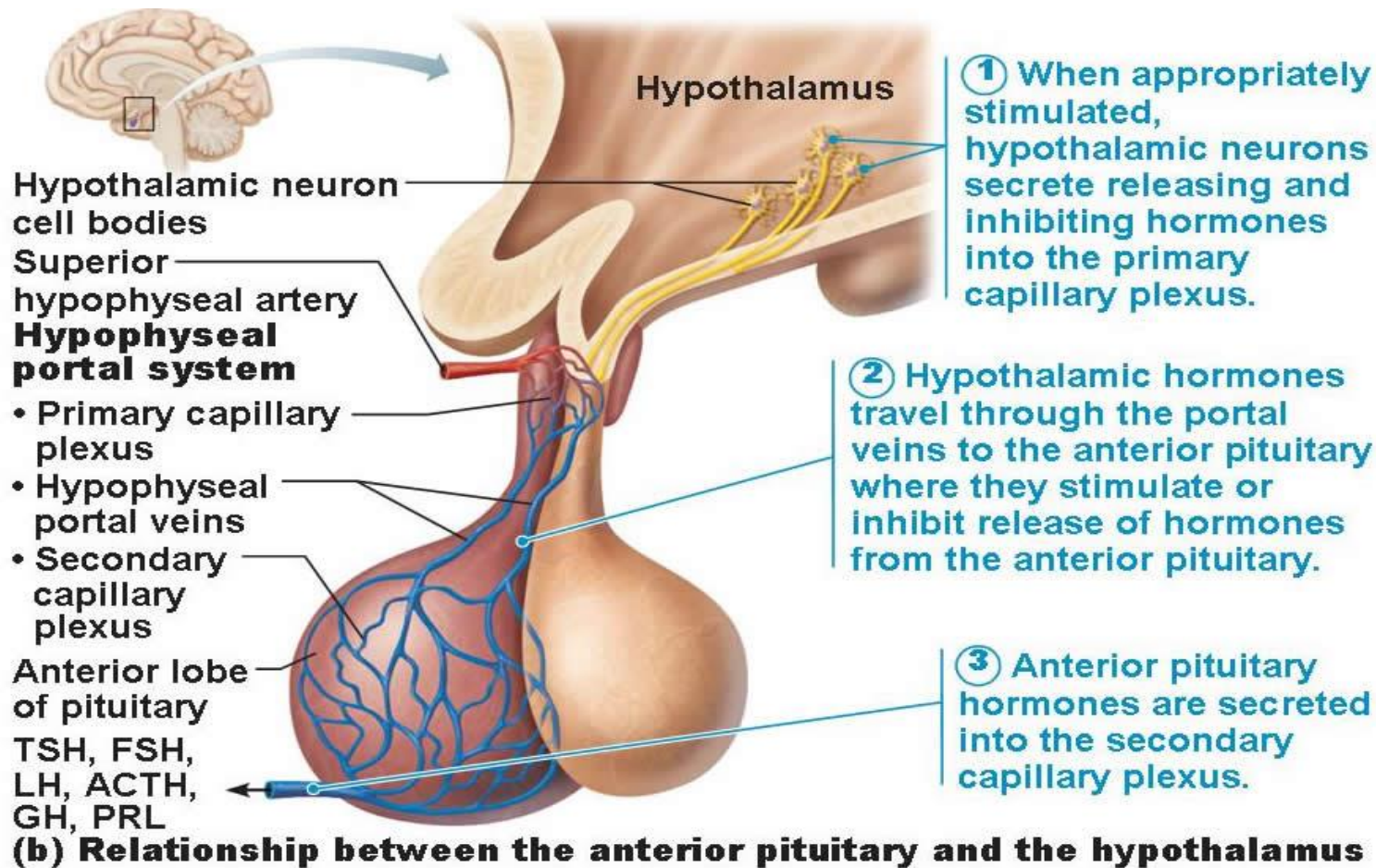
- Special neurons in the hypothalamus synthesize and secrete the hypothalamic releasing and inhibitory hormones that control secretion of anterior pituitary
- Neurons send their nerve fibers to the **median eminence** (extension of hypothalamic tissue into the pituitary stalk)
- Hormones are secreted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



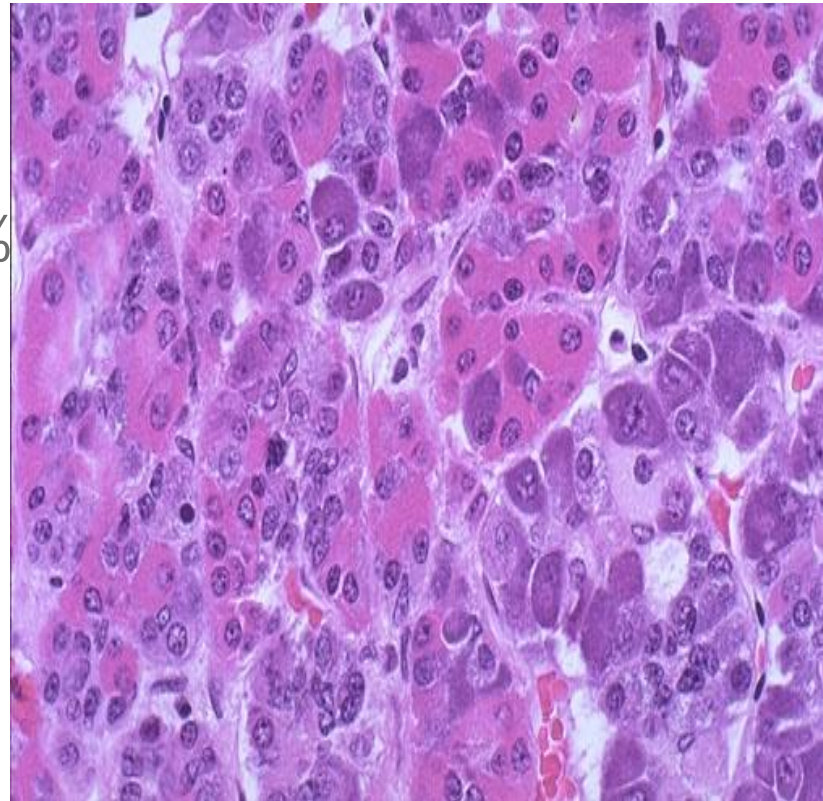
CONTROL OF ANTERIOR PITUITARY BY HYPOTHALAMUS



STRUCTURE OF PITUITARY GLAND

○ Anterior pituitary contains 5 cell types:

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



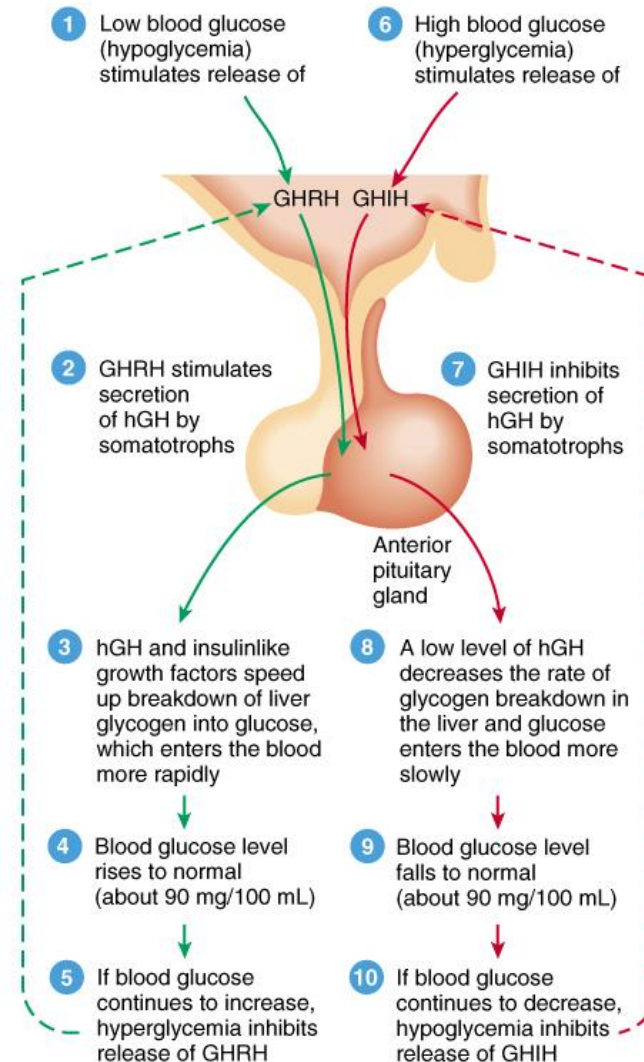
HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

○ Growth hormone releasing hormone (GHRH)

- Stimulates release of growth hormone

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

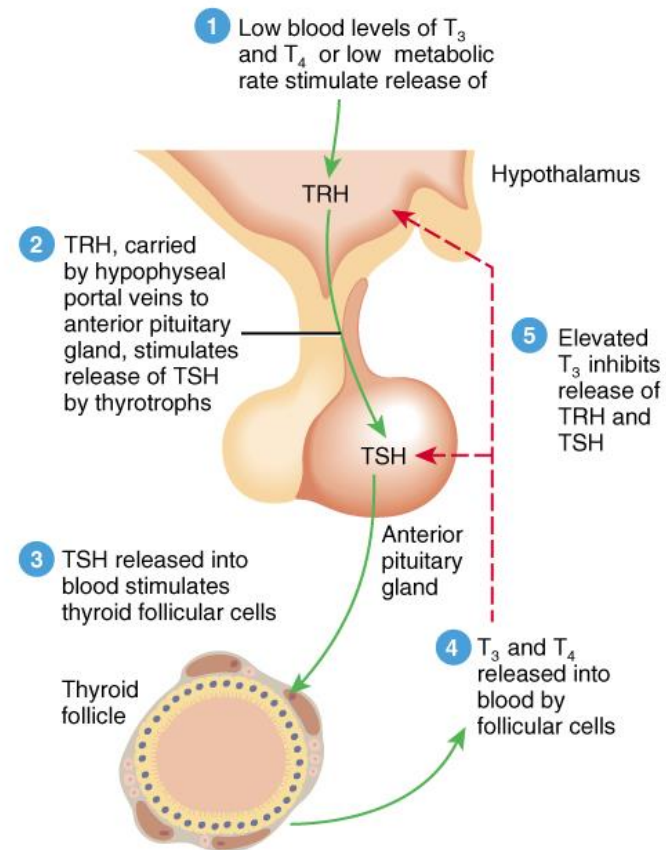
- Inhibits release of growth hormone



HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

○ Thyrotropin-releasing hormone (TRH)

- Stimulates release of thyroid stimulating hormone (TSH)



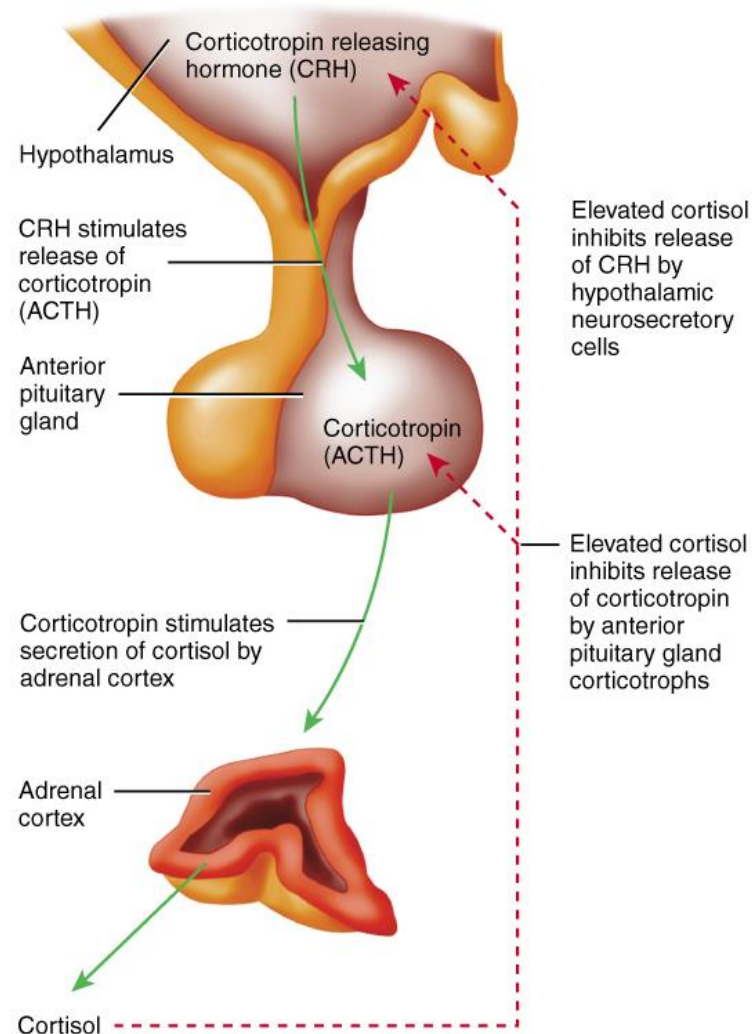
Key:

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

HYPOTHALAMIC RELEASING AND INHIBITING HORMONES

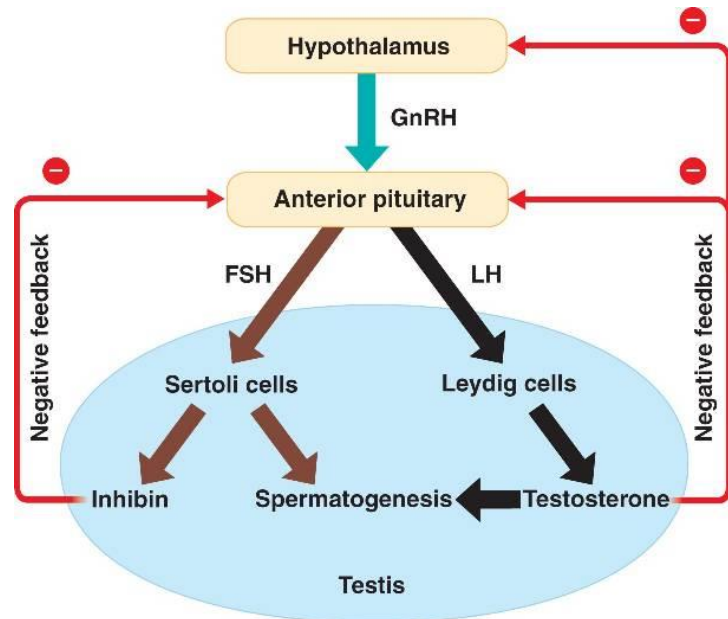
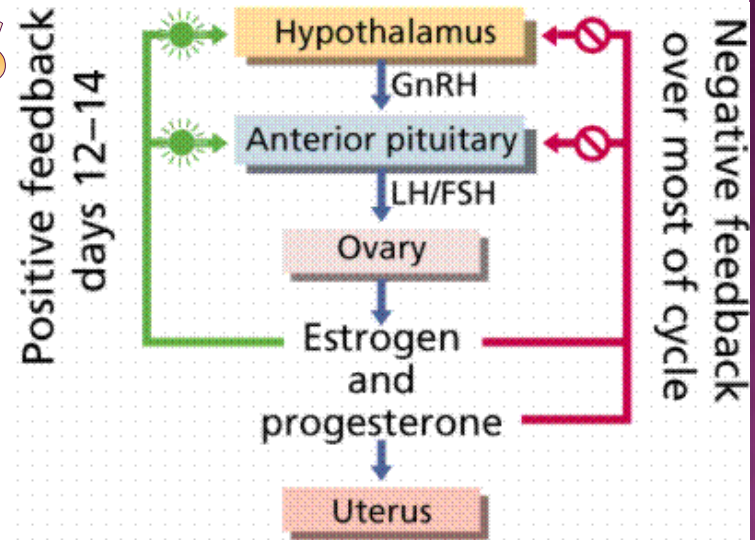
○ Corticotropin-releasing hormone (CRH)

- 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

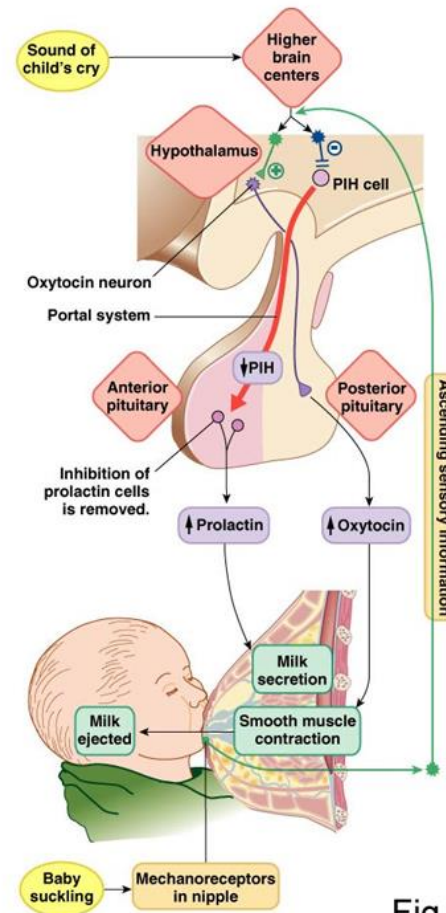


Fig. 26-23

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.

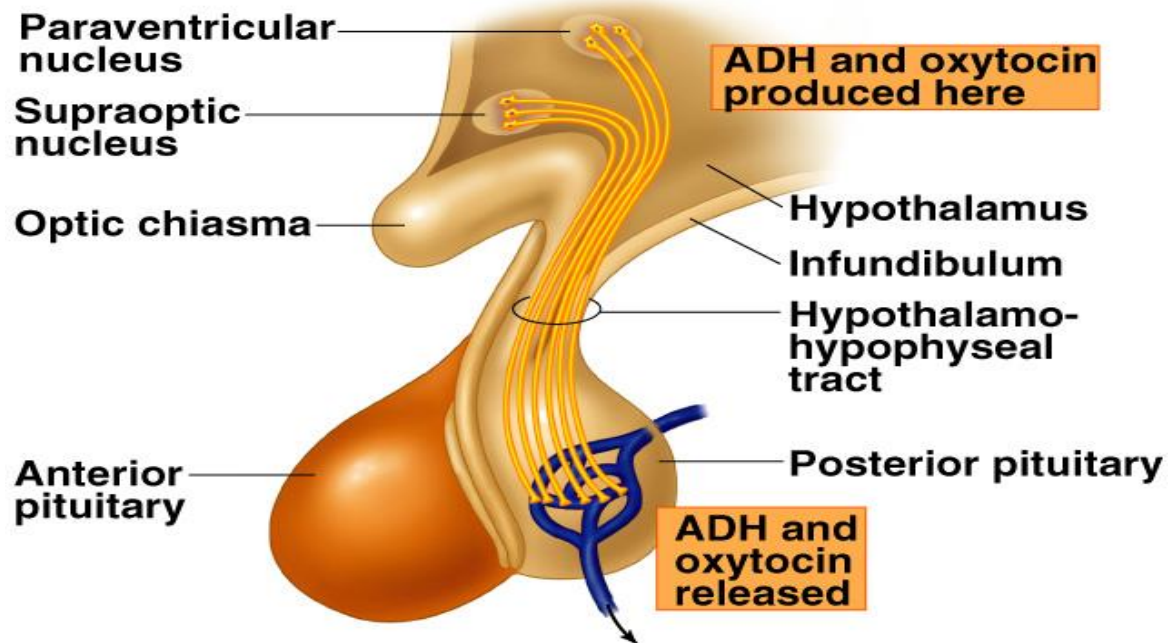
POSTERIOR PITUITARY GLAND

(Neurohypophysis)

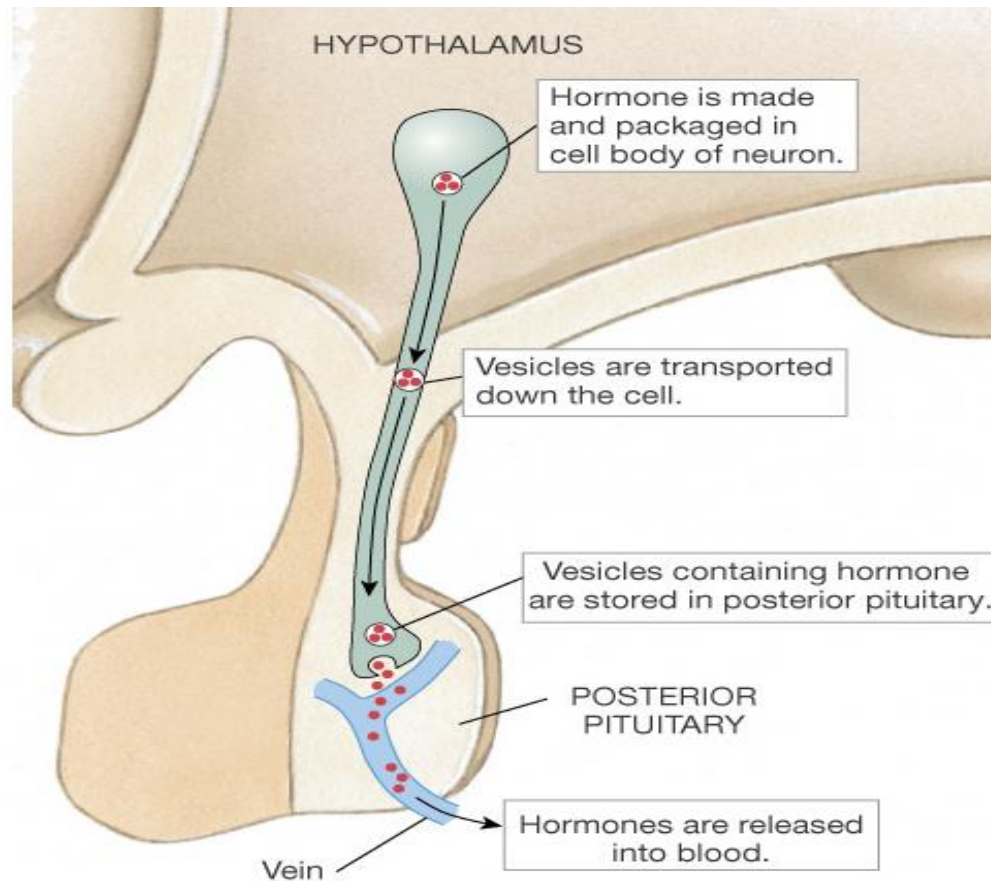
HYPOTHALAMIC CONTROL OF POSTERIOR PITUITARY GLAND (NEUROHYPOPHYSIS)

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

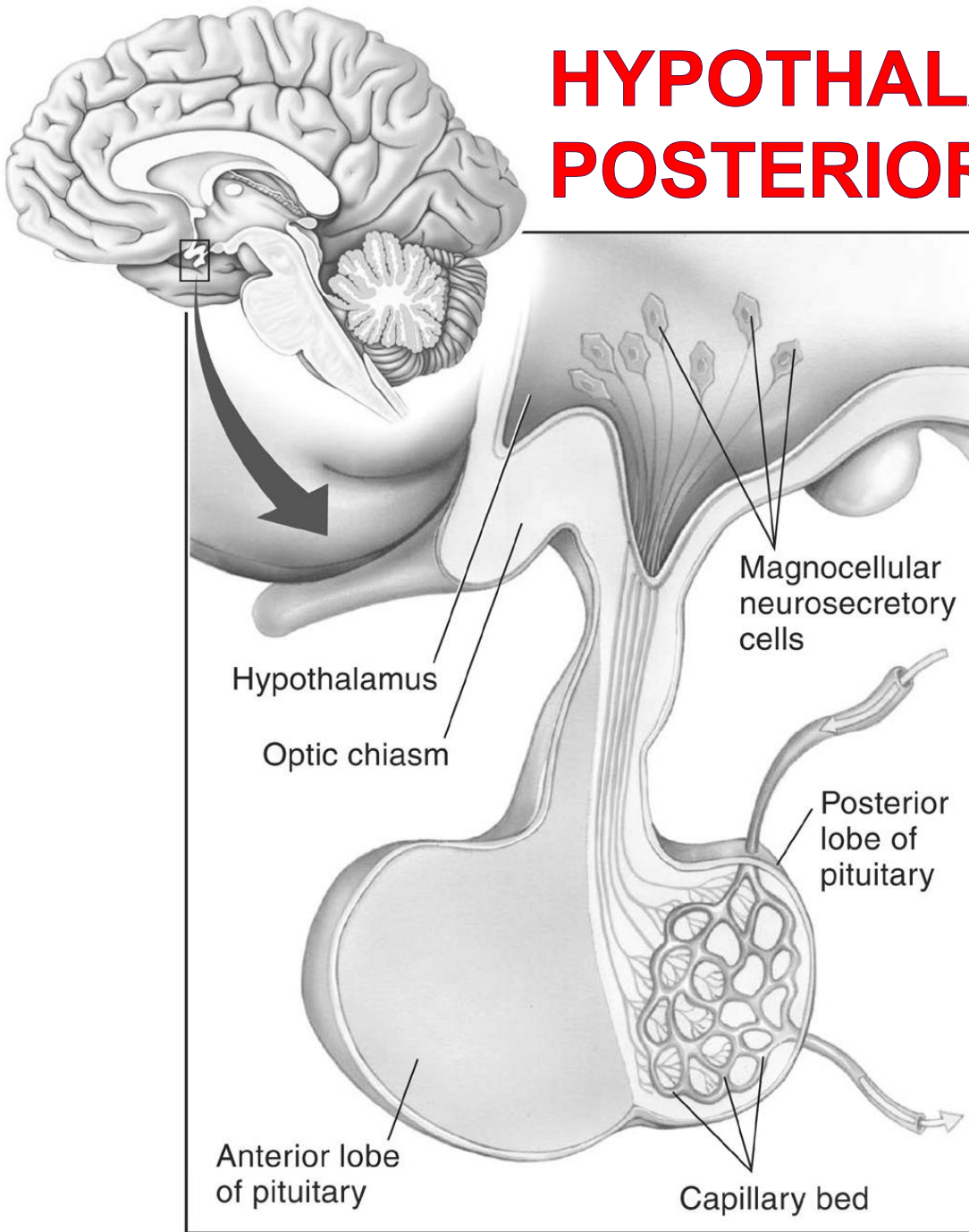
Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



SECRETION OF POSTERIOR PITUITARY HORMONES

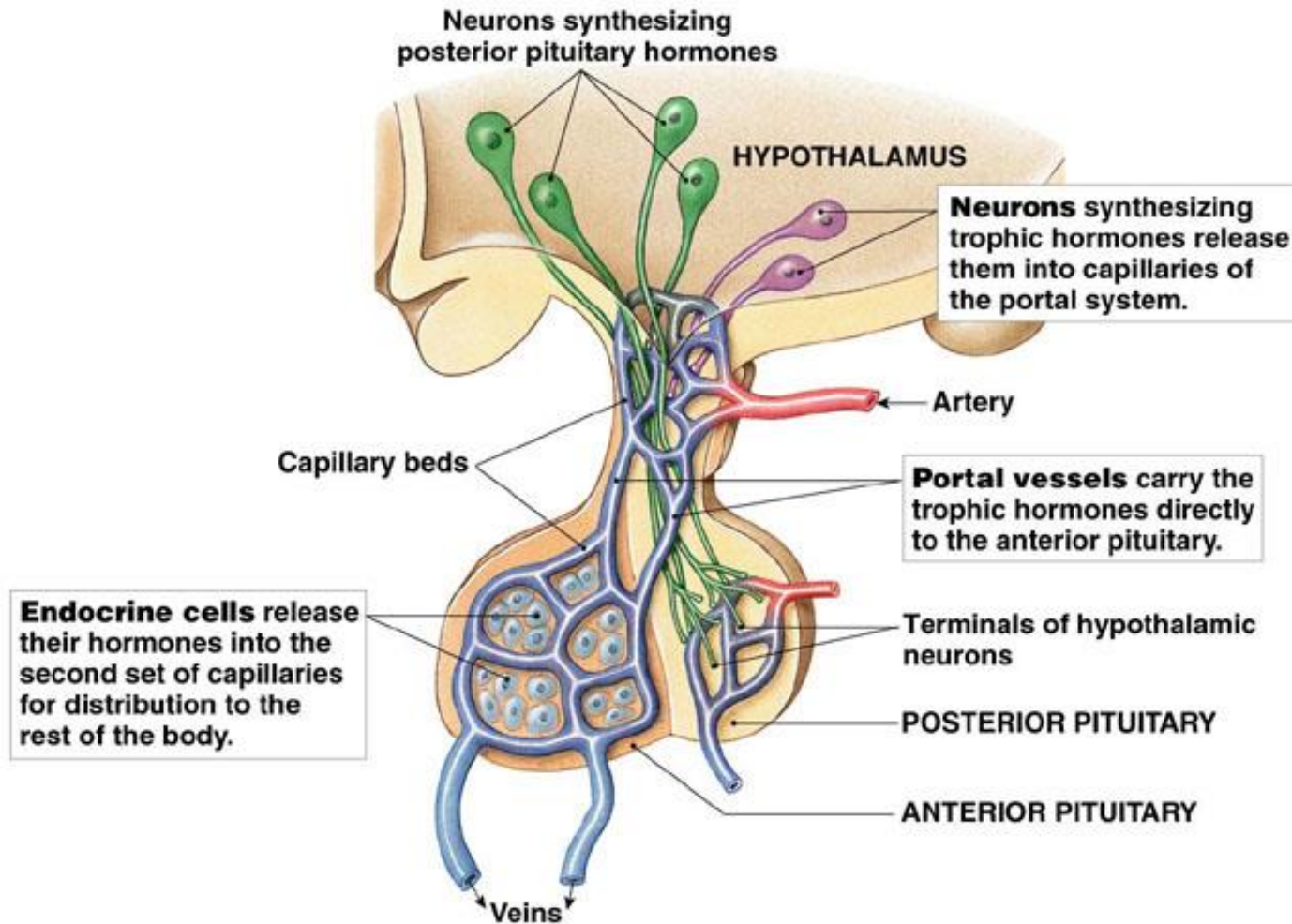


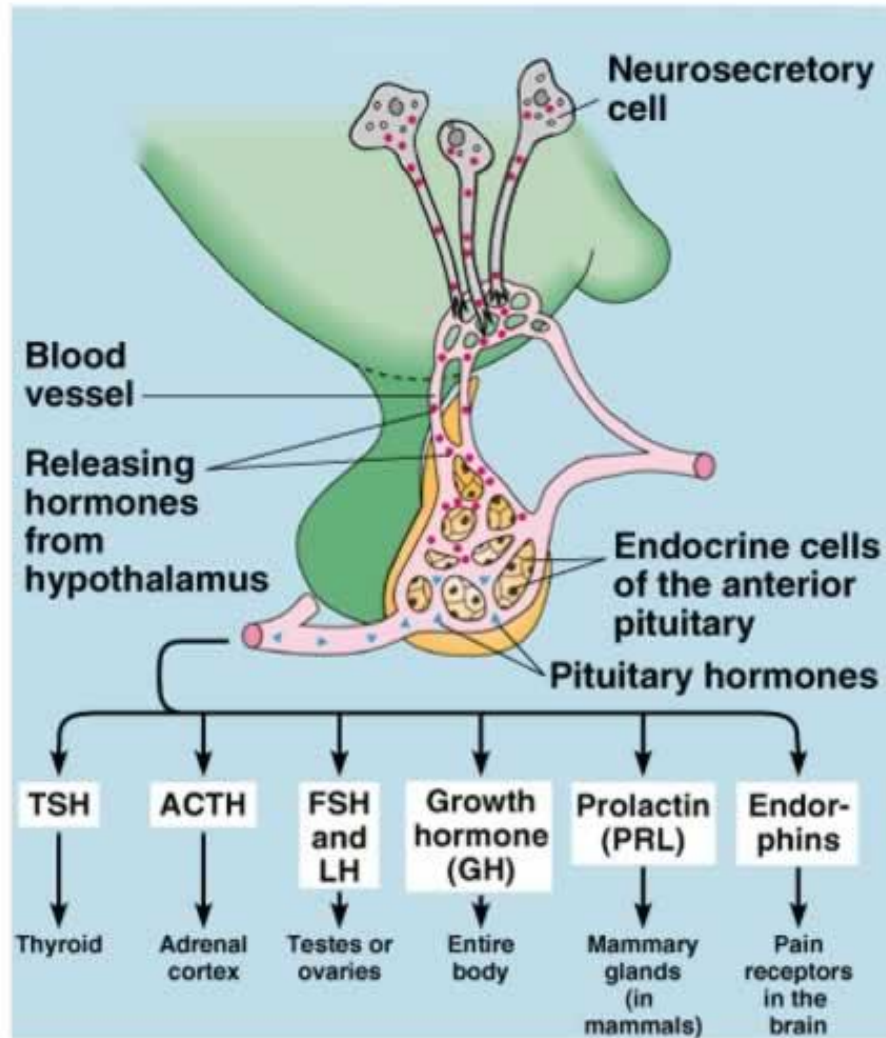
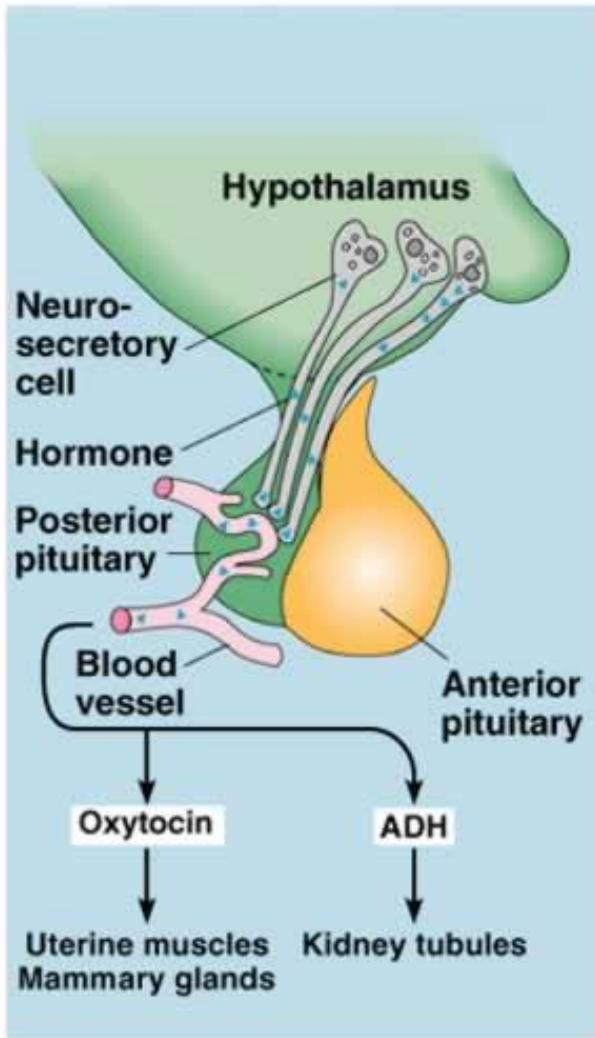
HYPOTHALAMUS AND POSTERIOR PITUITARY



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

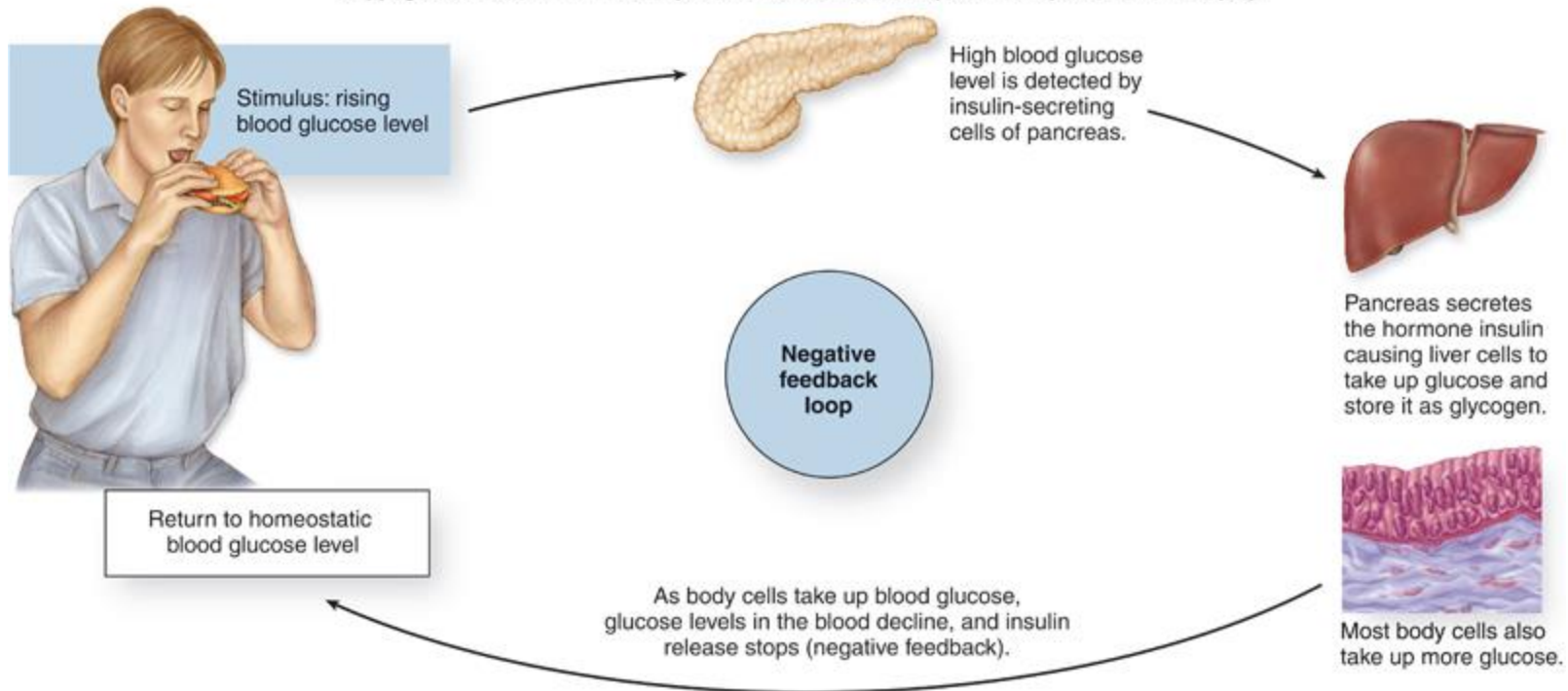
- Release of hormone A stimulates the release of hormone B
- Hormone B stimulates further release of hormone A

Negative feedback

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

NEGATIVE FEEDBACK

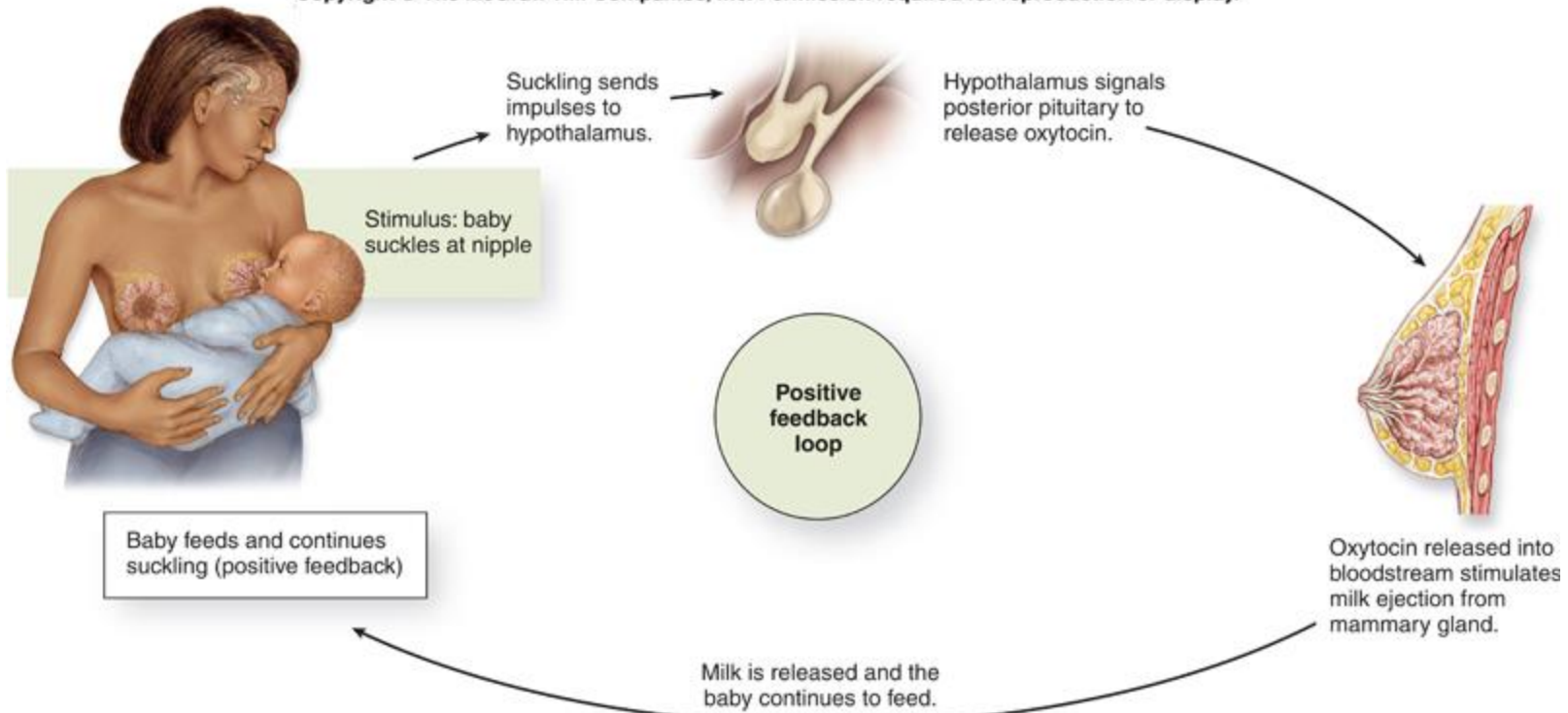
Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



(a) Negative feedback

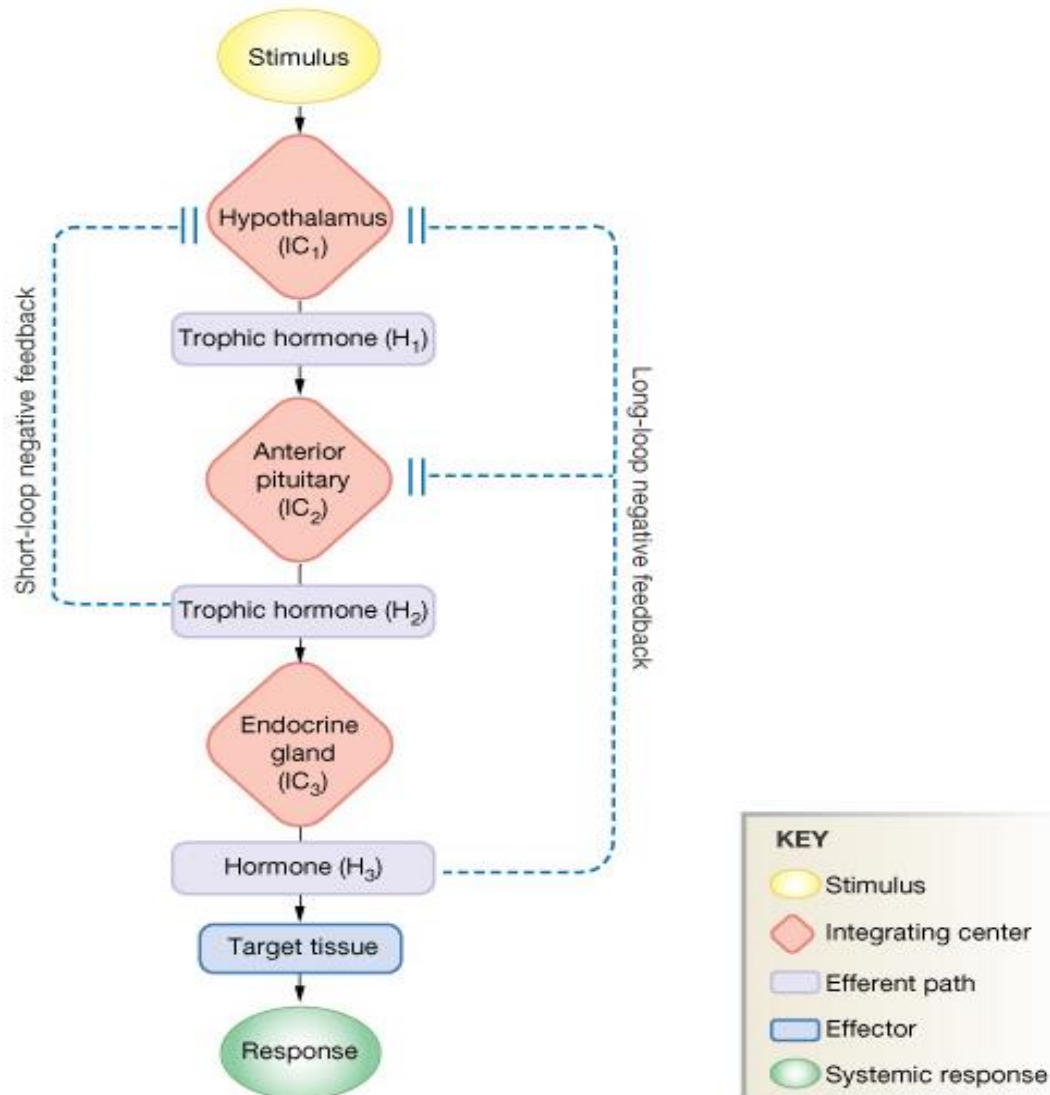
POSITIVE FEEDBACK

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

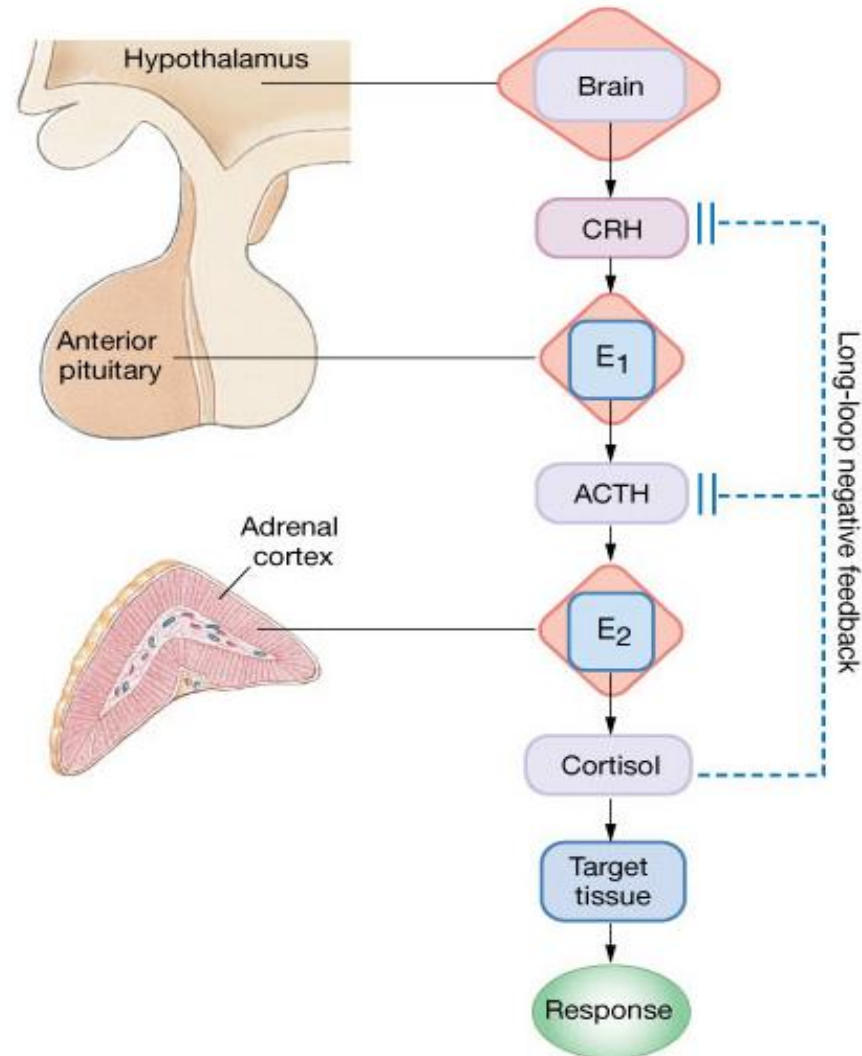


(b) Positive feedback

NEGATIVE FEEDBACK MECHANISM: LONG & SHORT LOOP REFLEXES

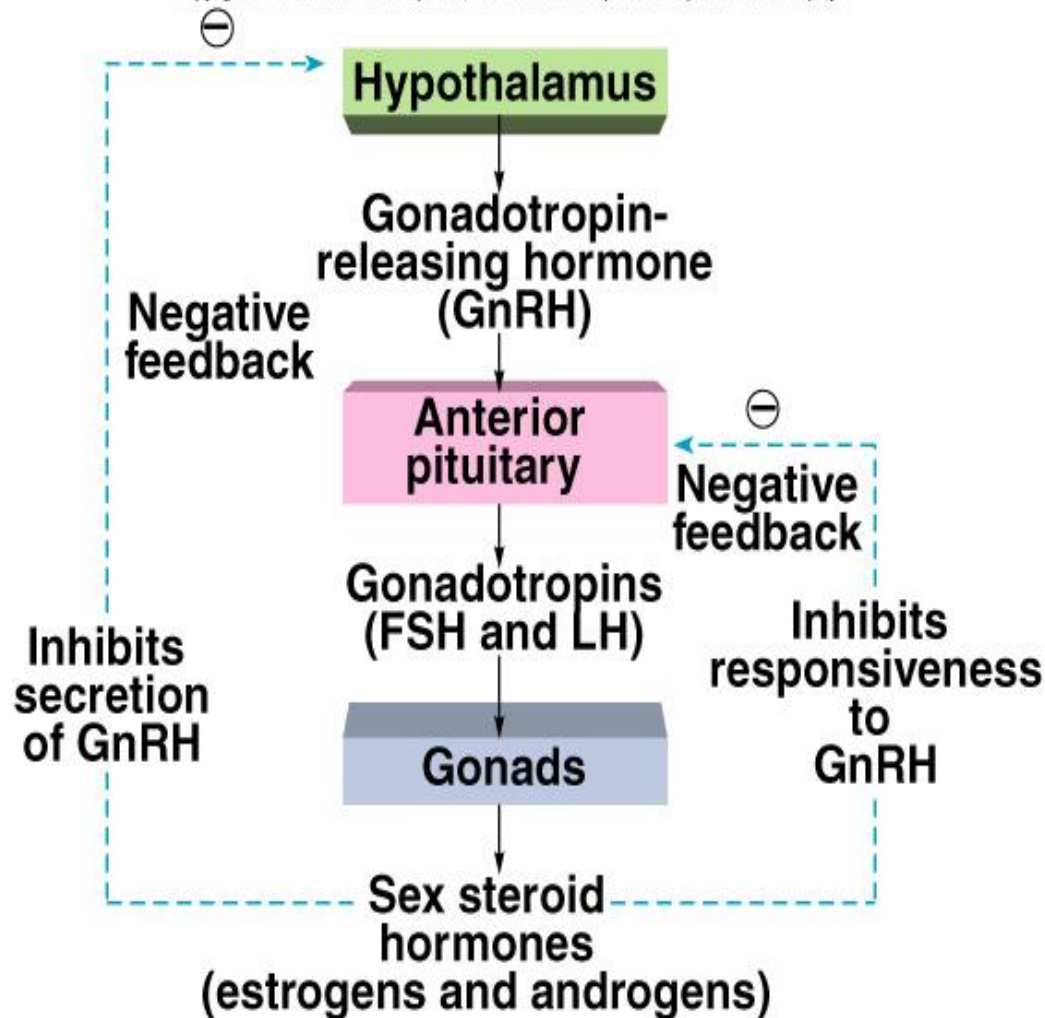


NEGATIVE FEEDBACK MECHANISM CORTISOL



NEGATIVE FEEDBACK MECHANISM SEX STEROIDS

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.





Thank you