

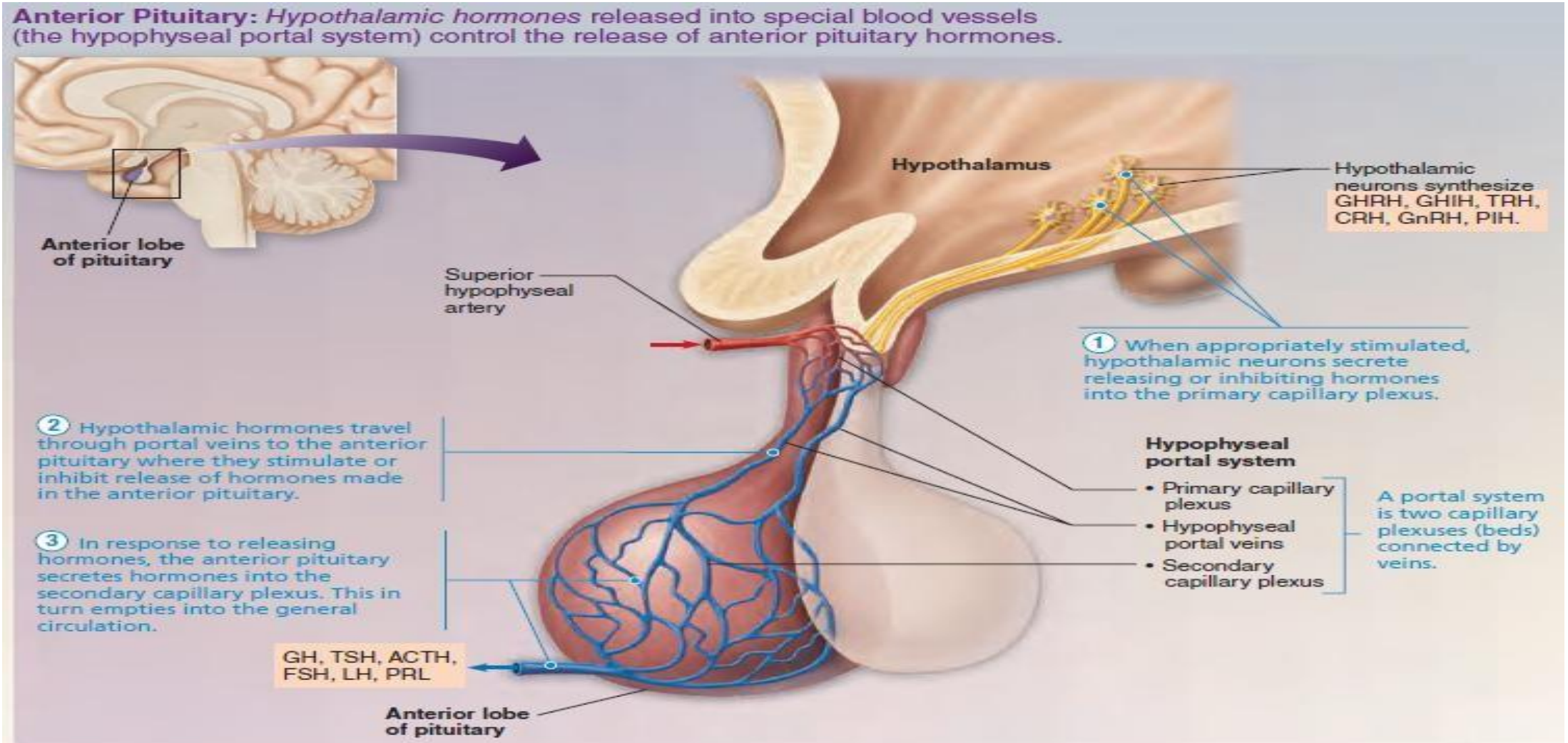
The Pituitary Gland and Hypothalamus

Pituitary-Hypothalamic Relationships

- The pituitary gland is a **master endocrine gland**.
- Pea shaped structure, attached to hypothalamus by a stalk, **the infundibulum**
- It consists of a hormone-producing glandular portion (**anterior pituitary or adenohypophysis**) and a neural portion (**posterior pituitary or neurohypophysis**), which is an extension of the hypothalamus.
- Hypothalamus synthesizes hormones that it exports to the anterior and posterior pituitary for storage or release and regulates the hormonal output of the releasing and inhibiting hormones.

Anterior Pituitary Hormones

- Secrete hormones that regulate wide variety of body activities.



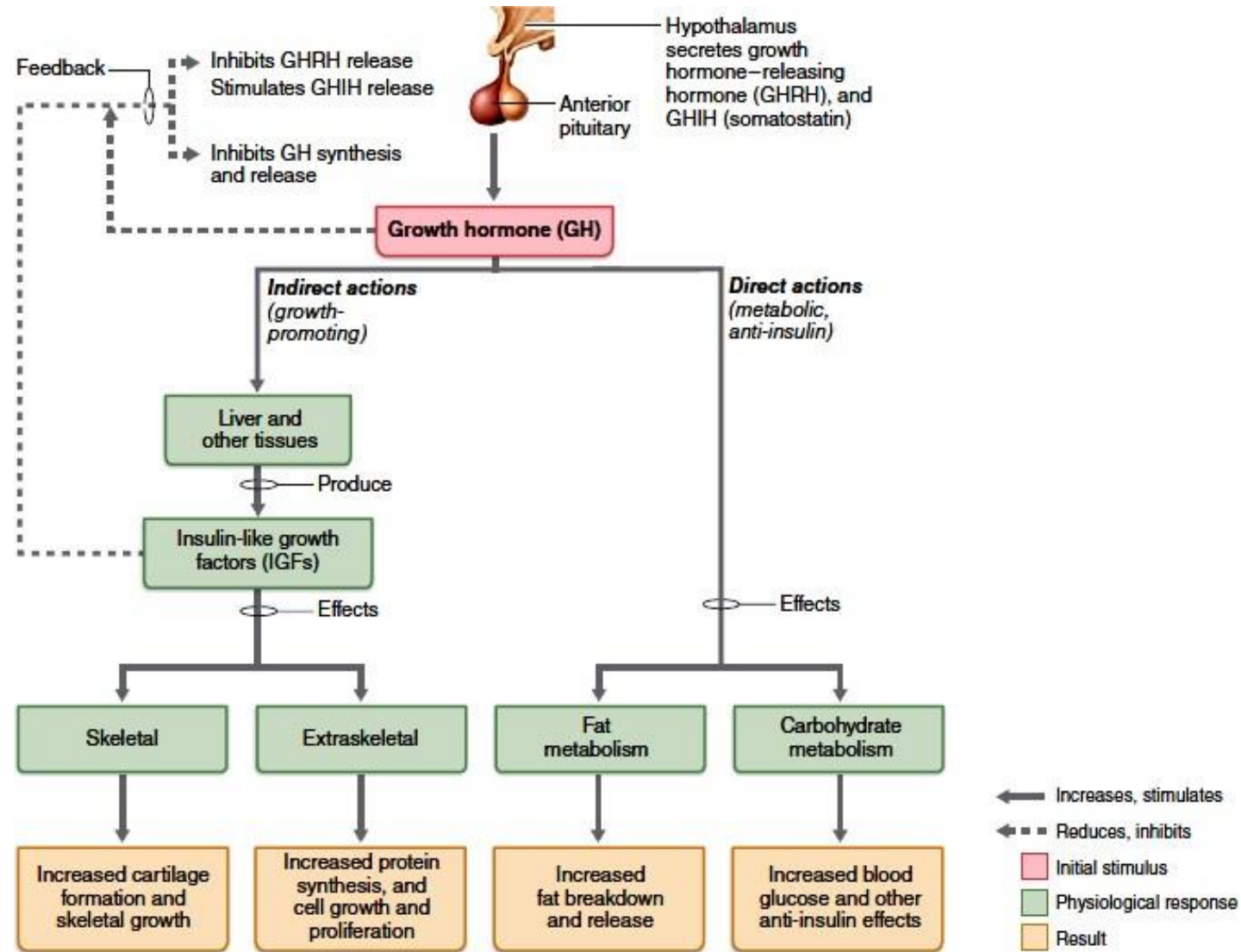
5 types of cells

- **Somatotrophs** - Growth hormone (GH)
- **Thyrotrophs** - Thyroid-stimulating hormone (TSH)
- **Corticotrophs** - Adrenocorticotrophic hormone (ACTH)
- **Gonadotrophs** - The gonadotropins—follicle-stimulating hormone (FSH) and luteinizing hormone (LH)
- **Lactotrophs** - Prolactin (PRL)

Growth hormone (GH) (somatotropin)

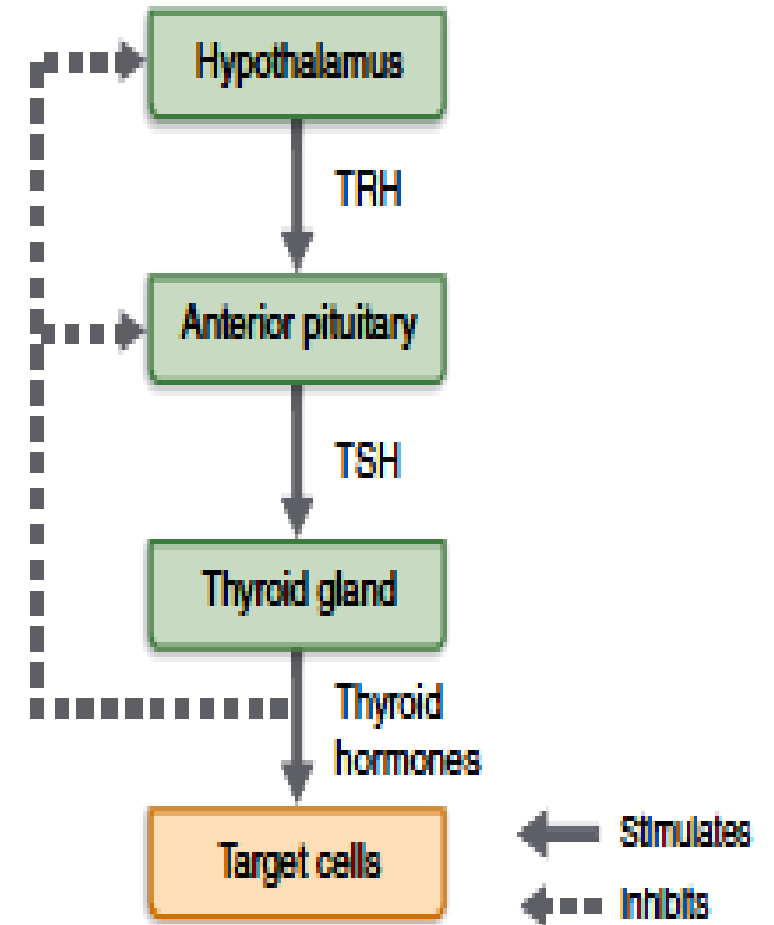
- It is an anabolic hormone that stimulates growth of all body tissues but especially skeletal muscle and bone.
- It may act directly, or indirectly, via insulin-like growth factors (IGFs).
- GH mobilizes fats, stimulates protein synthesis, and inhibits glucose uptake and metabolism.
- Its secretion is regulated by growth hormone–releasing hormone (GHRH) and growth hormone–inhibiting hormone (GHIH), or somatostatin.
- Hypersecretion causes **gigantism** in children and **acromegaly** in adults
- Hyposecretion in children causes pituitary **dwarfism**.

Growth-promoting and metabolic actions of GH



Thyroid-stimulating hormone (TSH)

- TSH promotes normal development and activity of the thyroid gland.
- Thyrotropin releasing hormone (TRH) stimulates release of TSH
- Negative feedback of thyroid hormone inhibits it.
- GHIH also inhibits TSH secretion
- Hypersecretion – **Grave's disease**
- Hyposecretion – **Cretinism** in children and **Myxedema** in adults



Adrenocorticotrophic hormone (ACTH)

- It stimulates the adrenal cortex to release corticosteroids.
- Corticotropin-releasing hormone (CRH) triggers ACTH release
- Rising glucocorticoid levels inhibit it.
- Hypersecretion – **Cushing's disease**

FSH and LH

- The gonadotropins—FSH and LH—regulate the functions of the gonads in both sexes.
- In both sexes, FSH stimulates production of gametes (sperm or eggs), while LH stimulates gonadal hormone production.
- In females, LH works with FSH to cause an egg-containing ovarian follicle to mature. LH then triggers ovulation and promotes synthesis and release of ovarian hormones.
- In males, LH stimulates the interstitial cells of the testes to produce the male hormone testosterone.
- Gonadotropin levels rise in response to gonadotropin-releasing hormone (GnRH).
- Negative feedback of gonadal hormones inhibits gonadotropin release.

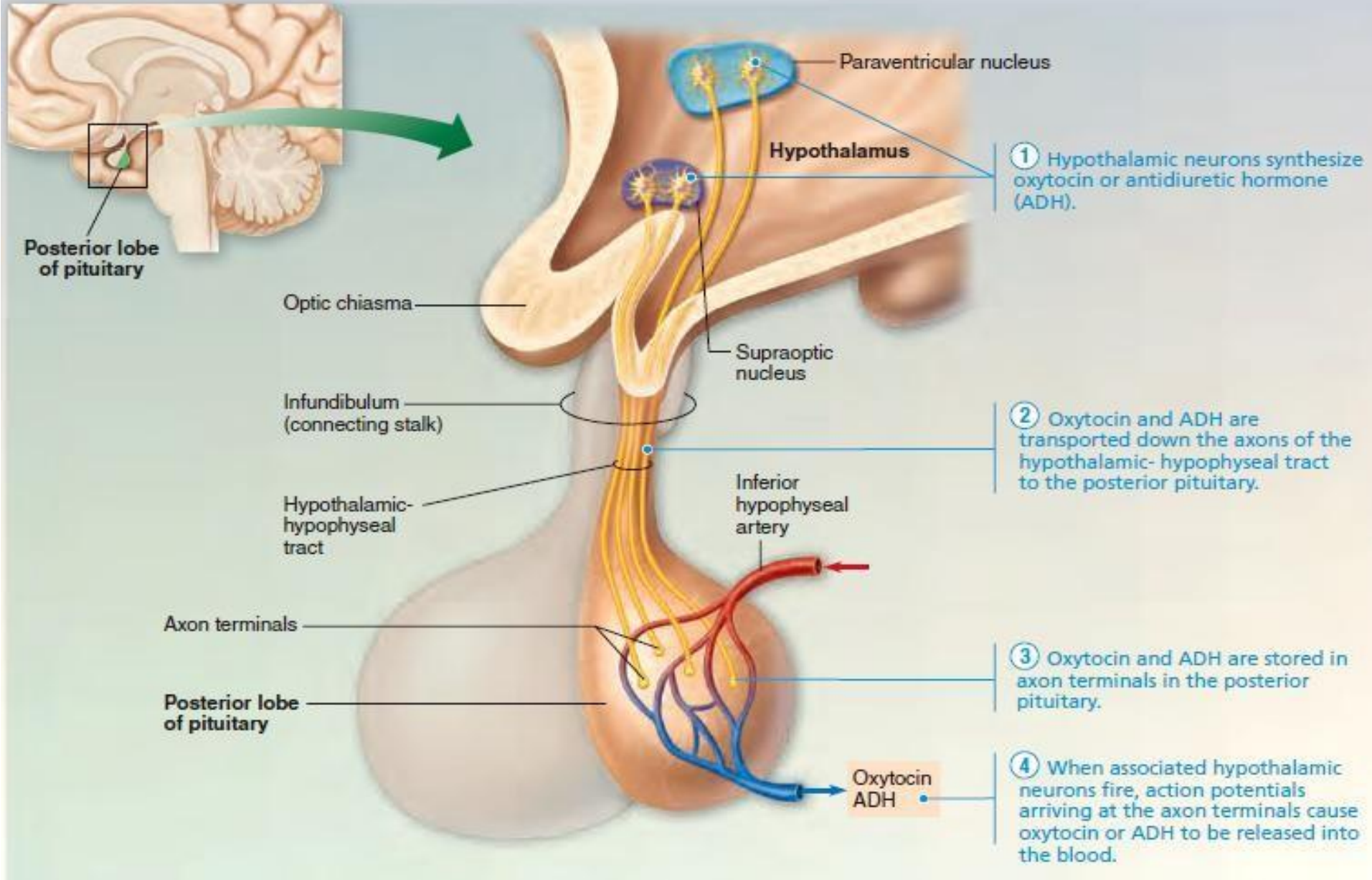
Prolactin (PRL)

- It promotes milk production in humans.
- Its secretion is inhibited by dopamine, that acts as a prolactin-inhibiting hormone (PIH)
- **Hypersecretion of prolactin (hyperprolactinemia) causes:**
 - **Females:** inappropriate lactation, lack of menses and infertility
 - **Males:** Impotence

The Posterior Pituitary and Hypothalamic Hormones

- The posterior pituitary stores and releases two hypothalamic hormones:
 - Oxytocin
 - Antidiuretic hormone (ADH)

Posterior Pituitary: Action potentials travel down the axons of hypothalamic neurons, causing hormone release from their axon terminals in the posterior pituitary.



Oxytocin

- It stimulates powerful uterine contractions, which trigger labor and delivery of an infant
- It stimulates milk ejection in nursing women.
- Its release is mediated reflexively by the hypothalamus and represents a positive feedback mechanism.

Antidiuretic hormone (ADH)

- It stimulates the kidney tubules to reabsorb and conserve water, resulting in small volumes of highly concentrated urine and decreased plasma solute concentration.
- ADH is released in response to high solute concentrations in the blood and inhibited by low solute concentrations in the blood.
- Hyposecretion results in **diabetes insipidus**

PINEAL GLAND

- Tiny, pine cone–shaped pineal gland hangs from the roof of the third ventricle in the diencephalon
- Consists of neuroglial cells and secretory cells called pinealocytes.
- Mainly secretes **Melatonin** hormone
- Melatonin concentrations in the blood rise and fall in a diurnal (daily) cycle: Peak levels occur during the night and make us drowsy, and lowest levels occur around noon.
- The pineal gland indirectly receives input from the visual pathways concerning the intensity and duration of daylight

THYMUS GLAND

- Bilobed organ located in the mediastinum between the sternum and aorta.
- Consists of T-cells, dendritic cells, epithelial cells, macrophages
 - T-cells** – immature T-cells from red bone marrow to the cortex of thymus – proliferate and begin to mature.
 - Dendritic cells** – assist the maturation.
 - Epithelial cells** – produce hormones – thymosin, thymic humoral factor, thymic factor, thymopoietin
 - Macrophage cells** – remove debris of dead and dying cells.
- Functions : **immunity**
- Disorder: **Myasthaenia gravis**