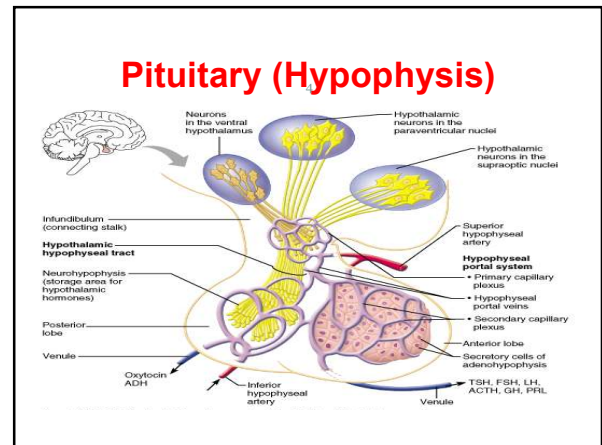
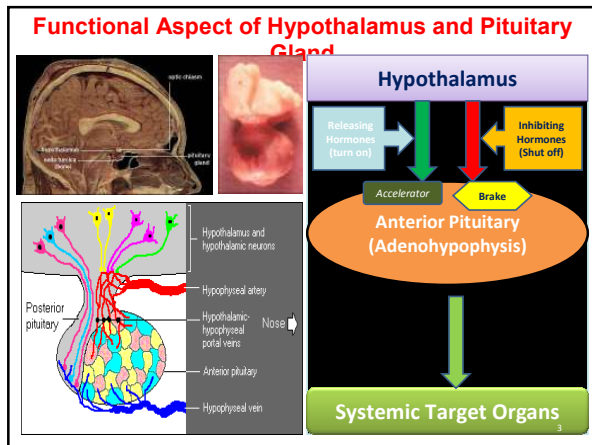


## Pituitary (Hypophysis)

- Pituitary gland – two-lobed organ that secretes nine major hormones
- **Neurohypophysis** – posterior lobe (neural tissue) and the infundibulum
  - Receives, stores, and releases hormones from the hypothalamus
- **Adenohypophysis** – anterior lobe, made up of glandular tissue
  - Synthesizes and secretes a number of hormones



## Relationships

### Posterior Lobe

- Posterior lobe – a downgrowth of hypothalamic neural tissue
- Has a neural connection with the hypothalamus (hypothalamic-hypophyseal tract)
- Nuclei of the hypothalamus synthesize oxytocin and antidiuretic hormone (ADH)
- These hormones are transported to the

### Anterior Lobe

- The anterior lobe of the pituitary is an outpocketing of the oral mucosa
- There is no direct neural contact with the hypothalamus
- There is a vascular connection, the hypophyseal portal system, consisting of:
  - The primary capillary plexus
  - The secondary capillary plexus

## Major hormones of the pituitary gland

	Hormone	Major target organ(s)	Major Physiologic Effects
Anterior Pituitary	Growth hormone	Liver, adipose tissue	Promotes growth (indirectly), control of protein, lipid and carbohydrate metabolism
	Thyroid-stimulating hormone	Thyroid gland	Stimulates secretion of thyroid hormones
	Adrenocorticotropic hormone	Adrenal gland (cortex)	Stimulates secretion of glucocorticoids
	Prolactin	Mammary gland	Milk production
	Luteinizing hormone	Ovary and testis	Control of reproductive function
Posterior Pituitary	Follicle-stimulating hormone	Ovary and testis	Control of reproductive function
	Antidiuretic hormone	Kidney	Conservation of body water
	Oxytocin	Ovary and testis	Stimulates milk ejection and uterine contractions

## Adenohypophyseal Hormones

- The six hormones of the adenohypophysis:
  - Are abbreviated as GH, TSH, ACTH, FSH, LH, and PRL
  - Regulate the activity of other endocrine glands
- In addition, pro-opiomelanocortin (POMC):
  - Has been isolated from the pituitary
  - Is enzymatically split into ACTH, opiates, and MSH

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## ACTIVITY OF THE ADENOHYPOPHYSIS

- The hypothalamus sends chemical stimulus to the anterior pituitary
  - Releasing hormones stimulate the synthesis and release of hormones
  - Inhibiting hormones shut off the synthesis and release of hormones
- The tropic hormones that are released are:
  - Thyroid-stimulating hormone (TSH)
  - Adrenocorticotropic hormone (ACTH)
  - Follicle-stimulating hormone (FSH)
  - Luteinizing hormone (LH)

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## Growth Hormone (GH)

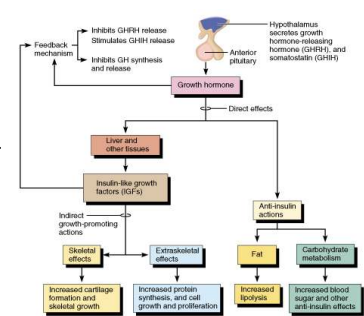
- Produced by somatotrophic cells of the anterior lobe that:
  - Stimulate most cells, but target bone and skeletal muscle
  - Promote protein synthesis and encourage the use of fats for fuel
- Most effects are mediated indirectly by somatomedins
- Antagonistic hypothalamic hormones regulate GH
  - Growth hormone–releasing hormone (GHRH) stimulates GH release
  - Growth hormone–inhibiting hormone (GHIH) inhibits GH release

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## Metabolic Action of Growth Hormone

- GH stimulates liver, skeletal muscle, bone, and cartilage to produce insulin-like growth factors
- Direct action promotes lipolysis and inhibits glucose uptake



## Thyroid Stimulating Hormone (Thyrotropin)

- Tropic hormone that stimulates the normal development and secretory activity of the thyroid gland
- Triggered by hypothalamic peptide thyrotropin-releasing hormone (TRH)
- Rising blood levels of thyroid hormones act on the pituitary and hypothalamus to block the release of TSH

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## C HORMONE (CORTICOTROPIN)

- Stimulates the adrenal cortex to release corticosteroids
- Triggered by hypothalamic corticotropin-releasing hormone (CRH) in a daily rhythm
- Internal and external factors such as fever, hypoglycemia, and stressors can trigger the release of CRH

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## Prolactin (PRL)

- In females, stimulates milk production by the breasts
- Triggered by the hypothalamic prolactin-releasing hormone (PRH)
- Inhibited by prolactin-inhibiting hormone (PIH)
- Blood levels rise toward the end of pregnancy
- Suckling stimulates PRH release and encourages continued milk production

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## Gonadotropins

- Gonadotropins – follicle-stimulating hormone (FSH) and luteinizing hormone (LH)
  - Regulate the function of the ovaries and testes
  - FSH stimulates gamete (egg or sperm) production
  - Absent from the blood in prepubertal boys and girls
  - Triggered by the hypothalamic gonadotropin-releasing hormone (GnRH) during and after

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## The Posterior Pituitary and Hypothalamic Hormones

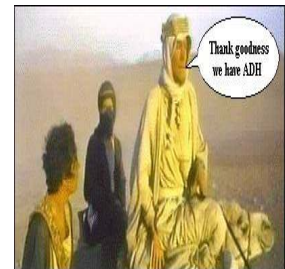
- **Posterior pituitary** – made of axons of hypothalamic neurons, stores **antidiuretic hormone (ADH)** and **oxytocin**
- ADH and oxytocin are synthesized in the hypothalamus
- ADH influences water balance
- Oxytocin stimulates smooth muscle contraction in breasts and uterus
- Both use PIP second-messenger mechanisms

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## Antidiuretic Hormone (ADH)

- ADH helps to avoid dehydration or water overload
  - Prevents urine formation
- Osmoreceptors monitor the solute concentration of the blood
- With high solutes, ADH is synthesized and released, thus preserving water
- With low solutes, ADH is not released, thus causing water loss from the body



## Oxytocin

- Oxytocin is a strong stimulant of uterine contraction
- Regulated by a positive feedback mechanism to oxytocin in the blood
- This leads to increased intensity of uterine contractions, ending in birth
- Oxytocin triggers milk ejection ("letdown" reflex) in women producing milk
- Synthetic and natural oxytocic drugs are used to induce or hasten labor
- Plays a role in sexual arousal

