

The **H**uman Body
in **H**ealth and **I**llness

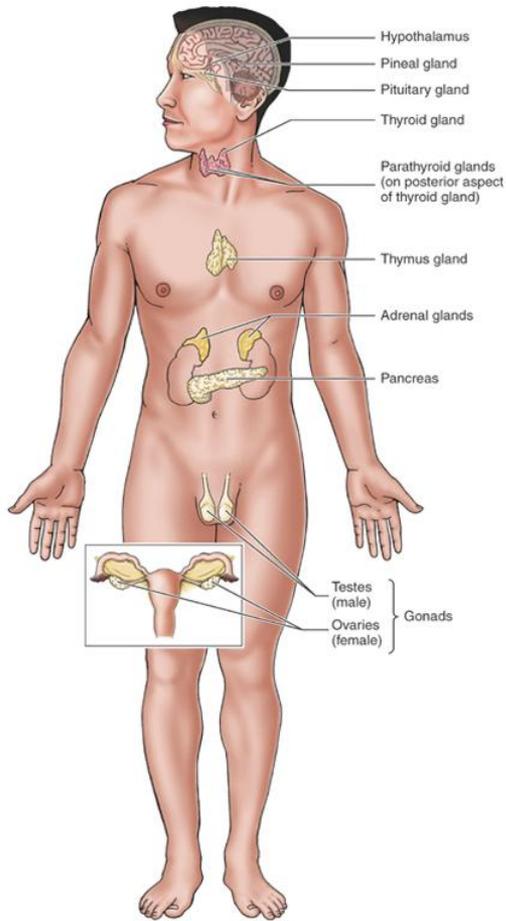
Barbara Herlihy

Chapter 14:
Endocrine System

Lesson 14.1 Objectives

- List the functions of the endocrine system.
- Define *hormone*.
- Explain negative feedback control as a regulator for hormone levels.
- Describe the relationship of the hypothalamus to the pituitary gland.
- Describe the location, hormones, and regulation of the pituitary gland.

Endocrine Glands



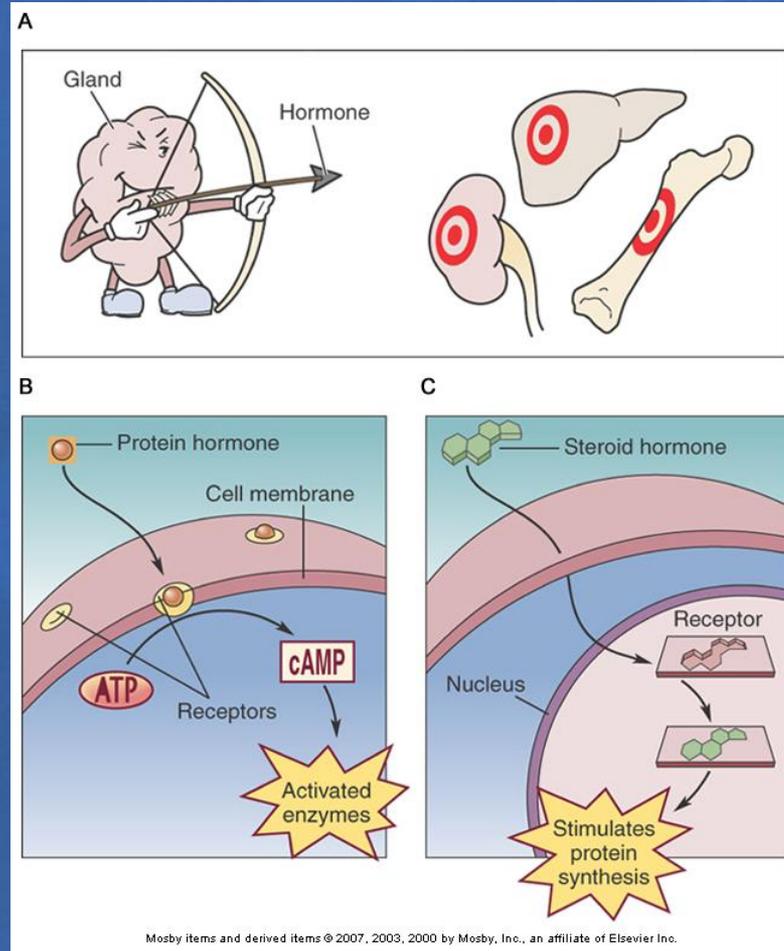
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- Endocrine glands:
 - Ductless glands
 - Widely distributed throughout the body
 - Secrete hormones

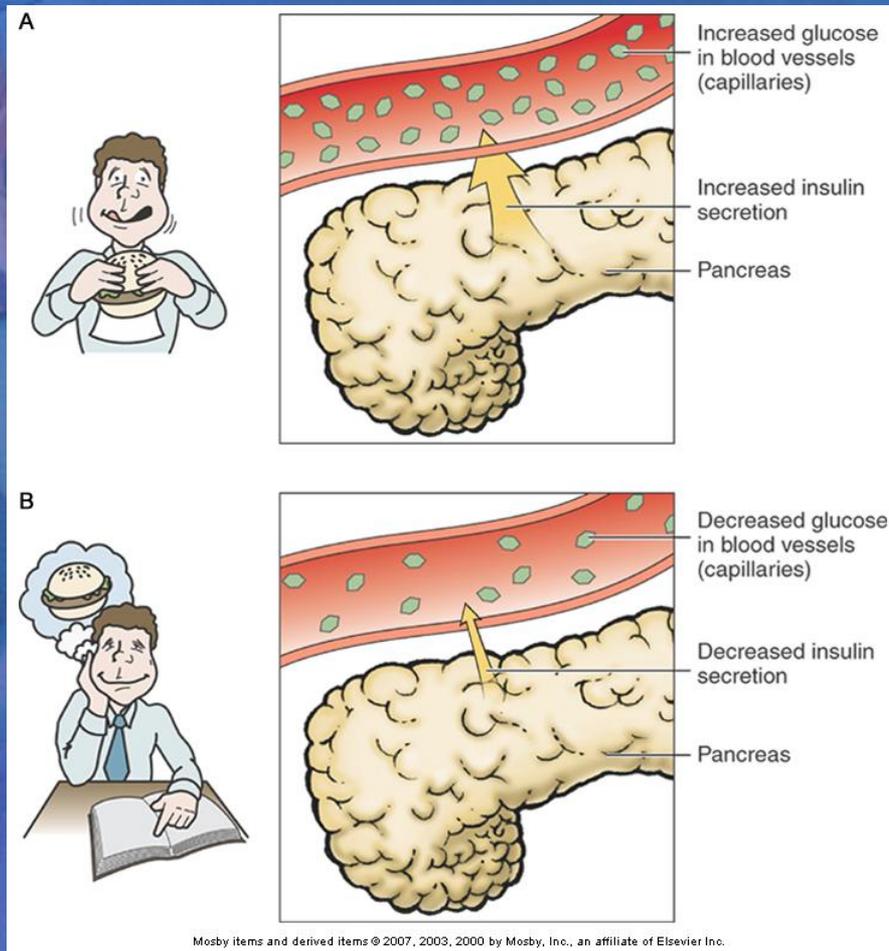
Hormones

- Hormone: chemical messenger that influences or controls the activities of other tissues and organs
- Classification of hormones:
 - Proteins (and protein-related substances)
 - Steroids

Hormones (cont'd.)



Hormone Secretion



- **Negative feedback:** information about the hormone or its effects is fed back to the gland that secretes it

Hormone Secretion (cont'd.)

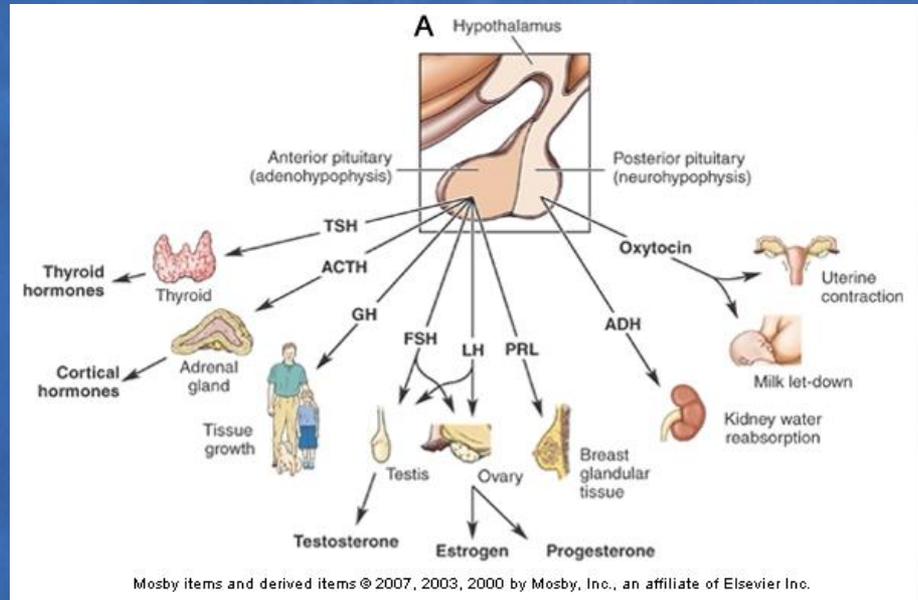
- Biorhythms: rhythmic alteration in a hormone's rate of secretion
 - Circadian rhythm: 24-hour rhythm
 - Chronopharmacology: study of the effects of biorhythms on drug effects

Hormone Secretion (cont'd.)

- Central nervous system helps control secretion of hormones in two ways:
 - Activation of hypothalamus
 - Stimulation of sympathetic nervous system

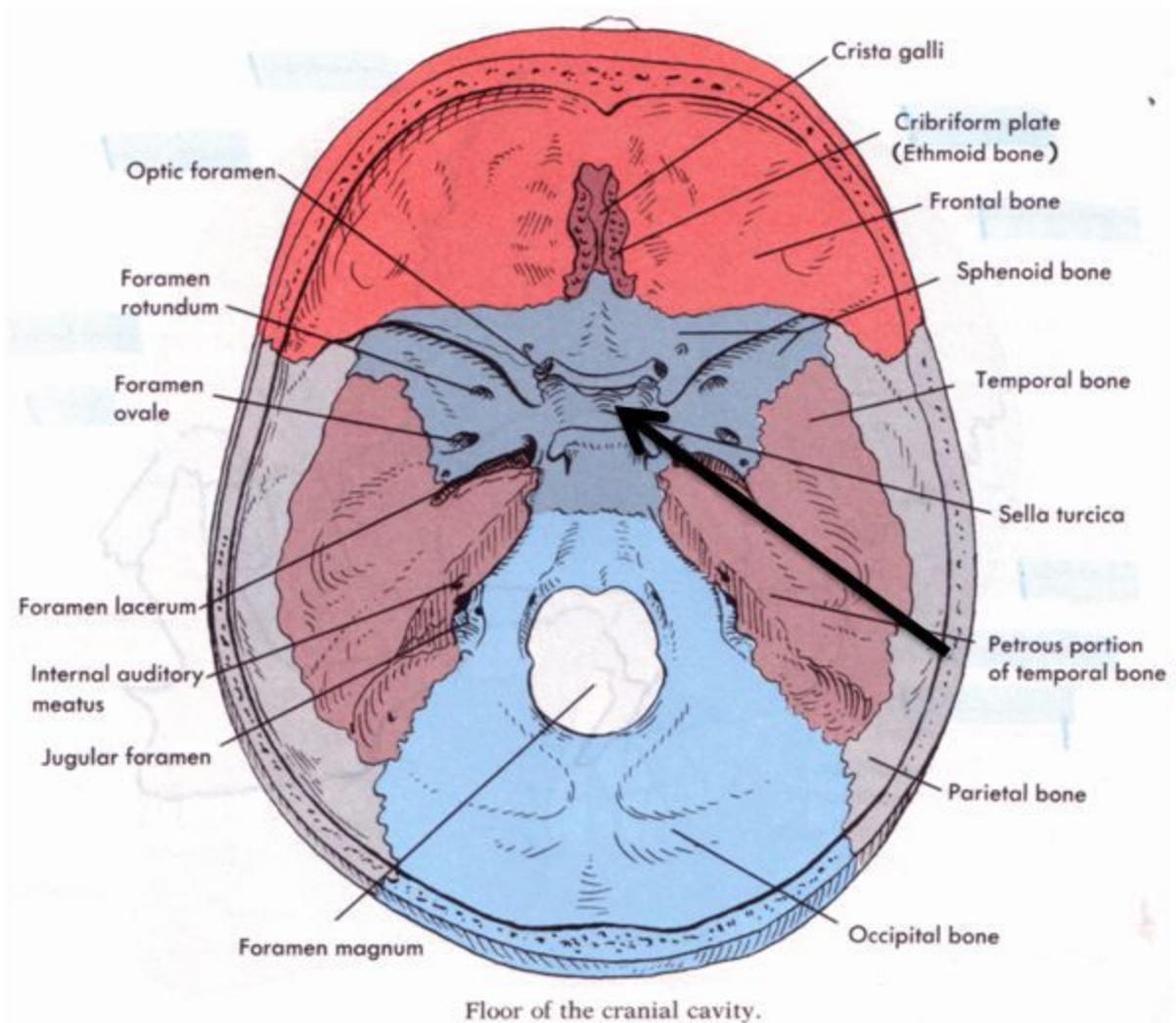
The Pituitary Gland

- Pituitary gland: pea-sized gland located in a depression of the sphenoid bone
- Two main parts:
 - Anterior pituitary gland
 - Posterior pituitary gland



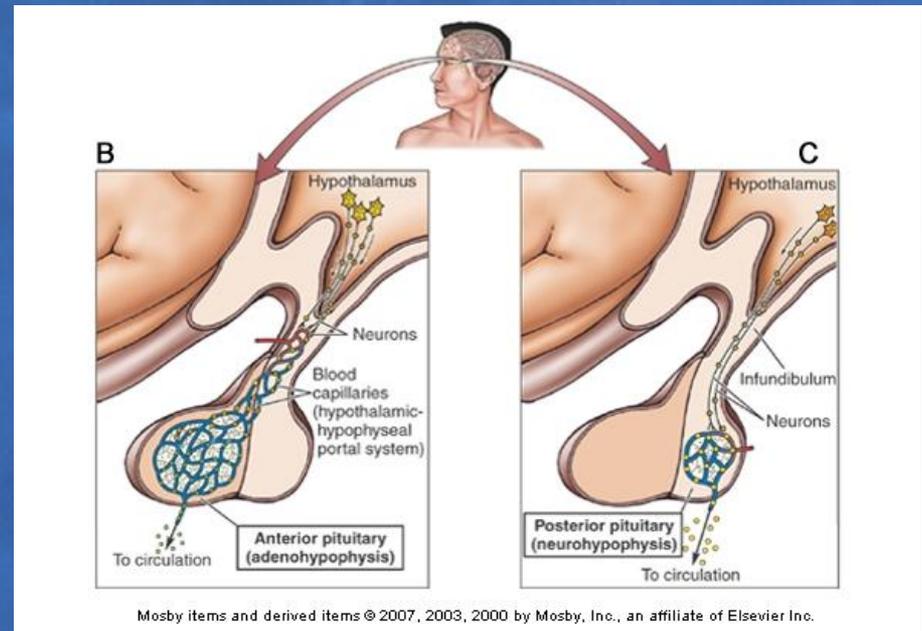
Sphenoid Bone Markings

- Sella turcica:
holds the
pituitary gland
in place



The Pituitary Gland (cont'd.)

- Hypothalamus: controls secretions of the anterior pituitary gland
- Hypothalamic-hypophyseal portal system: network of capillaries that connects the hypothalamus with the anterior pituitary gland



The Pituitary Gland (cont'd.)

- Anterior pituitary gland
 - Composed of glandular epithelial tissue
 - Secretes hormones that control other glands and affect many organ systems
- Hormones of the anterior pituitary gland:
 - Prolactin (PRL, or lactogenic hormone): promotes milk production after childbirth
 - Growth hormone (GH): affects growth of skeletal muscles and long bones

The Pituitary Gland (cont'd.)

- Hormones of the anterior pituitary gland (cont'd.):
 - Thyroid-stimulating hormone (TSH): stimulates thyroid gland to secrete two thyroid hormones
 - Adrenocorticotrophic hormone (ACTH): stimulates the adrenal cortex to secrete steroids
 - Gonadotropins: stimulate the gonads, or sex glands (ovaries and testes), to secrete follicle-stimulating hormone (FSH) and luteinizing hormone (LH)

The Pituitary Gland (cont'd.)

- Posterior pituitary gland: extension of hypothalamus, composed of nervous tissue
- Hormones: produced in the hypothalamus and transported to the gland to be stored until needed
 - Antidiuretic hormone
 - Oxytocin

The Pituitary Gland (cont'd.)

- Tiny third lobe: third, smaller part of pituitary gland
- Hormone: melanocyte-stimulating hormone (MSH)

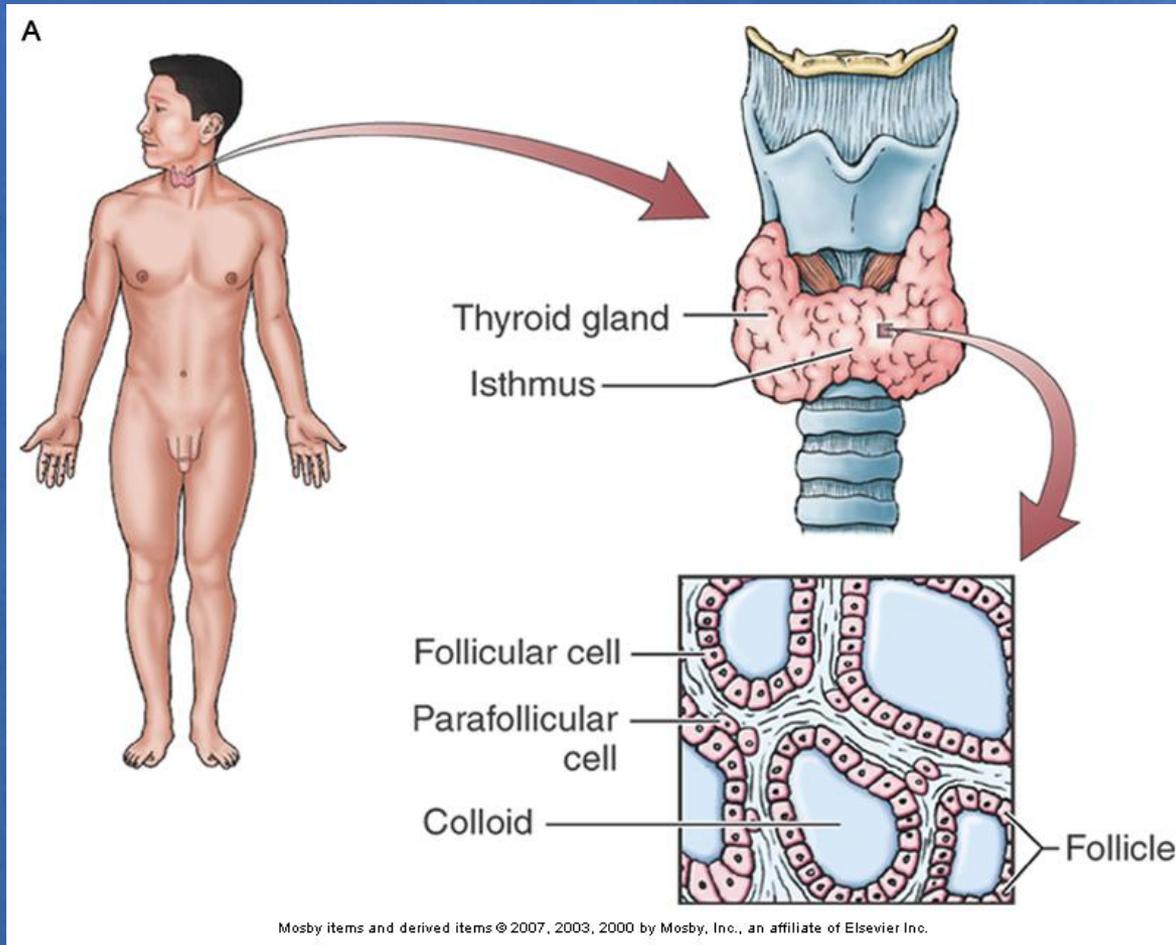
Lesson 14.2 Objectives

- Identify the major endocrine glands and their hormones.
- Explain the effects of hyposecretion and hypersecretion of the major endocrine glands.

Thyroid Gland

- Largest endocrine gland
- Located in anterior neck
- Situated on front and sides of trachea
- Two lobes
- Two types of cells:
 - Follicular cells
 - Parafollicular cells

Thyroid Gland (cont'd.)



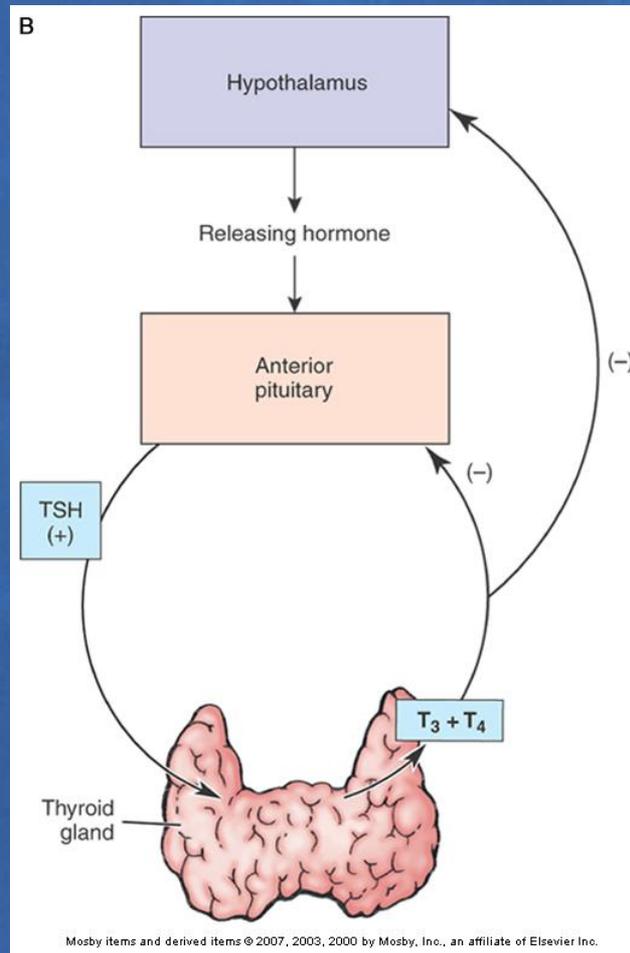
Thyroid Gland (cont'd.)

- Thyroid hormones: function to regulate all phases of metabolism, necessary for:
 - Proper functioning of all other hormones
 - Normal maturation of the nervous system
 - Normal growth and development
- Follicular cells secrete:
 - Triiodothyronine (T_3)
 - L-3,5,3',5'-tetraiodothyronine (T_4 , or thyroxine)

Thyroid Gland (cont'd.)

- Hypothyroidism: thyroid hormone deficiency resulting in myxedema, a slowed-down metabolic state
- Hyperthyroidism: excess of thyroid hormones produces a sped-up metabolic state

Thyroid Gland (cont'd.)



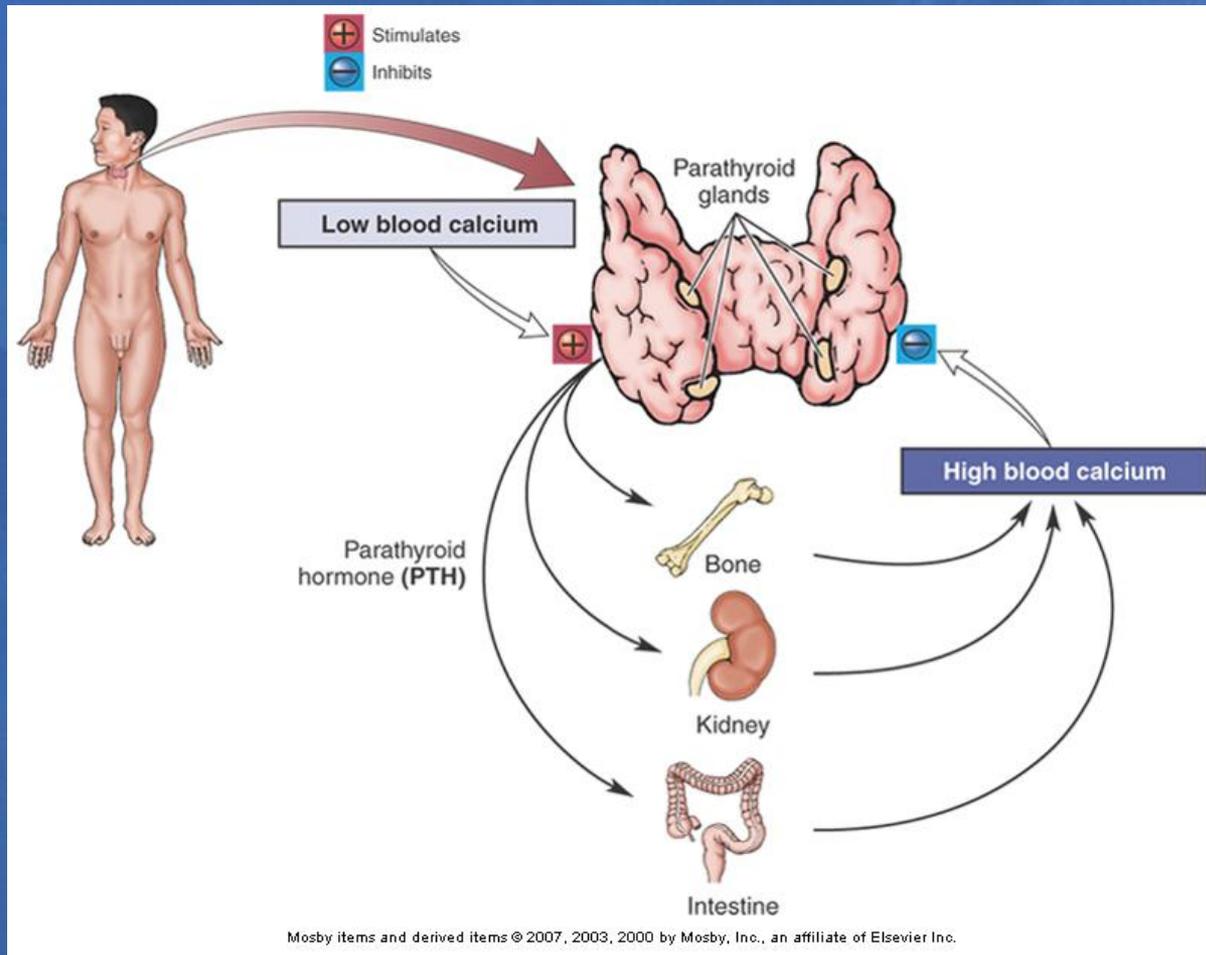
Thyroid Gland (cont'd.)

- Iodine:
 - Required for synthesis of T_3 and T_4
 - Comes from dietary sources
 - Is actively pumped into the follicular cells of the thyroid gland
- Parafollicular cells: secrete calcitonin

Parathyroid Glands

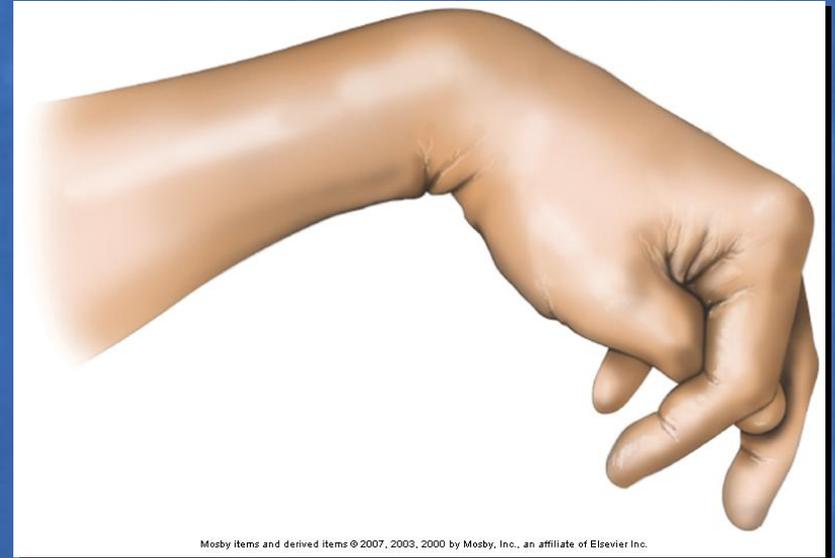
- Parathyroid glands:
 - Lie along the posterior surface of the thyroid gland
 - Secrete parathyroid hormone (PTH), which elevates blood calcium

Parathyroid Glands (cont'd.)



Parathyroid Glands (cont'd.)

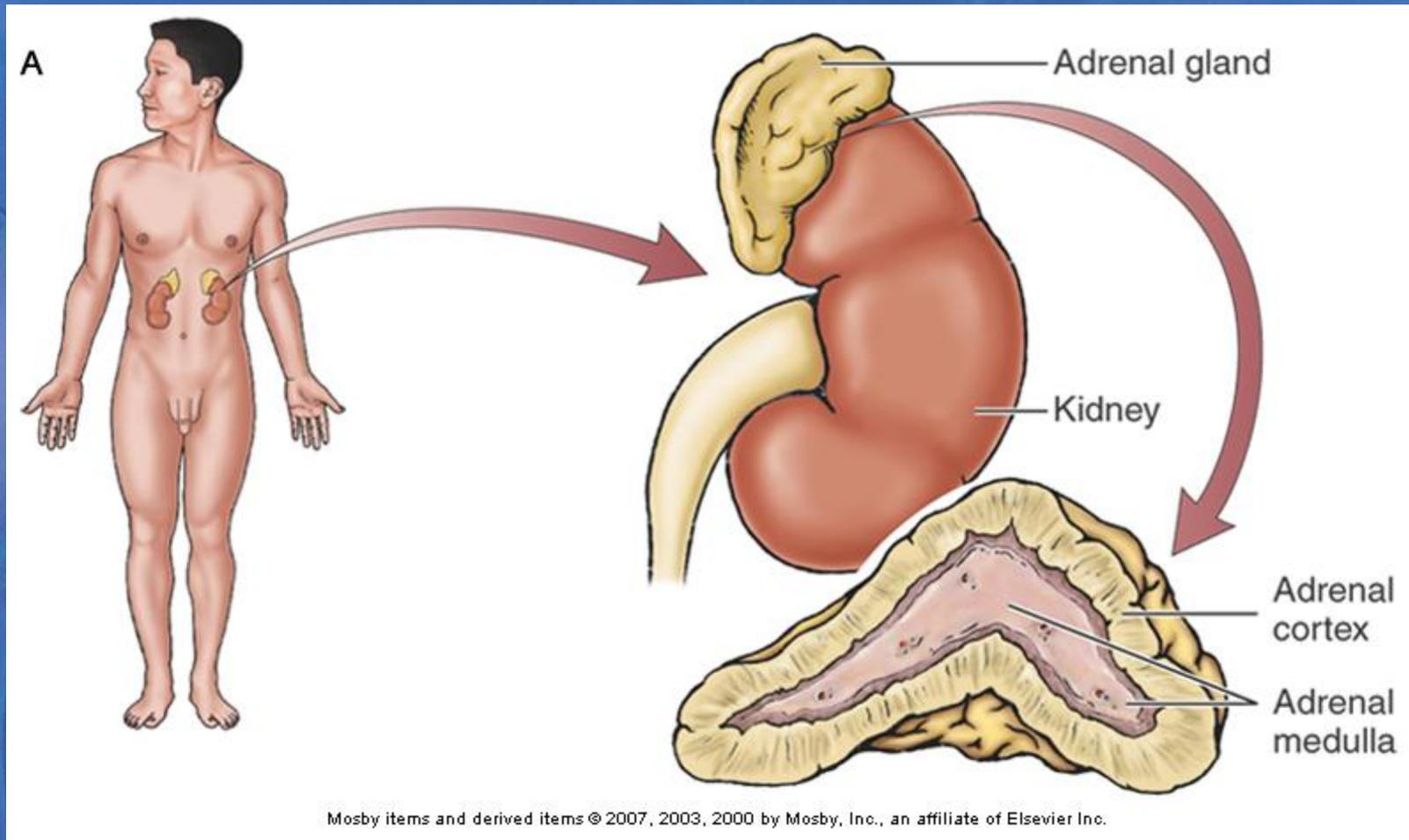
- Hyposecretion and hypersecretion
 - Hypocalcemia: absence of sufficient calcium causes carpal spasm
 - Hypercalcemia: hyperparathyroidism develops in response to a tumor in the parathyroid gland



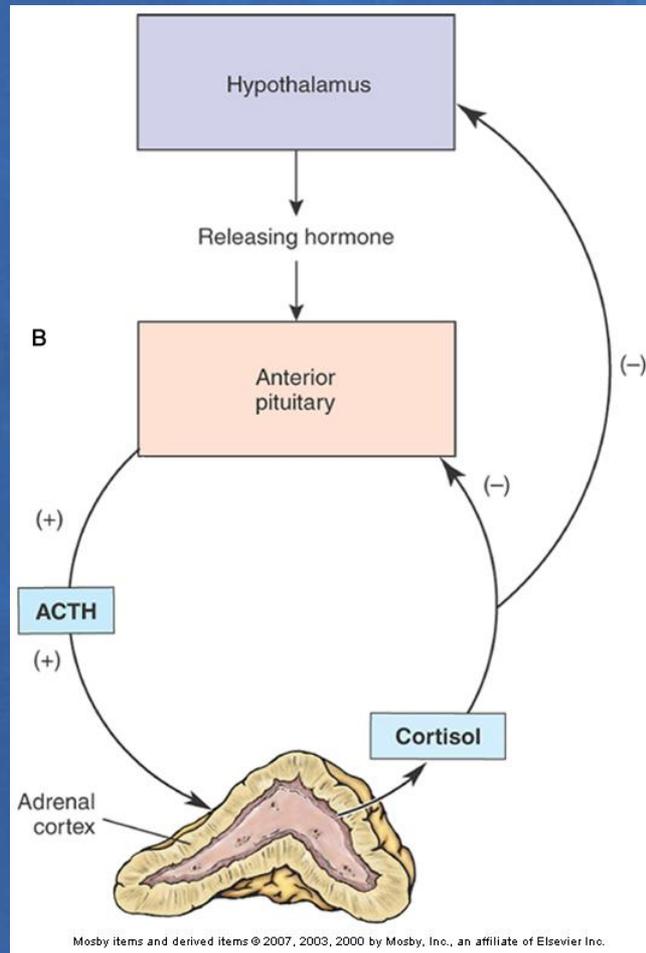
Adrenal Glands

- Adrenal glands: located above kidneys
- Two regions:
 - Adrenal medulla: inner region of the adrenal gland, extension of the sympathetic nervous system, excretes catecholamines
 - Adrenal cortex: outer region of the adrenal gland, secretes steroids

Adrenal Glands (cont'd.)



Adrenal Glands (cont'd.)



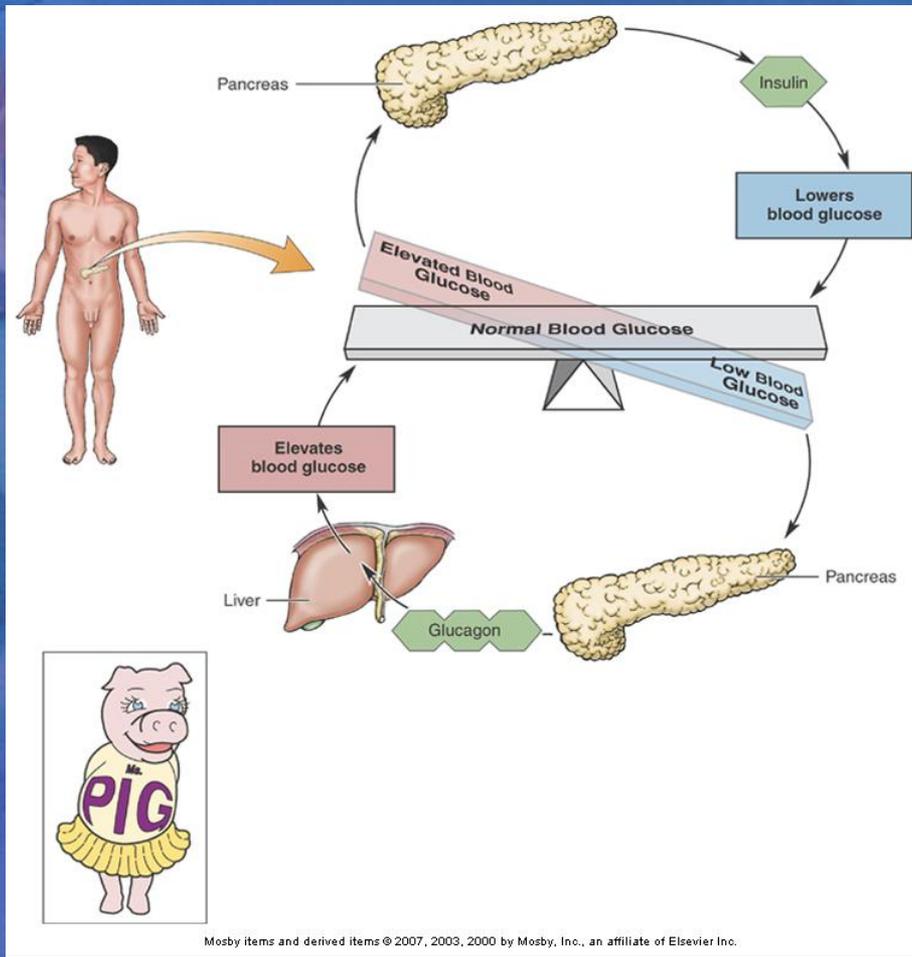
Adrenal Glands (cont'd.)

- Addison's disease: adrenal cortical insufficiency (hyposecretion)
- Cushing's syndrome: excess of adrenal cortical hormones (hypersecretion)

Pancreas

- Pancreas: long, slender organ that lies transversely across the upper abdomen
- Functions: exocrine gland and endocrine gland
- Hormones:
 - Insulin: released in response to increased blood levels of glucose
 - Glucagon: increases blood glucose by stimulating the conversion of glycogen to glucose, by stimulating the conversion of proteins into glucose, and by stimulating gluconeogenesis in the liver

Pancreas (cont'd.)



- **Diabetes mellitus:** insulin deficiency or ineffectiveness
- **Signs:**
 - Hyperglycemia
 - Glucosuria
 - Polyuria
 - Polydypsia
 - Polyphagia
 - Acidosis
 - Fruity breath odor

Gonads

- Gonads: sex glands
 - Male: testes
 - Hormone: testosterone
 - Female: ovaries
 - Hormones: estrogen and progesterone

Thymus Gland

- Thymus gland: lies in the thoracic cavity behind the sternum
- Hormones: thymosins

Pineal Gland

- Pineal gland: cone-shaped gland located close to the thalamus in the brain
- Hormone: melatonin

Other Hormones

- Organ-specific hormones: control the activities of a particular organ
- Prostaglandins: play a role in the regulation of smooth muscle contraction and the inflammatory response
- Adipose tissue hormones: excess adipose tissue acts as a gland that secretes cytokines

Other Hormones (cont'd.)

