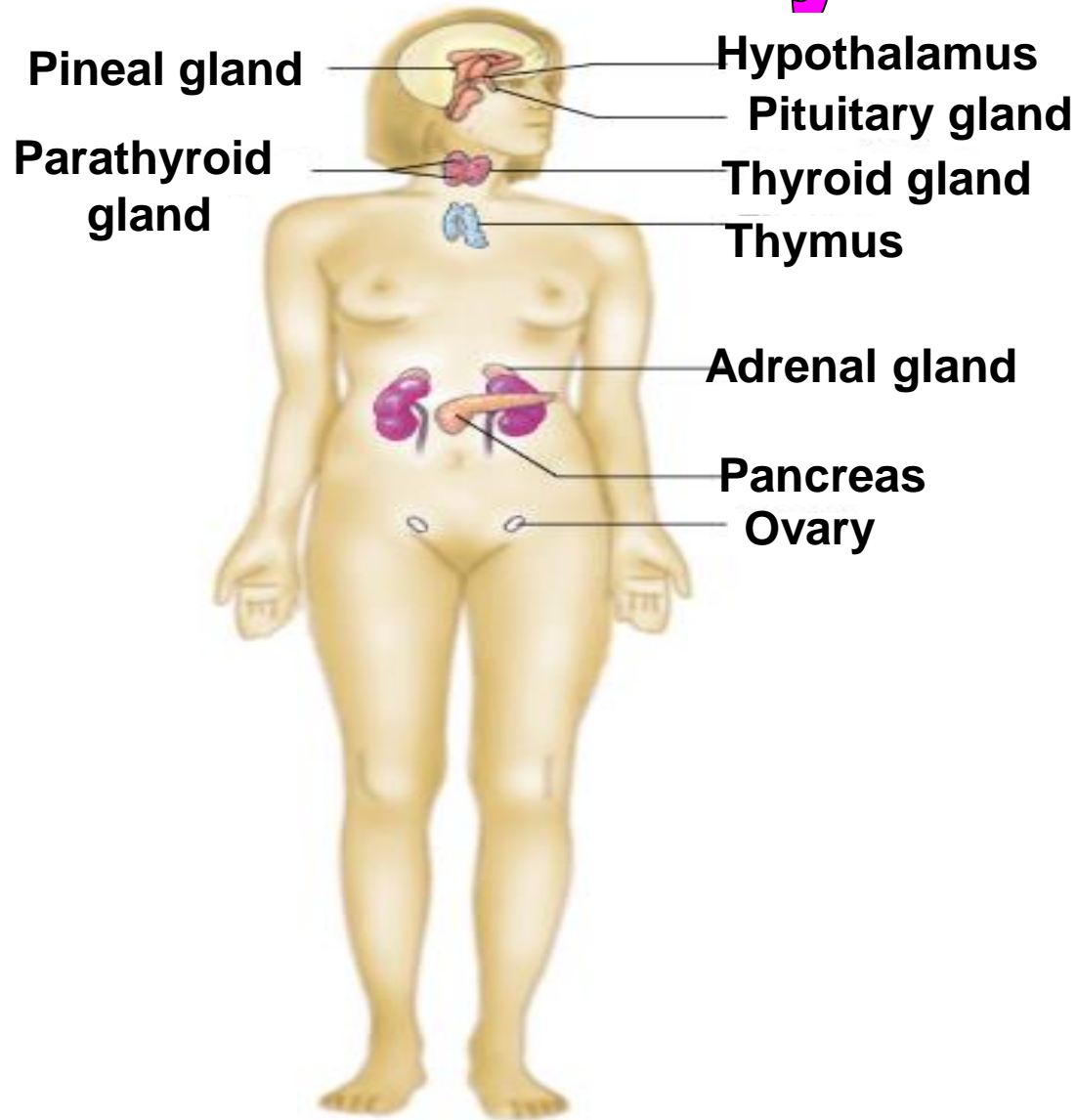


The Endocrine System



Objectives

After studying this chapter, you will be able to:

- **Name the parts of the endocrine system and discuss the function of each part**
- **Define the combining forms used in building words that relate to the endocrine system**
- **Identify the meaning of related abbreviations**
- **Name the common diagnoses, clinical procedures, and laboratory tests used in treating disorders of the endocrine system**

Objectives cont'd

- **List and define the major pathological conditions of the endocrine system**
- **Define surgical terms related to the endocrine system**
- **Recognize common pharmacological agents used in treating disorders of the endocrine system**

Structure and Function

The Endocrine System

- **Regulates many bodily functions**
- **Maintains homeostasis by regulating the production of chemicals that affect most functions of the body**
- **Secretes substances that aid the nervous system**
- **Important regulator of growth and development**
- **Endocrine glands are ductless glands, unlike exocrine glands that secrete substances into ducts.**

Structure and Function

The Endocrine System

Consists of:

glands

secrete

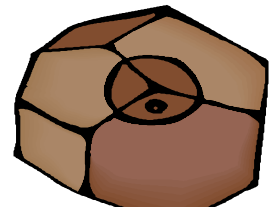


hormones

into

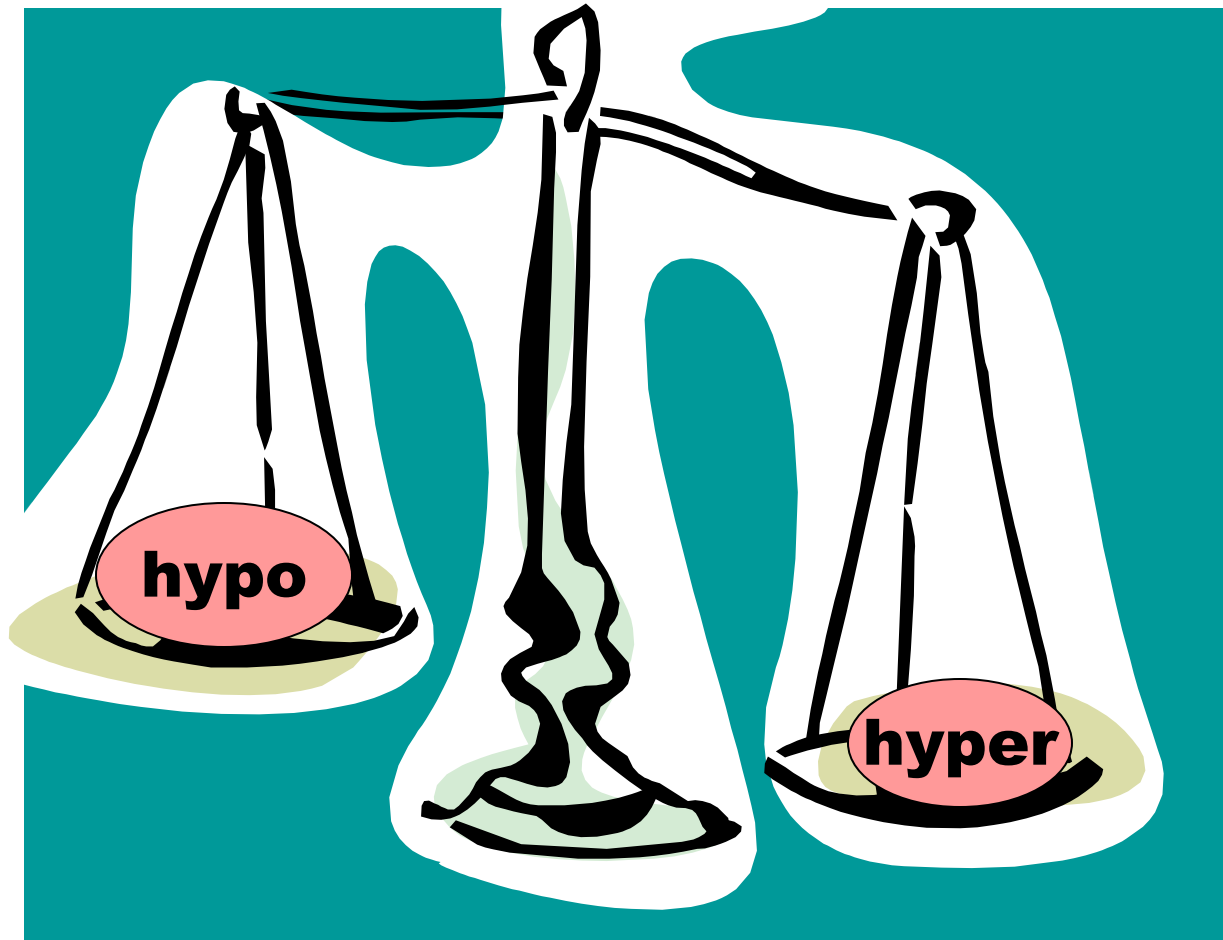
bloodstream

to



target tissues

Structure and Function



Homeostasis exists when there is a balance of substances. Endocrine conditions are due to either **hypo (too little) or **hyper** (too much) secretions of substances (**hormones**).**

Structure and Function

Hypothalamus

- Part of the nervous system. Also serves as an endocrine gland because it releases hormones that regulate pituitary hormones
- Hormones released have either a releasing or an inhibiting factor

Pineal Gland

- Located superior and posterior to the pituitary gland
- Releases **melatonin**, a hormone believed to affect sleep and gonad functioning

Pituitary Gland

- Located at the base of the brain in an area called the **sella turcica**
- Is the body's master gland
- Consists of an anterior and posterior lobe

Structure and Function

Thyroid Gland

- **Consists of a right and left lobe, located on either side of the trachea**
- **The *isthmus* connects the two lobes together**
- **Secretions control metabolism and blood calcium concentrations**

Hormones Secreted

Thyroxin (T4) and Triiodothyronine (T3)

- **Functions to regulate the metabolism of carbohydrates, lipids and proteins**

Calcitonin

- **Functions to help lower blood calcium levels**

Structure and Function

Parathyroid Gland

- Four oval shaped glands located on the dorsal side of the thyroid
- Regulates calcium and phosphate levels

Thymus Gland

- Also part of the immune system
- The hormones secreted stimulate the production of T and B cells

Adrenal Glands

- A pair of glands, each one situated on top of a kidney
- Each gland has an outer portion (**adrenal cortex**) and inner portion (**adrenal medulla**)
- Regulates electrolytes
- Adrenal medulla secretes **catecholamines** (**epinephrine** and **norepinephrine**) in response to stress

Structure and Function

Pancreas

- Helps maintain proper blood glucose levels
- Is both an endocrine and exocrine gland. The **islets of Langerhans** serve its endocrine functions
- Two types of cells, **alpha** and **beta** are produced by the islets of Langerhans



Elevated



Blood sugar

Insulin is released by the **beta** cells which stimulate the **glucose** to be sent to the body's cells and convert unused glucose to glycogen



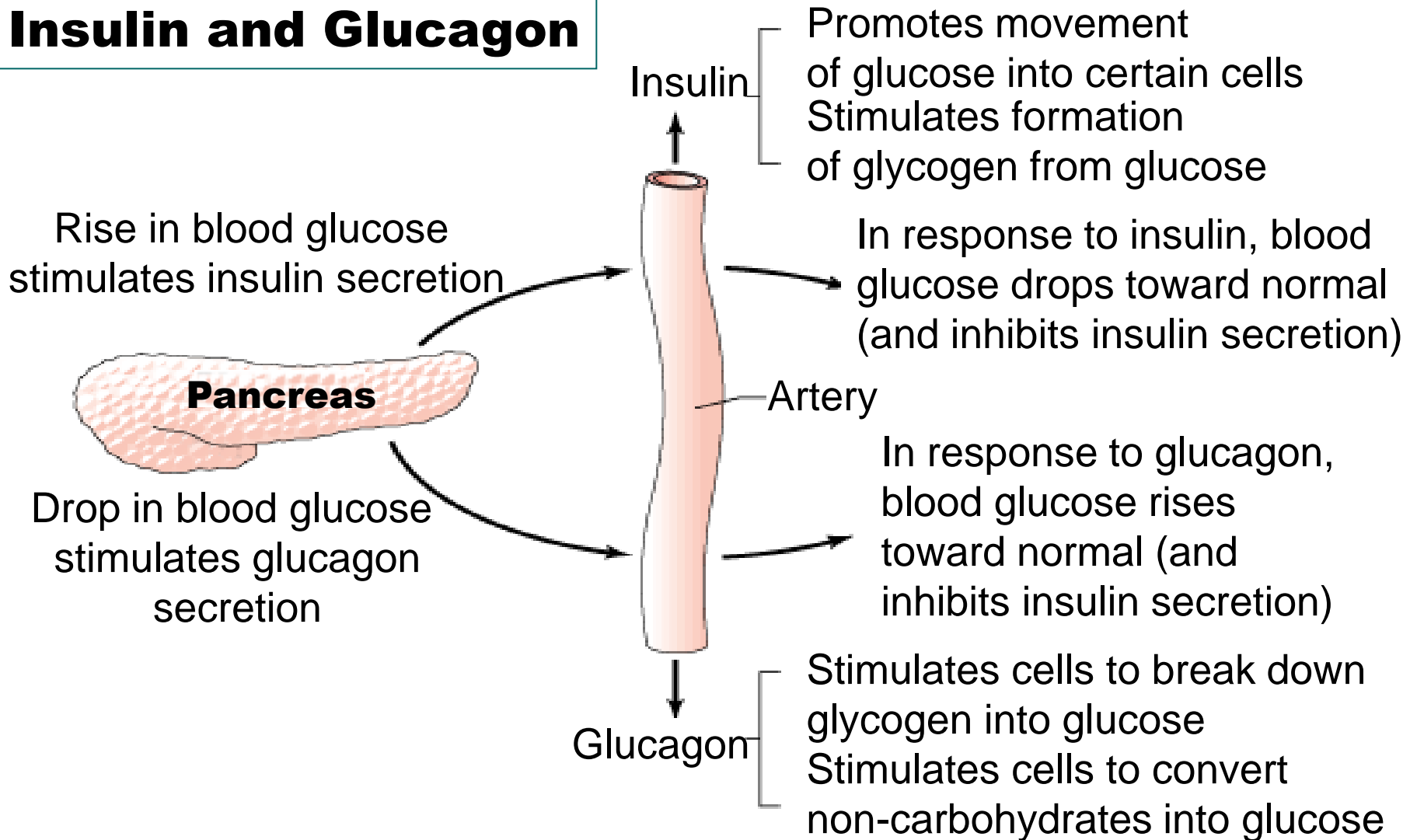
Blood sugar

Low

Glucagon is released by the **alpha** cells which stimulate stored **glycogen** to be transformed into glucose again

Structure and Function

Insulin and Glucagon



Structure and Function

Ovaries

- **Located in the female pelvic region one attached to the top of each fallopian tube**
- **Produce the female hormones:**
 - **estrogen**
 - **progesterone**

Testes

- **Located in the scrotum, a sac outside the body**
- **Produce spermatozoa which fertilizes the female ova**
- **Produce male sex hormones:**
 - **testosterone**

Combining Forms and Abbreviations

Combining Form

Meaning

aden(o)	→	gland
adren(o)	→	adrenal glands
gluc(o)	→	glucose
glyc(o)	→	glycogen
gonad(o)	→	sex glands
pancreat(o)	→	pancreas
parathyroid(o)	→	parathyroid
thyr(o)	→	thyroid gland

Combining Forms and Abbreviations

Abbreviation

Meaning

ACTH	adrenocorticotrophic hormone
ADH	antidiuretic hormone
CRH	corticotropin-releasing hormone
DM	diabetes mellitus
FSH	follicle-stimulating hormone
GH	growth hormone
GTT	glucose tolerance test
HCG	human chorionic gonadotropin

Combining Forms and Abbreviations

Abbreviation

Meaning

IDDM → **insulin-dependent diabetes mellitus**

LH → **luteinizing hormone**

MSH → **melanocyte-stimulating hormone**

NIDDM → **noninsulin dependent diabetes mellitus**

PRL → **prolactin**

PTH → **parathyroid hormone, parathormone**

STH → **somatotropin hormone**

TSH → **thyroid-stimulating hormone**

Diagnostic, Procedural, and Laboratory Terms

Blood Tests

- Fasting blood sugar
- Glucose tolerance test
- Thyroid function test

Other tests

- Radioactive iodine uptake
- Thyroid scan
- Radioactive immunoassay



Pathological Terms

Most endocrine conditions are the result of hypersecretion or hyposecretion of one or more hormones.

acromegaly

• **Hypersecretion of the growth hormone which may result in gigantism**

Pituitary Abnormalities

dwarfism

• **Hyposecretion of the growth hormone which causes stunted growth**

diabetes insipidus

• **Hyposecretion of the antidiuretic (ADH) hormone which causes polyuria and polydipsia**

syndrome of inappropriate ADH

Hypersecretion of the antidiuretic hormone (ADH) which causes excessive water to be retained

Pathological Terms

Thyroid Conditions

Hyperthyroidism

- Also known as Graves' disease or thyrotoxicosis
- Overactive thyroid secretions may cause exophthalmos (bulging of the eyes)
- A **goiter** may also form due to oversecretion of thyroid gland

Hypothyroidism

- Underactive thyroid secretion
- Signs include slow pulse, sluggishness, and often obesity
- Types of hypothyroidism include:
 - myxedema
 - congenital hypothyroidism
- Both can be treated with synthetic hormones

Pathological Terms

Parathyroid Conditions

The parathyroid glands help control calcium levels which contribute to bone growth and muscular health.

Hyperparathyroidism

- **Over activity of the parathyroid glands**
- **Usually caused by a tumor**
- **Symptoms may include the following:**
 - bone loss
 - kidney failure

Hypoparathyroidism

- **Under activity of the parathyroid glands causing low blood calcium levels**
- **Common symptoms include the following:**
 - bone loss
 - tetany (muscle paralysis)

Pathological Terms

Adrenal Conditions

Hyperadrenalism

- **Overactive adrenal gland secretion**
- **May be caused by a tumor**
- **Adrenogenital syndrome results in symptoms of excessive androgens affecting both men and women**
- **Symptoms may include hirsutism, and virilism**

Hypoadrenalism

- **Under secretion of the adrenal gland**
- **Also known as Addison's disease**
- **Symptoms may include:**
 - **anemia**
 - **abnormal skin pigment**
 - **general malaise**

Pathological Terms

Pancreatic Conditions

Pancreatitis

Inflammation of the pancreas

Hypoglycemia

- **Caused by hypersecretion of insulin**
- **Blood sugar levels below normal deprive the body cells of needed glucose**
- **Can be controlled with dietary changes**



Pathological Terms

Diabetes Mellitus

- *Can be due to hyposecretion of insulin*
- *Affects about 4% of the U. S. population*

Type I

- **Insulin-dependent diabetes**
- **Occurs in childhood**
- **Results from underproduction of insulin**
- **Controlled with doses of insulin**

Type II

- **Noninsulin-dependent diabetes**
- **Occurs during adulthood**
- **Usually results in overweight people**
- **Several physical complications such as:**
 - infection
 - diabetic nephropathy
 - diabetic neuropathy
 - diabetic retinopathy
- **controlled with exercise and diet**

Surgical Terms

Certain endocrine glands that become diseased can be removed

Common Procedures

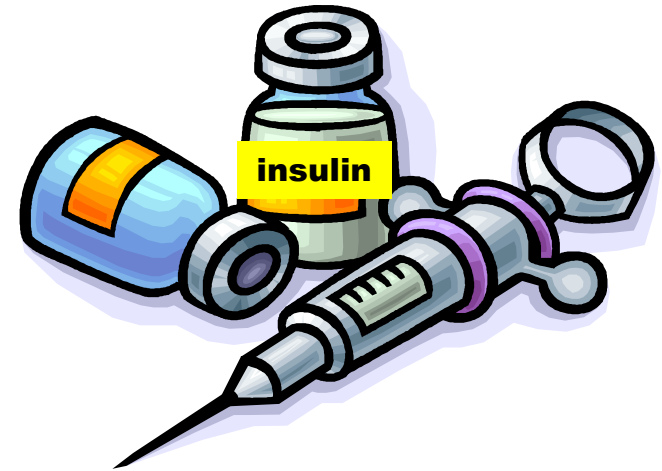
- adenectomy
- adrenalectomy
- hypophysectomy
- pancreatectomy
- parathyroidectomy
- thymectomy
- thyroidectomy



Pharmacological Terms

Hormone Replacement Therapy

- **Used to treat hormonal deficiencies**
- **Examples include synthetic**
 - **thyroid**
 - **estrogen**
 - **testosterone**



Antihypoglycemic

- **Prevents or relieves severe hypoglycemia**
- **Example**
 - **dextrose**

Antihyperglycemic

- **Lowers the blood sugar**
- **Example**
 - **Insulin**

Pharmacological Terms

Radioactive iodine

- **Used to treat thyroid tumors**

Human growth hormone

- **Increases height in cases of abnormal lack of growth**
- **Example**
 - **somatotropin**

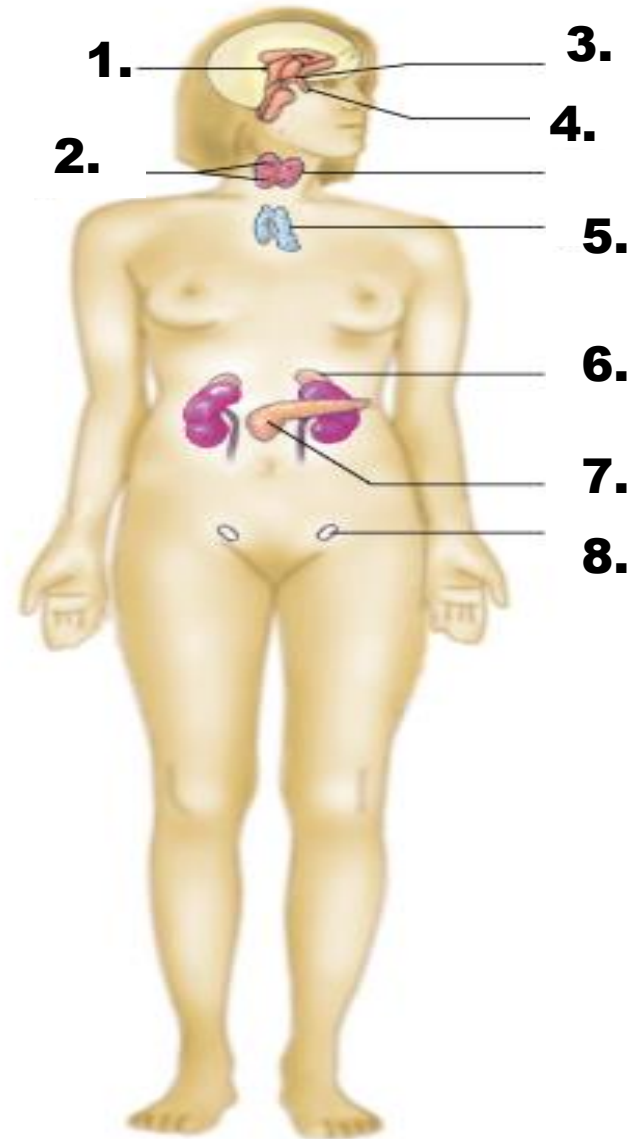
Steroid

- **Increases growth**
- **Example**
 - **prednisone**

Apply Your Knowledge

Identify the following labeled endocrine organs

1. pineal gland
2. parathyroid gland
3. hypothalamus
4. pituitary gland
5. thymus
6. adrenal gland
7. pancreas
8. ovary



Apply Your Knowledge

Which of the following endocrine glands is located in the sella turcica?

A. Pineal

B. Pituitary

C. Adrenal

Answer: B. Pituitary

Apply Your Knowledge

A lack of which of the following nutrients in the bloodstream will adversely affect the body's metabolism?

A. carbohydrates

B. sodium

C. iodine

Answer: C. iodine

Apply Your Knowledge

Carrie, age 5 has been diagnosed with diabetes mellitus. Which type of diabetes would she more than likely have?

A. insulin-dependent

B. noninsulin-dependent

C. Type II

Answer: A. insulin-dependent