54a A&P: Endocrine System

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Class Outline

5 minutes	Attendance, Breath of Arrival, and Reminders
10 minutes	Lecture:
25 minutes	Lecture:
15 minutes	Active study skills:
60 minutes	Total

54a A&P: Endocrine System

Class Reminders

Assignments:

- 55a Review Questions (due before class starts)
- 62a Deep Tissue Outside Massages (due before class starts)

Quizzes and Exams:

- 57a Quiz (45a/b, 47a, 48a, 49a, 50a/b, 51a/b, 52a, 54a, 55a, and 56a/b)
- 60a Exam

Preparation for upcoming classes:

- 55a Pathology: Endocrine System
- 55b Deep Tissue: Technique Review and Practice – Posterior Upper and Lower Body
- 56a/b Internship: ***This class cannot be made up in the make-up room***. To schedule a sit-in, please contact the Student Administrator.
- 58a Clinical Assessment: Structural Anatomy (Part I)

Classroom Rules

Punctuality - everybody's time is precious

- Be ready to learn at the start of class; we'll have you out of here on time
- Tardiness: arriving late, returning late after breaks, leaving during class, leaving early

The following are not allowed:

- Bare feet
- Side talking
- Lying down
- Inappropriate clothing
- Food or drink except water
- Phones that are visible in the classroom, bathrooms, or internship

You will receive one verbal warning, then you'll have to leave the room.

54a A&P: Endocrine System

Packet E - 123

Introduction:

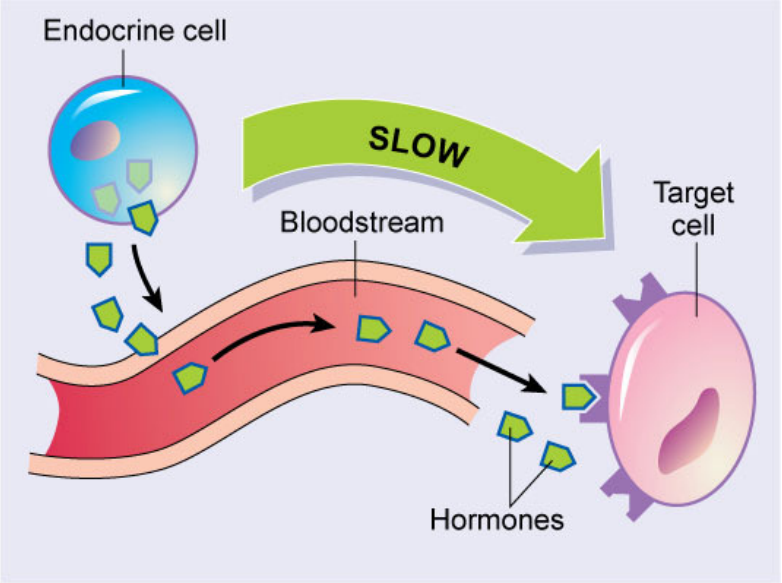
The endocrine system is a collection of cells and glands that release hormones. These hormones are chemicals that enter the bloodstream and exert their effects in distant parts of the body.

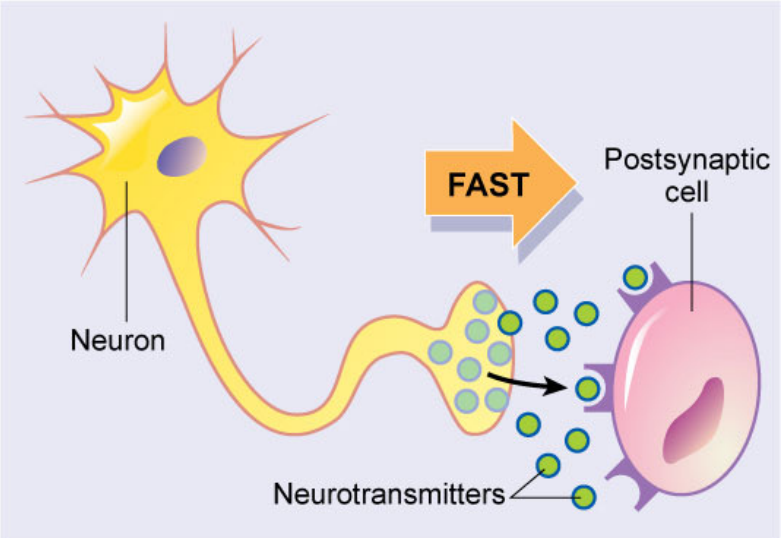
While it works alongside the nervous system to control physiological activity, it operates at a considerably slower pace with longer-lasting effects.

Introduction

The endocrine system works along with the ___nervous___ system to coordinate most body system functions.

Whereas the nervous system uses neural impulses to communicate, the endocrine system uses chemical messengers called ___hormones___.





Introduction

The endocrine system regulates processes that continue for relatively long periods, and its effects are more widespread than those of the nervous system.

The two types of glands of the body are ___exocrine___ and endocrine.

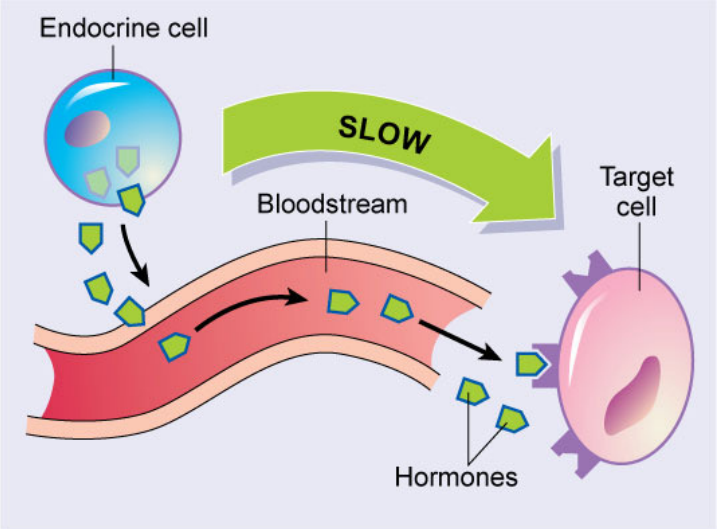
Introduction

Exocrine gland Gland that secretes products into ducts that open into body cavities, the hollow center of an organ, or onto the body's surface. Examples: sudoriferous (sweat), sebaceous (oil), ceruminous (wax), salivary, digestive.

Introduction

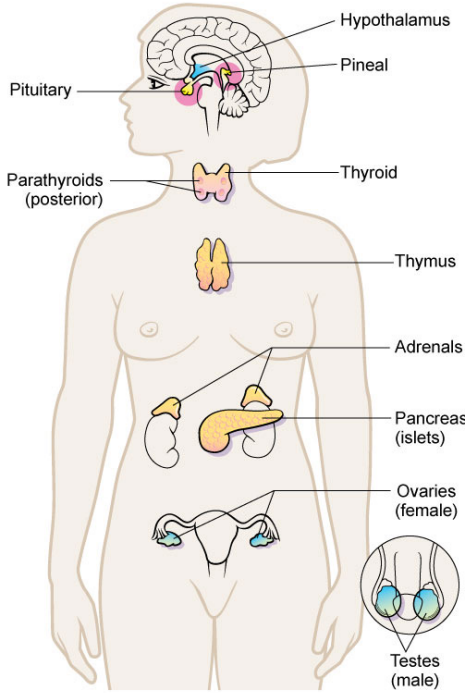
Endocrine gland ____ductless____ gland that produces hormones.

Endocrine glands produce specialized hormones. Most are released in one part of the body and travel through the bloodstream, affecting cells in other parts of the body. Some hormones do not enter the bloodstream but work on neighboring cells instead.



Introduction

Compared with other body systems, the glands of the endocrine system are small. Although the total weight of all the endocrine glands is less than 0.5 lbs., normal functioning of these glands is vital to the body process.



Anatomy

Hormones

Hypothalamus

Pituitary

Pineal

Thyroid

Parathyroid

Thymus

Adrenals

Pancreatic islets

Ovaries

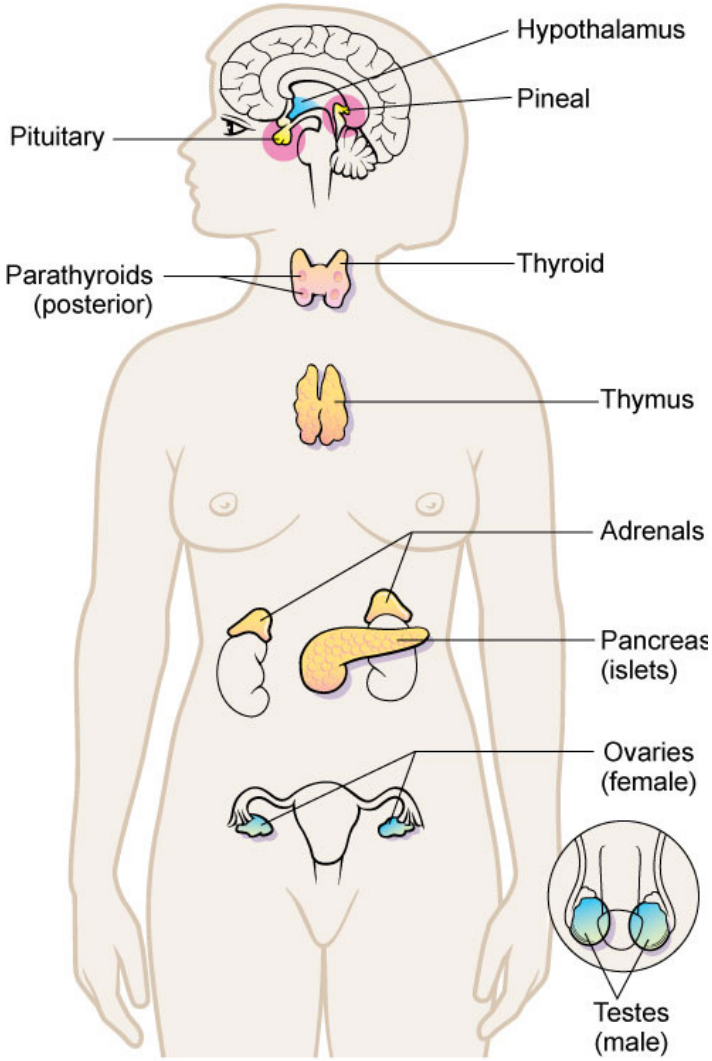
Testes

Organs that possess endocrine cells or act as temporary endocrine glands:

- Placenta
- Gastric and intestinal mucosa
- Heart
- Fat cells

Physiology

- Produces and secretes hormones.



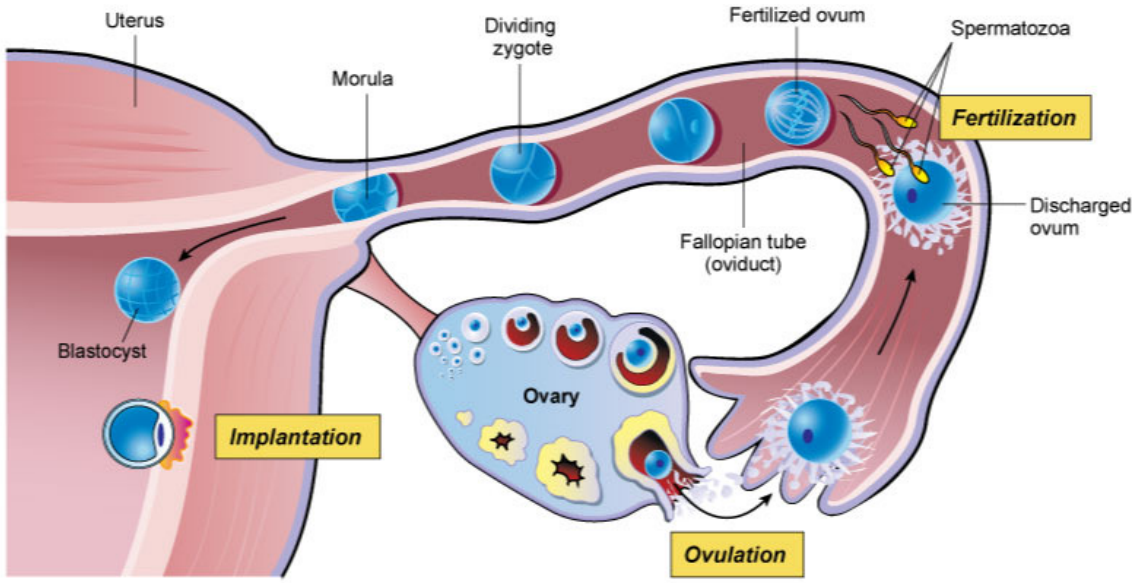
Physiology

- Regulates metabolic activities such as growth and development:
- Regulates the activity of other organs and glands, as well as ___smooth___ and ___cardiac___ muscle.
- Assists the body to adapt during times of ___stress___, such as trauma, infection, dehydration, emotional stress, and starvation.

Physiology

- Regulates the chemical composition and volume of body fluids (intracellular and extracellular).

- Contributes to the ___reproductive___ process.



Hormones

Hormone Glandular secretion that acts as a catalyst in biochemical reactions and regulates the physiological activity of other cells. Chemical messenger.

Hormones

Prostaglandins Local hormones. Produced by many tissues and generally act near their site of secretion.

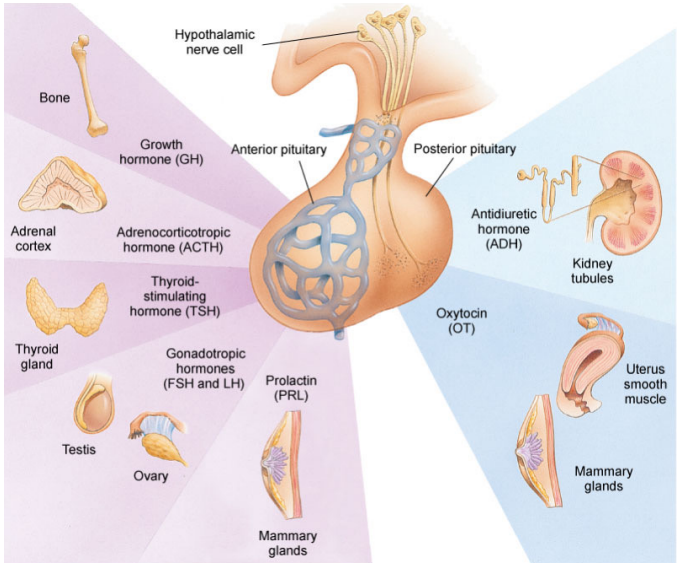
Hormonal Control Mechanisms

Negative feedback system Hormone control mechanism that triggers the negative, or opposite, response. Example: low calcium in the blood triggers an increase of parathyroid hormone which releases stored calcium from the bones into the blood stream. Once the calcium level in the blood increases sufficiently, there is a decrease in the release of parathyroid hormone.

Hormonal Control Mechanisms

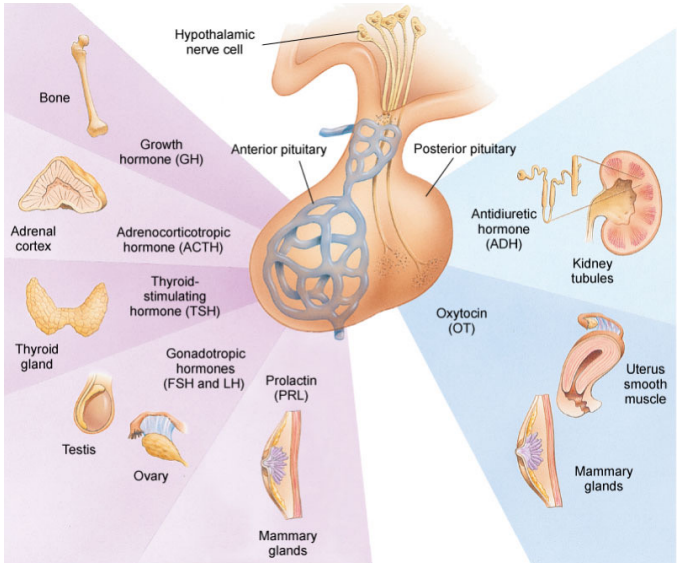
Hormonal control Hormone control mechanism using hormones to stimulate or ___inhibit___ the release of other hormones.

Example: The hypothalamus regulates the function of the anterior pituitary gland by production of releasing or inhibiting hormones.



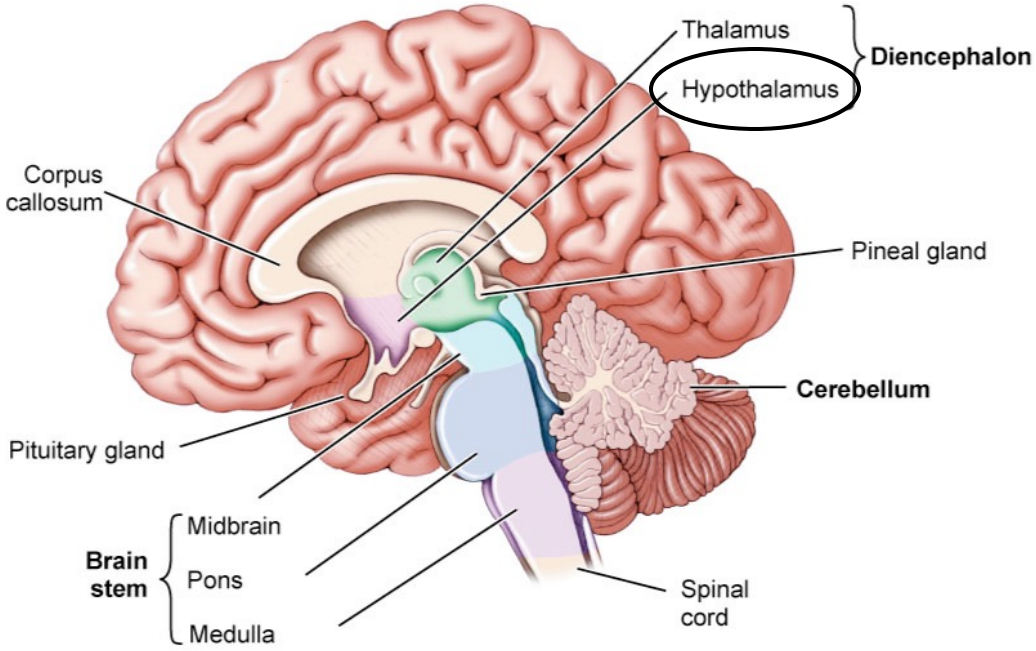
Hormonal Control Mechanisms

Neural control Hormonal control mechanism where hormones are secreted as a result of neural stimulation. Example: Release of epinephrine and norepinephrine from the adrenal medulla due to signals received from the sympathetic nervous system.



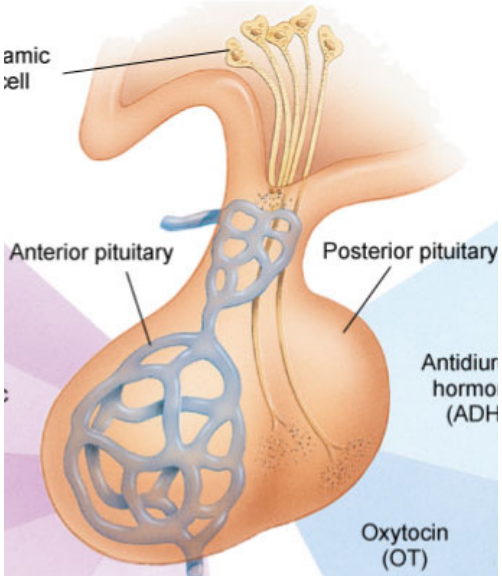
Hypothalamus

Hypothalamus Part of the diencephalon that regulates the ANS and the endocrine system by governing the ___pituitary___. Controls hunger, thirst, temperature, anger, aggression, release of hormones, sexual behavior, sleep patterns, and consciousness.



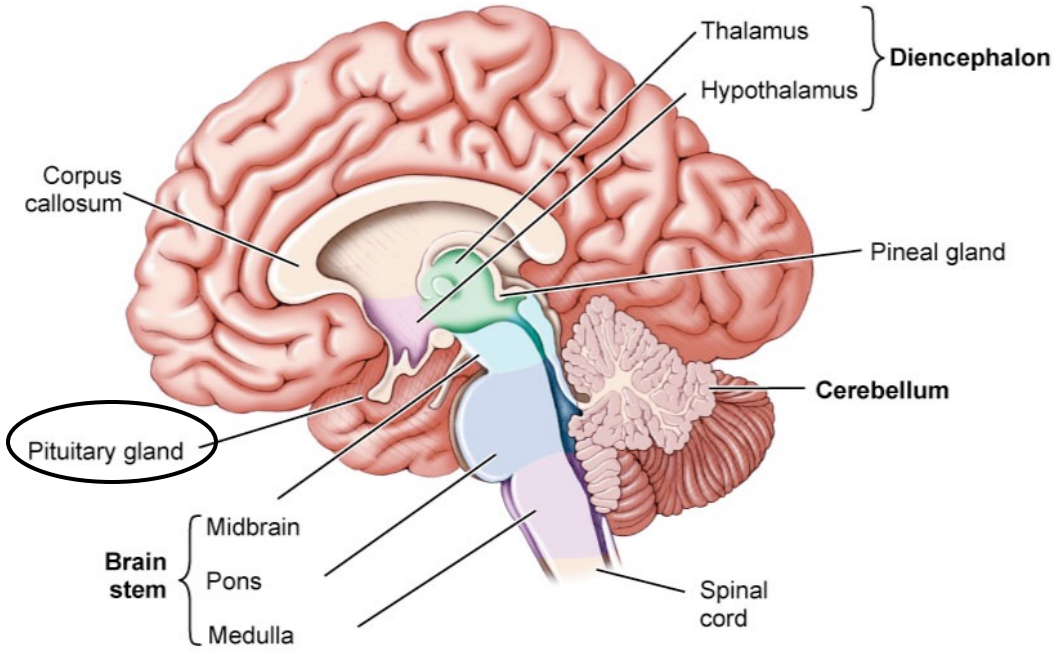
Hypothalamus

Hypophyseal portal system Complex network of small blood vessels made up of two capillary beds connected by veins. Carries hormones from the hypothalamus directly to the anterior pituitary, without having to travel to the heart and back again.



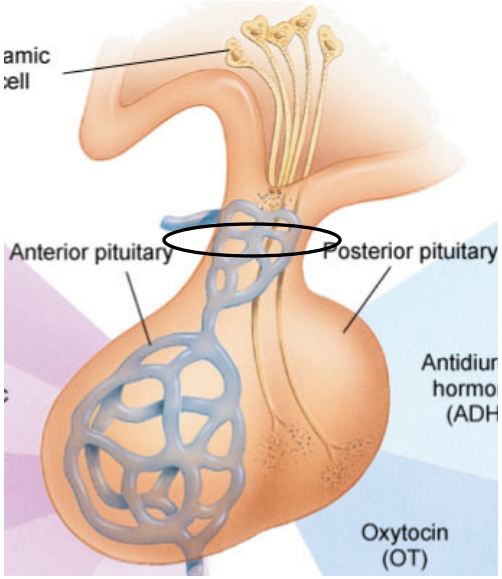
Pituitary

Pituitary (AKA: hypophysis) Bi-lobed gland that extends from the hypothalamus. Its hormones control and stimulate other glands to produce and secrete their hormones.



Pituitary

Infundibulum Stalk-like structure that extends from the hypothalamus to the pituitary.



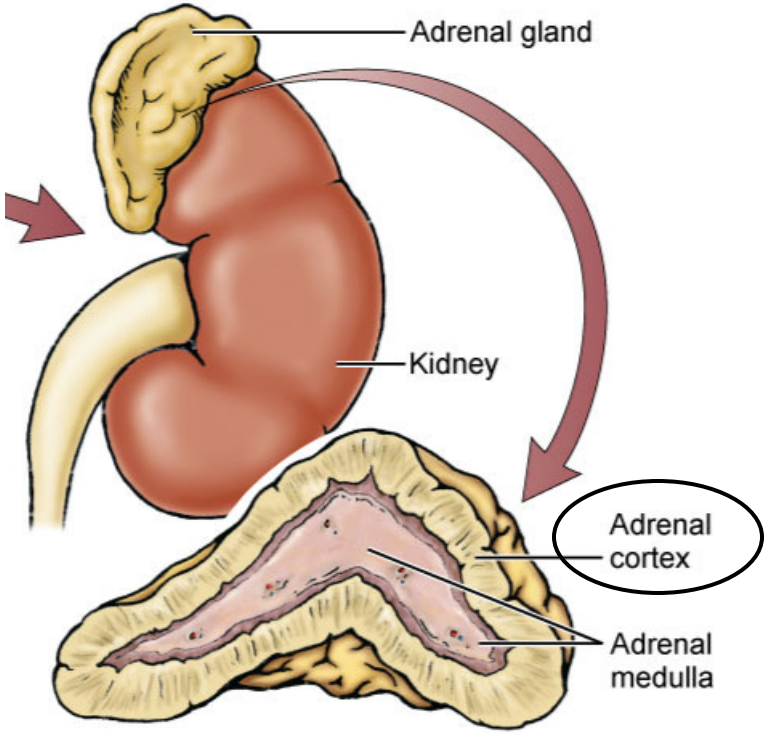
Pituitary

Anterior lobe of the pituitary (AKA: adenohypophysis) Lobe of the pituitary that produces seven hormones.

- ACTH
- GH
- TSH
- FSH
- LH
- PRL
- MSH

Anterior Lobe of the Pituitary

Adrenocorticotropic hormone (ACTH) Pituitary hormone that stimulates the adrenal cortex to secrete hormones, especially cortisol.

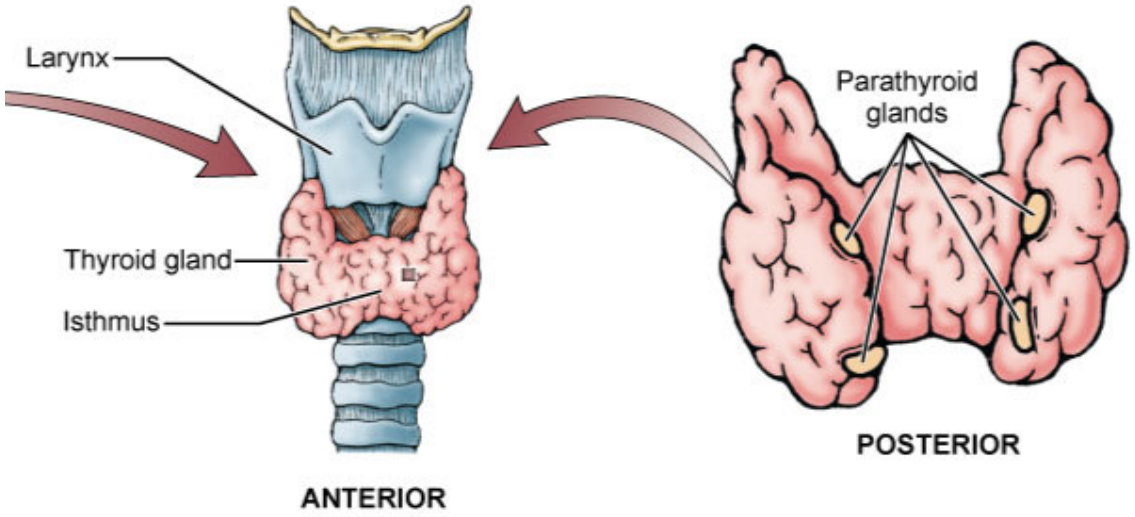


Anterior Lobe of the Pituitary

Growth hormone (GH) Pituitary hormone that stimulates protein synthesis for muscle and bone growth, maintenance and repair, and plays a role in ___metabolism___.

Anterior Lobe of the Pituitary

Thyroid-stimulating hormone (TSH) Pituitary hormone that stimulates the thyroid to synthesize and secrete its hormone.

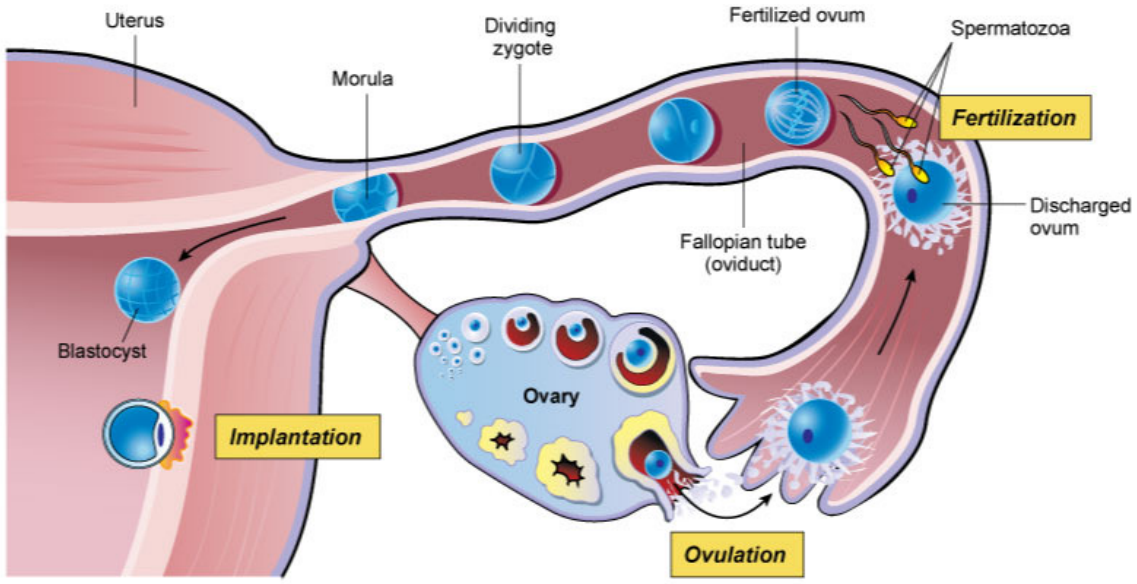


Anterior Lobe of the Pituitary

Follicle-stimulating hormone (FSH) Pituitary hormone that stimulates

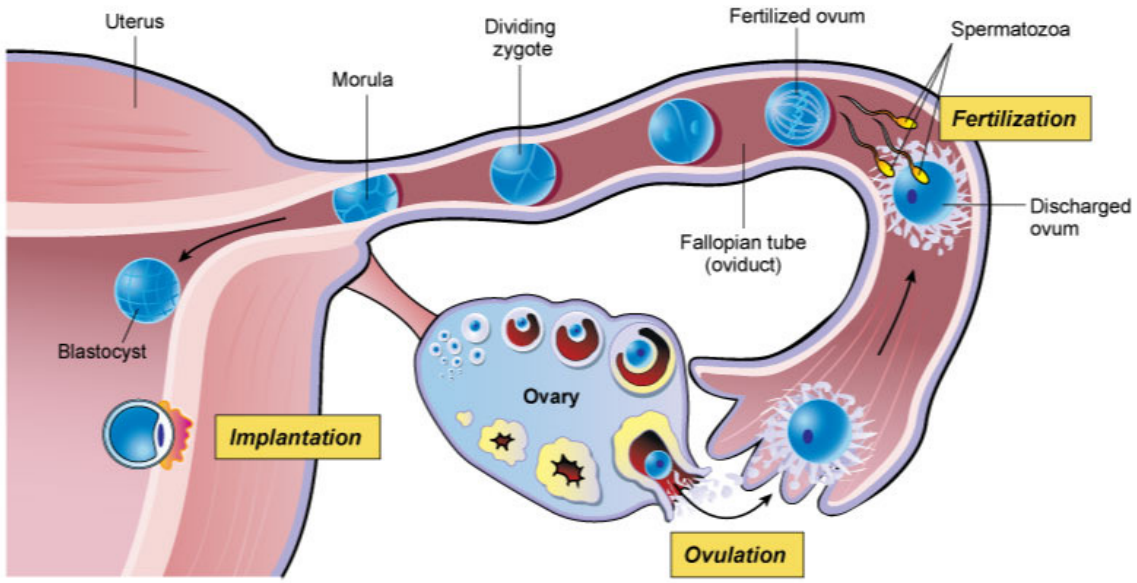
__estrogen__ production and development of ovarian follicle.

Stimulates __sperm__ production.



Anterior Lobe of the Pituitary

Luteinizing hormone (LH) Pituitary hormone that stimulates the release of estrogens and progesterone, ovulation, and development of the corpus luteum. Stimulates testosterone production.



Anterior Lobe of the Pituitary

Prolactin (PRL) Pituitary hormone that acts together with other hormones to promote milk production by the ___mammary___ glands.

Anterior Lobe of the Pituitary

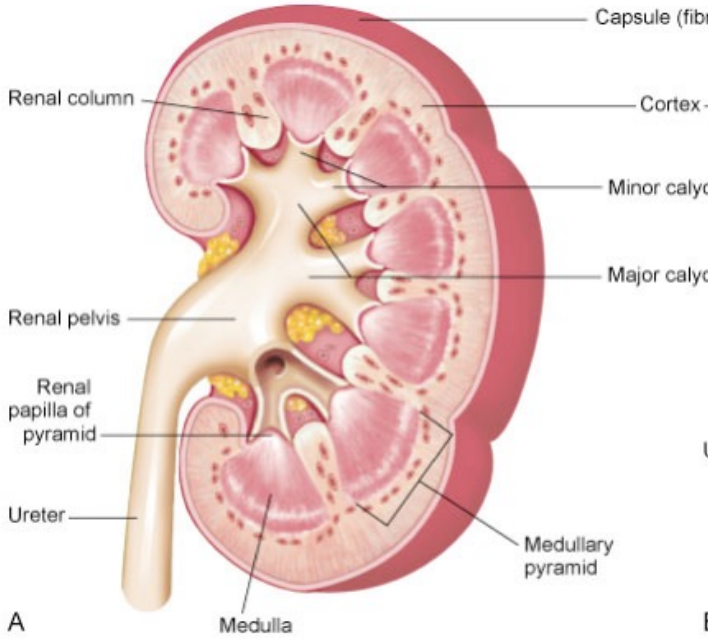
Melanocyte-stimulating hormone (MSH) Pituitary hormone that increases skin pigment production by stimulating the synthesis and release of melanin from skin/hair.

Posterior Pituitary Lobe

Posterior pituitary lobe (AKA: neurohypophysis) Lobe of the pituitary that stores and releases hormones produced by the hypothalamus.

Posterior Pituitary Lobe

Antidiuretic hormone (ADH) Pituitary hormone that decreases urine production by promoting the reabsorption of water in kidney tubules. Also constricts blood vessels, which raises blood pressure.

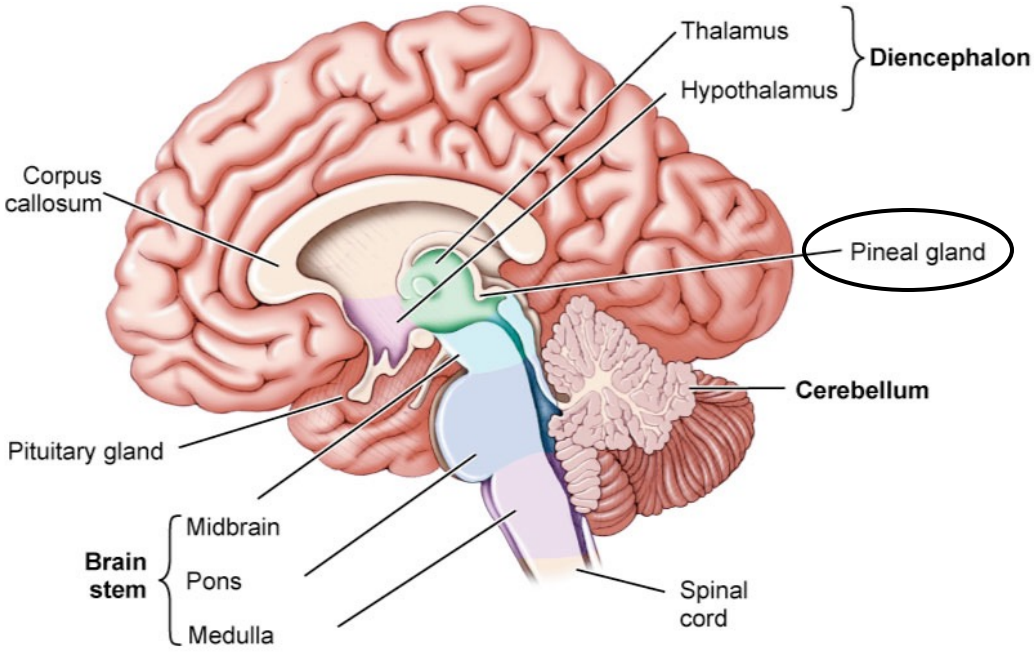


Posterior Pituitary Lobe

Oxytocin (OT) Pituitary hormone that stimulates uterine contractions and milk expression from mammary gland during lactation.

Pineal

Pineal gland (AKA: pineal body) Gland located on the posterior aspect of the brain's diencephalon. Produces and secretes the hormone melatonin.

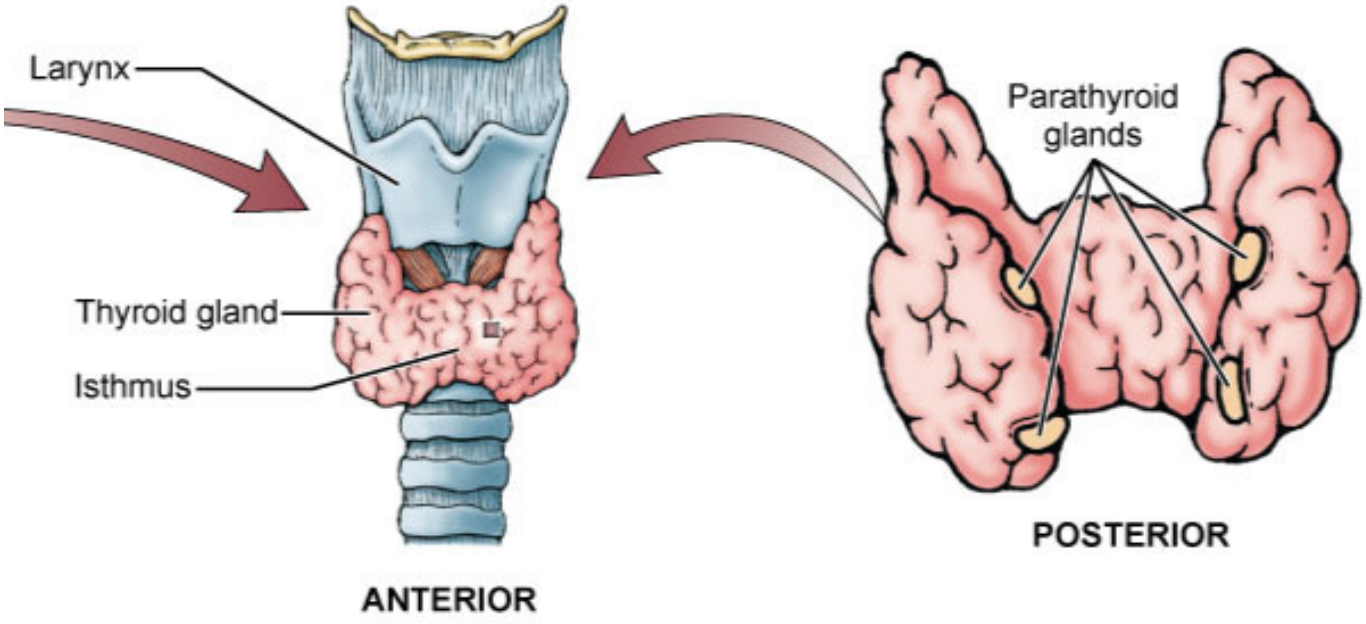


Pineal

Melatonin Pineal gland hormone involved in the control of biorhythms (the body's 24-hour cycle), and in the growth and development of sexual organs.

Thyroid

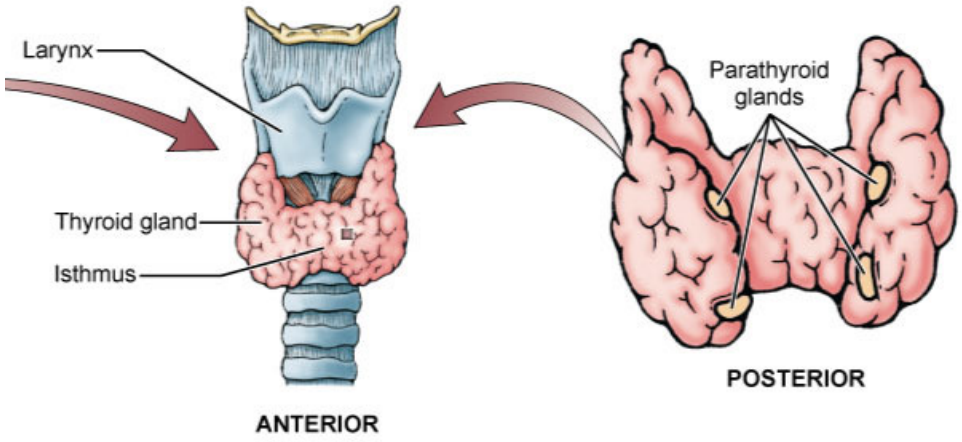
Thyroid Bi-lobed gland located at the base of the ___throat___ posterior and inferior to the larynx.



Thyroid

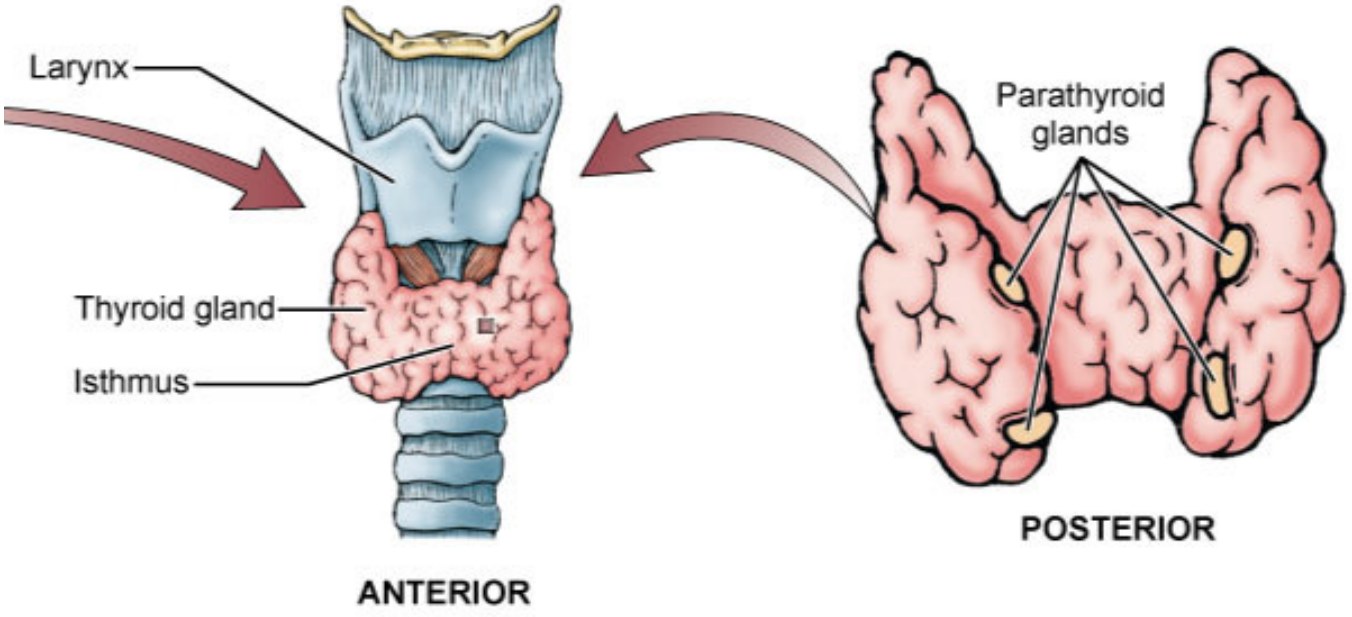
T3 (triiodothyronine) and T4 (tetraiodothyronine) Thyroid hormones that control metabolic rate and regulate growth and development.

Calcitonin (CT) Hormone secreted by the thyroid that decreases blood __calcium__ by stimulating osteoblasts to increase calcium storage in bones.



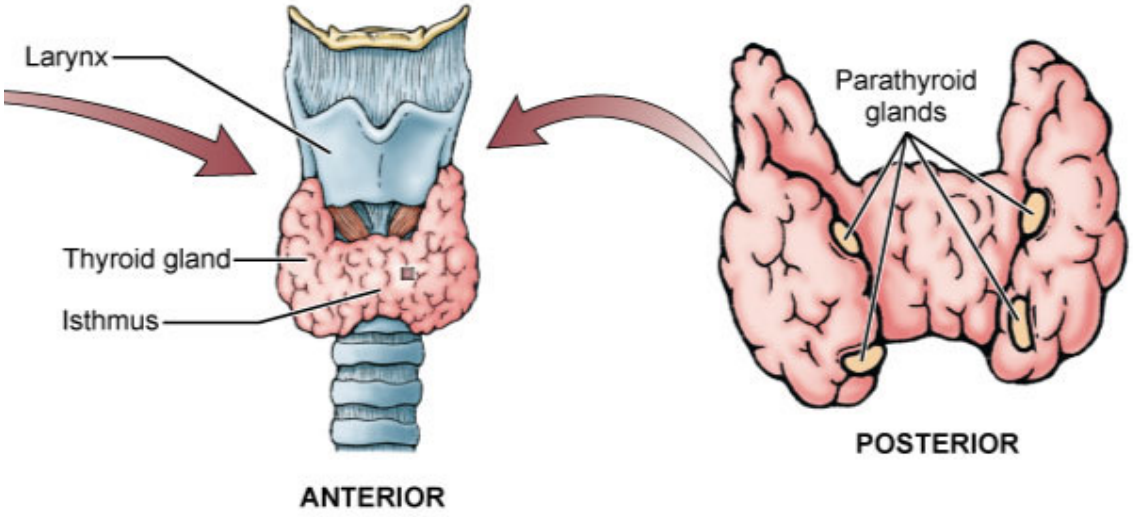
Parathyroid

Parathyroids Glands located on the posterolateral surface of the thyroid. Usually four in number.



Parathyroid

Parathyroid hormone (PTH) Hormone that __increases__ blood calcium by stimulating the __osteoclast__ activity to break down bone and release calcium into the blood, and increases calcium reabsorption from urine and the intestines back into the blood.



Thymus

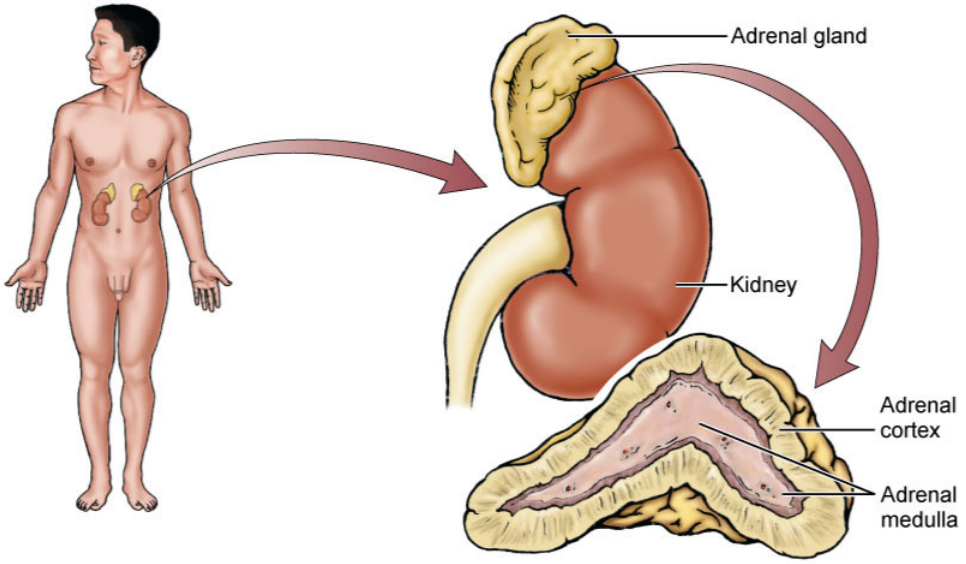
Thymus Bi-lobed gland posterior to the sternum. Stimulates production and activation of T cells.

- **Thymosin and thymopoietin** Hormones secreted by the thymus that stimulate the maturation of T cells.

Adrenals

Adrenals (AKA: suprarenals) Glands located superior to each kidney.

- Adrenal cortex
- Adrenal medulla



Adrenals

Adrenal cortex Outer region of the adrenals; secretes glucocorticoids, mineralcorticoids, and sex hormones.

- **Cortisol (hydrocortisone)** Stress hormone. Glucocorticoid that ensures that glucose, lipids, and amino acids are available for cells to use for energy and protein synthesis. Also has an anti-inflammatory effect.

- **Aldosterone** Adrenal hormone that stimulates kidneys to conserve sodium, which results in water retention in the blood. Also helps maintain proper mineral balance.

- **Sex hormones** (testosterone and estrogens)

Adrenals

Adrenal medulla Inner region of the adrenals. Secretes epinephrine and norepinephrine.

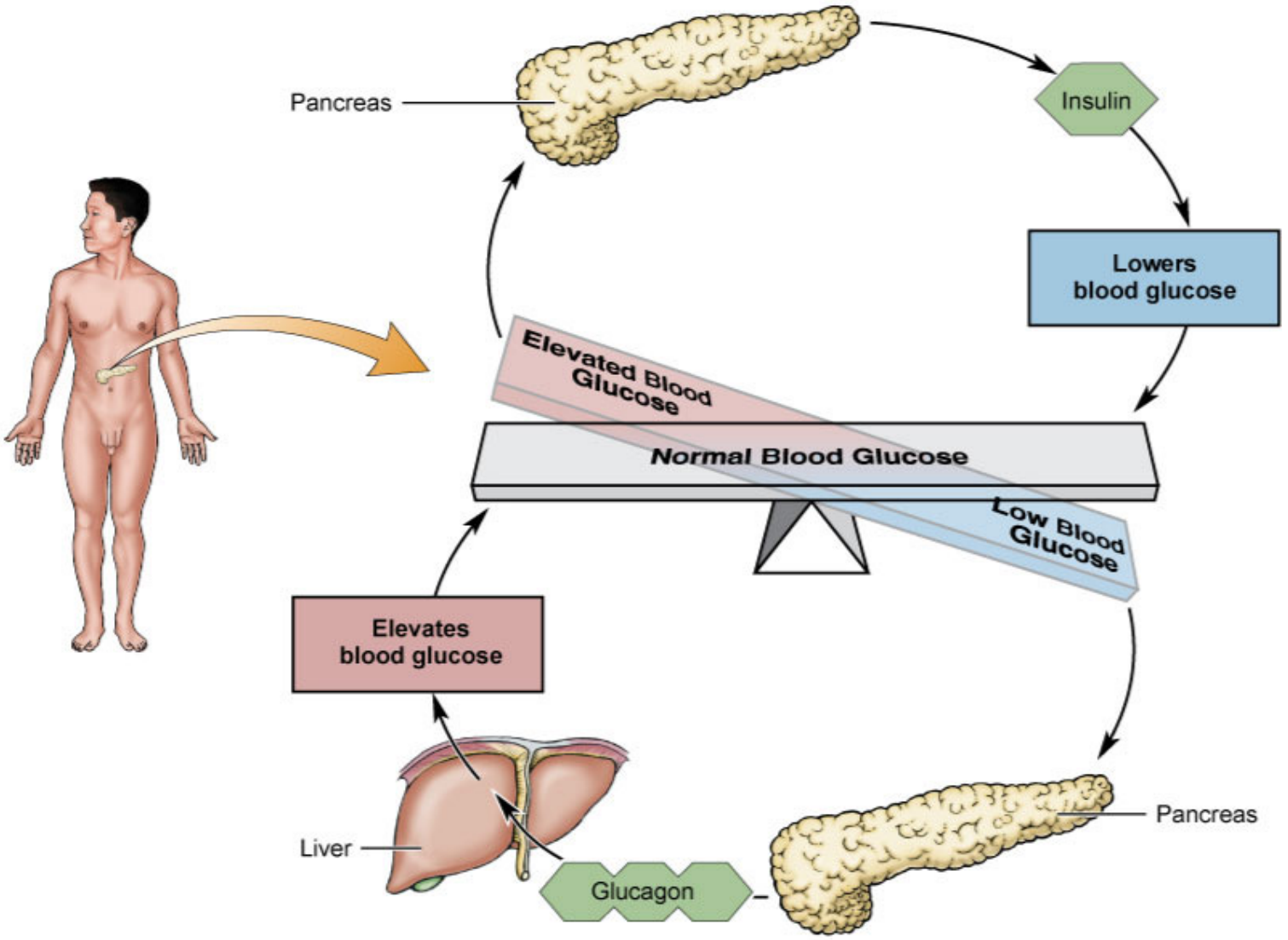
- **Epinephrine (adrenaline) and norepinephrine (noradrenaline)** Enhance and prolong sympathetic arousal of the nervous system.

Pancreatic Islets

Pancreatic islets (AKA: islets of Langerhans) Islands of endocrine cells located within the pancreas. Secrete insulin and glucagon.

- **Insulin** Pancreatic hormone that <u>decreases</u> blood glucose levels.

- **Glucagon** Pancreatic hormone that increases blood glucose levels.


Pancreas
Insulin
Lowers blood glucose
Elevated Blood Glucose
Normal Blood Glucose
Low Blood Glucose
Elevates blood glucose
Liver
Glucagon
Pancreas

Ovaries

Ovaries Glands located in the superior part of the pelvic cavity, lateral to the uterus. House developing oocytes within the follicles and produce the hormones progesterone and estrogen.

Ovaries

- **Estrogens** Hormones responsible for secondary sex characteristics. Promote the development and release of the ovum from the ovary at ovulation. Stimulate the uterine lining to proliferate and thicken in anticipation of a fertilized ovum.

- **Progesterone** Hormone that maintains the uterine lining for implantation and pregnancy.

Testes

Testes (AKA: testicles) Glands located in the scrotum that are the site of sperm and testosterone production.

- **Testosterone** Hormone that promotes secondary sex characteristics, libido, and sperm production.

Organs that possess endocrine cells

Placenta

Gastric and Intestinal mucosa

Heart

Fat cells

Placenta

Placenta Organ formed against the uterine lining that allows the developing embryo and the pregnant client to exchange nutrients and wastes. Also secretes hormones required to maintain the pregnancy.

- **Human chorionic gonadotropin (hCG)** Placental hormone that stimulates estrogen and progesterone. Can be detected in the urine during pregnancy.

- **Relaxin** Placental hormone facilitating implantation of fertilized ovum and softening of connective tissue in pregnant clients.

Gastric and intestinal mucosa

Gastrin Hormone secreted by the stomach that initiates the production and secretion of gastric juices and stimulates bile and pancreatic enzyme emissions into the small intestines.

Gastric and intestinal mucosa

Cholecystokinin Hormone produced by the intestinal mucosa that stimulates the _____gallbladder_____ to release bile and the _____pancreas___ to secrete enzymes.

Gastric and intestinal mucosa

Secretin Hormone produced by the intestinal mucosa that stimulates the pancreas to secrete an alkaline liquid that neutralizes the acid chyme and facilitates the action of intestinal enzymes.

Heart

Atrial natriuretic hormone (ANH) Hormone secreted by the heart that decreases blood volume and blood pressure.

Fat Cells

Leptin Hormone that plays a key role in energy (appetite and metabolism).

Resistin Hormone that increases blood glucose levels by reducing insulin sensitivity.

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