

Endocrine System

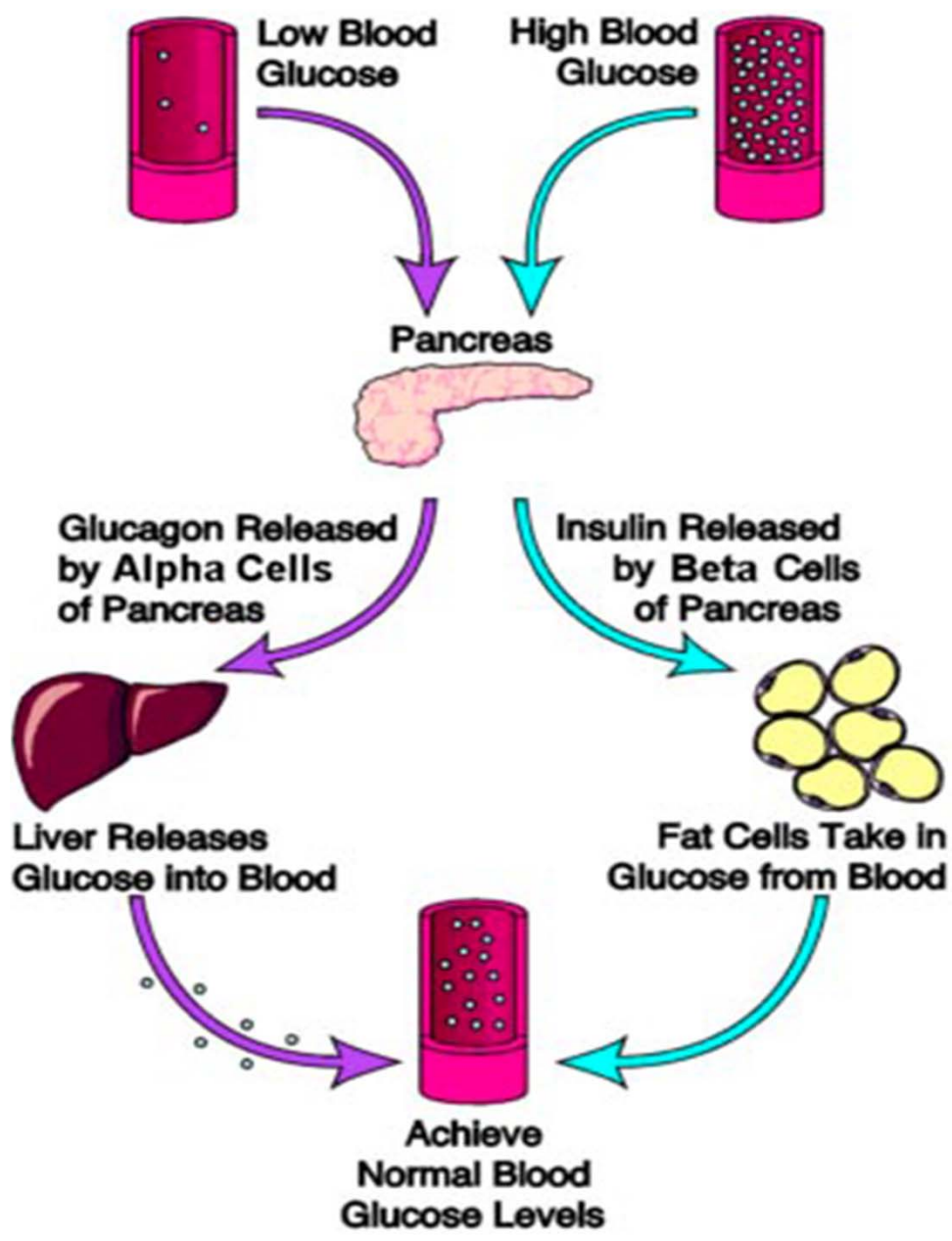
Endocrine System

- **Function of the Endocrine System** – to secrete hormones – chemical messengers that coordinate and direct target cells and organs.
- **ENDOCRINE GLANDS**
 - Secrete hormones directly into bloodstream
 - Ductless
- **EXOCRINE GLANDS** – secrete substances through a duct (sweat, salivary, lacrimal and pancreas)

Hormonal Control

- **NEGATIVE FEEDBACK**

- Drop in hormone level triggers a chain reaction to increase secretion, for example
 1. Blood level of hormone falls
 2. Brain gets message and sends out hormone to stimulate gland
 3. Gland stimulates more hormone
 4. When blood levels of hormone increase, the brain hormones stop

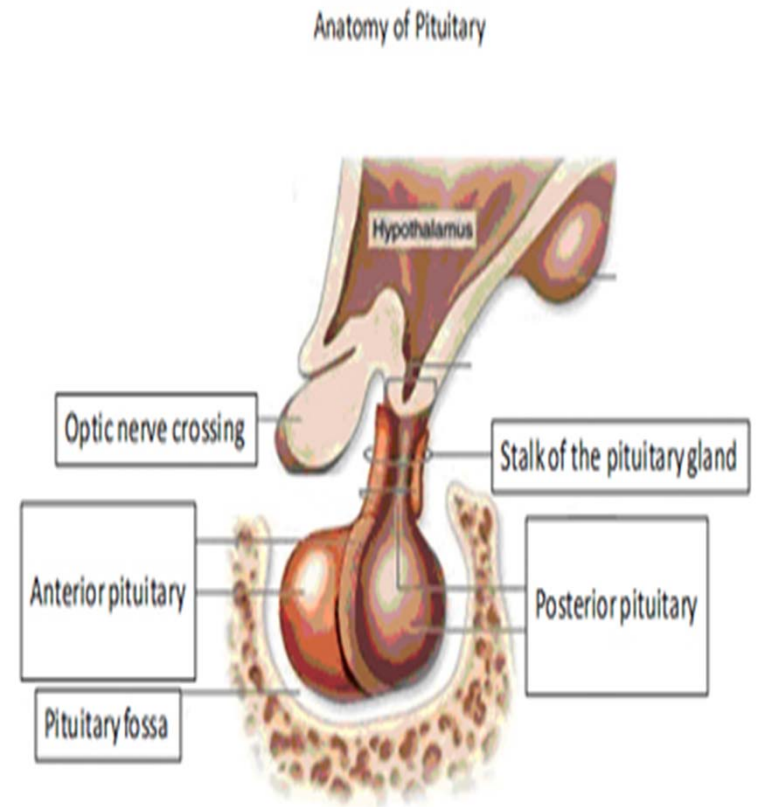


Hormonal Control

- Nervous Control – in some cases, sympathetic nervous system causes direct release of hormone from gland (for example, when stress causes the adrenal medulla to secrete adrenalin)

PITUITARY GLAND

- Tiny structure the size of a grape
- Located at the base of the brain
- Connected to the hypothalamus
- Divided into anterior and posterior lobes
- The “Master Gland”



Anterior Pituitary Lobe

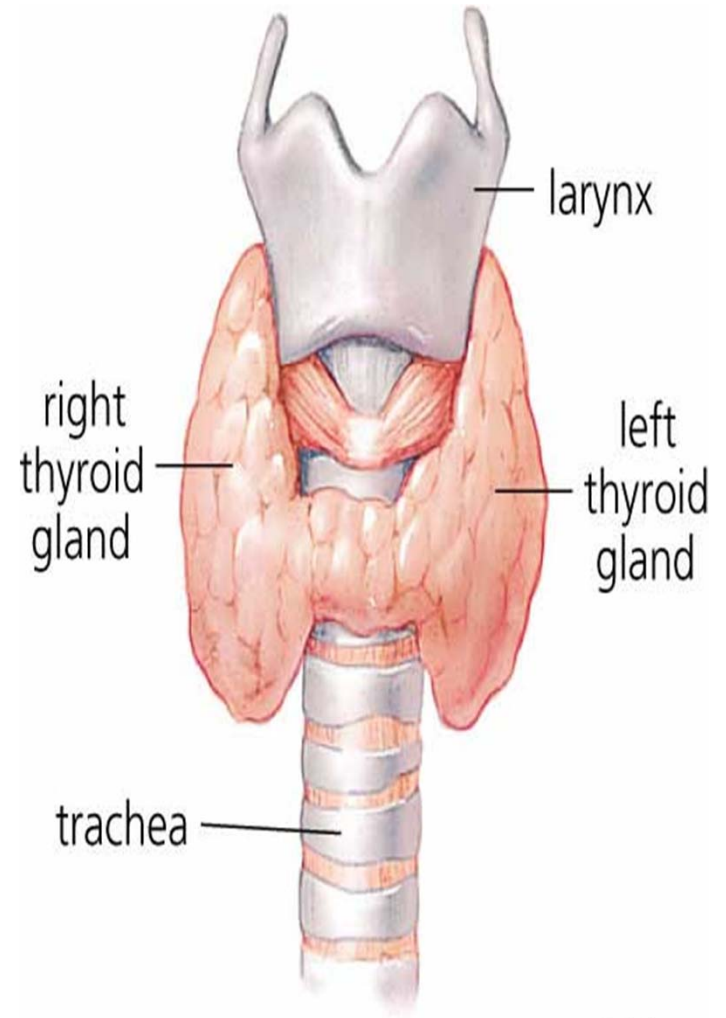
- **GROWTH HORMONE - GH**
(SOMATOTROPIN) responsible for growth and development
- **PROLACTIN** – develops breast tissue, stimulates production of milk after childbirth
- **THYROID-STIMULATING HORMONE – TSH** -
stimulates thyroxine
- **ADRENOCORTICOTROPIC HORMONE –**
ACTH – stimulates adrenal cortex
- **FOLLICLE-STIMULATING HORMONE – FSH** - stimulates growth of graafian follicle and production of estrogen in females, sperm in males
- **LUTEINIZING HORMONE – LH** – stimulates ovulation and formation of corpus luteum, which produces progesterone in females

Posterior Pituitary Lobe

- **VASOPRESSIN** – converts to ADH (antidiuretic hormone) in the bloodstream, acts on kidney to concentrate urine and preserve H₂O in the body
- **OXYTOCIN** – released during childbirth causing contractions of the uterus

THYROID GLAND

- Butterfly-shaped mass of tissue
- On either side of larynx, over trachea
- H-shaped
- Main hormone – **THYROXINE** – is controlled by the secretion of TSH
 - **Thyroxine** controls the rate of metabolism
- **CALCITONIN** – controls calcium ion concentration in the body, prevents hypercalcemia



PARATHYROID GLANDS

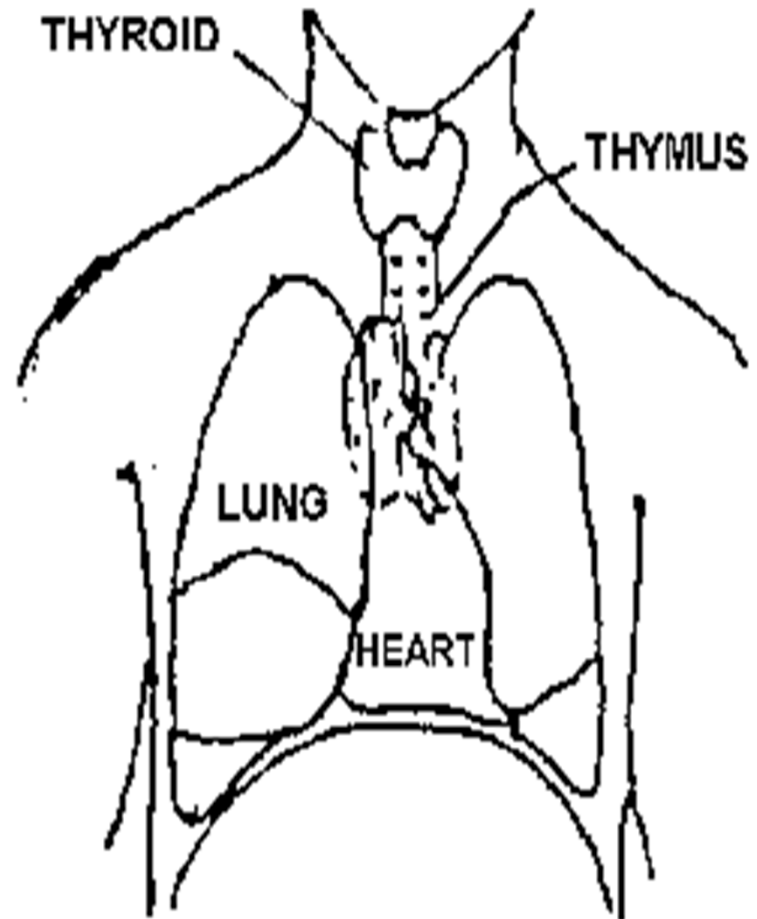
- Four glands, each the size of a grain of rice
- Attached to posterior thyroid
- Produce **PARATHORMONE** which helps control blood calcium level, prevents hypocalcemia



Thyroid/Parathyroid Glands

THYMUS

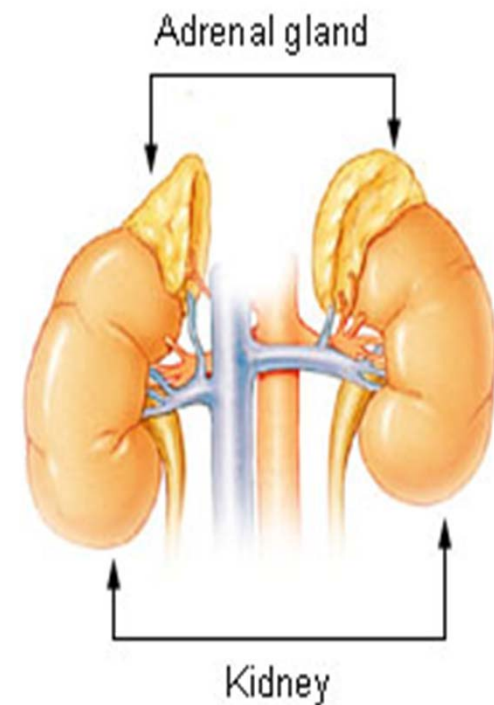
- Endocrine gland and lymphatic organ
- Located behind the sternum, above and in front of the heart
- Begins to disappear at puberty
- Help body fight diseases



ADRENAL GLANDS

- Located on top of each kidney
- Adrenal cortex secretes hormones known as corticoids – they are anti-inflammatory
- They are: mineralcorticoids, glucocorticoids, and sex hormones
- ANDROGENS are male sex hormones
- Adrenal medulla secretes epinephrine (adrenalin) and norepinephrine
- ADRENALIN is a powerful cardiac stimulant – “fight or flight” hormones that prepare the body for an emergency situation

Adrenal Gland

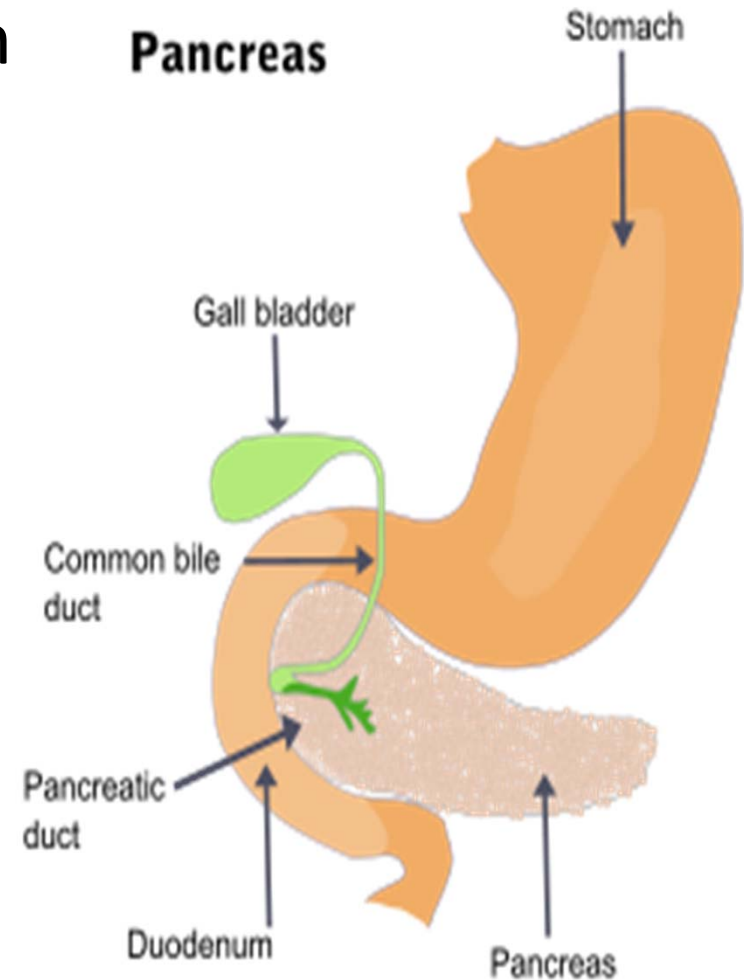


GONADS

- Ovary in female
- Testes in male
- Estrogen – development of female reproductive organs, secondary sex characteristics
- Progesterone – plays a part in the menstrual cycle
- Testosterone – male reproductive organs and secondary sex characteristics

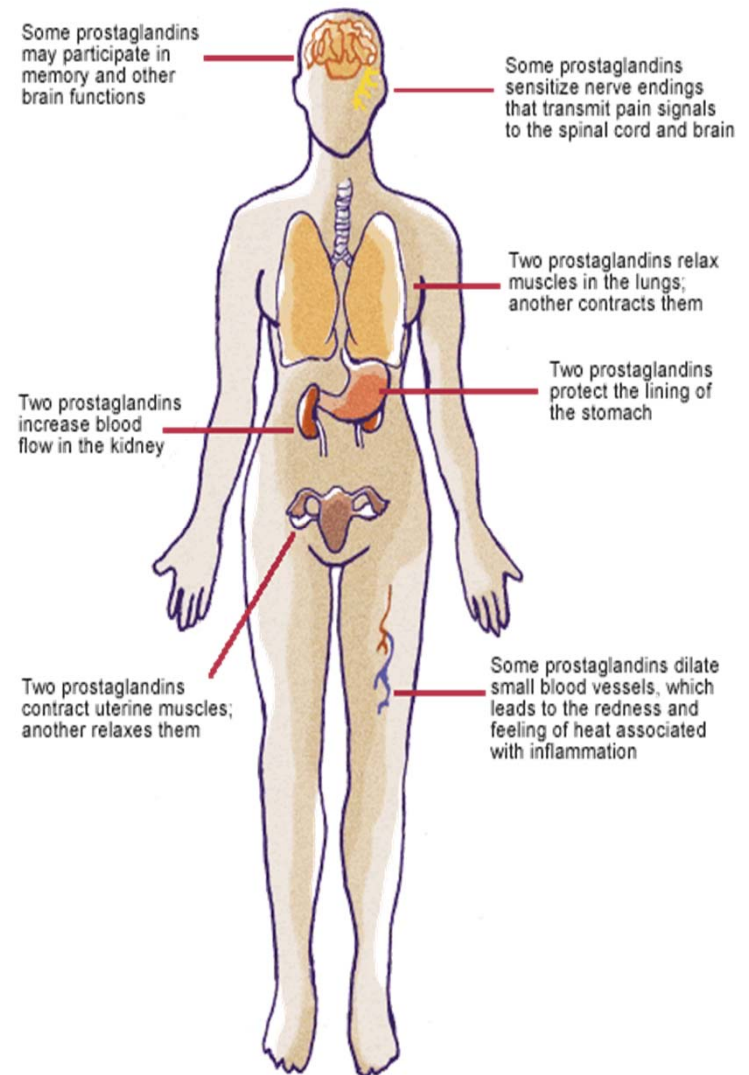
PANCREAS

- Located behind the stomach
- Involved in production of INSULIN by ISLETSOFLANGERHANS
- Insulin – promotes utilization of glucose by the cells, fatty acid and amino acid transport, and facilitates protein synthesis



PROSTAGLANDINS

- Like hormones but not like hormones.
- Unlike hormones, prostaglandins do not circulate but are localized.
- tissue hormones.
- Involved in:
 - constriction of blood vessels (clotting)
 - muscle contractions
 - can be used to induce labor



Endocrine Disorders - Pituitary

- GIGANTISM
 - Hyperfunction of pituitary – too much growth hormone
 - In preadolescent – overgrowth of long bones leads to excessive tallness
- ACROMEGALY
 - Hyperfunction of pituitary – too much growth hormone in adulthood
 - Overdevelopment of bones in face, hands and feet
 - Attacks cartilage – so the chin protrudes, lips nose and extremities enlarge
 - Rx – drugs to inhibit growth hormone, radiation

Endocrine Disorders - Pituitary

- DWARFISM
 - Hypofunction of pituitary in childhood
 - Small size, but body proportions and intellect are normal
 - Sexual immaturity
 - Rx – early diagnosis, injection of growth hormone

Endocrine Disorders - Thyroid

- HYPERTHYROIDISM

- Overactive thyroid gland
- Too much thyroxine secreted leading to enlargement of gland
- People with this disease consume large quantities of food but lose body fat and weight
- Most pronounced symptoms are enlargement of gland (GOITER) and bulging of eyeballs (EXOPHTHALMOS)
- Rx – total or partial removal of thyroid gland, drugs to reduce thyroxine, radiation

Endocrine Disorders - Thyroid

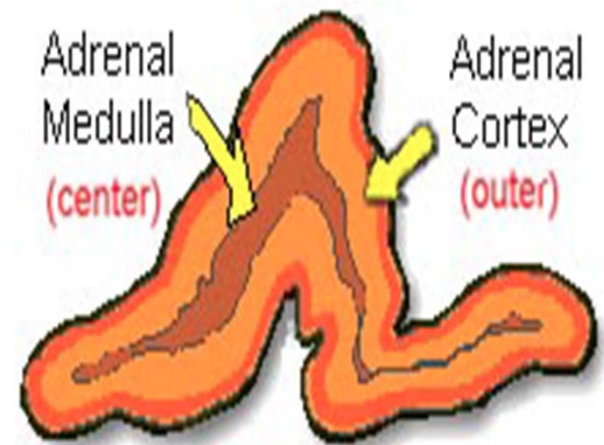
- HYPOTHYROIDISM
 - Not enough thyroxin secreted
 - May be due to lack of iodine (simple goiter)
 - Major cause of other types is inflammation of thyroid which destroys the ability of the gland to make thyroxine
 - Symps – dry and itchy skin, dry and brittle hair, constipation, muscle cramps at night

Endocrine Disorders - Parathyroid

- TETANY
 - In hypoparathyroidism, decreased calcium levels affect function of nerves
 - Convulsive twitching develops, person dies of spasms in the respiratory muscles
 - Rx – Vitamin D, calcium and parathormone

Endocrine Disorders – Adrenal Gland

- CUSHING'S SYNDROME
 - Hypersecretion of adrenal cortex
 - May be caused by adrenal cortical tumor or prolonged use of prednisone
 - Symps – high blood pressure, muscle weakness, obesity, poor healing, tendency to bruise, hirsutism (excessive hair growth), menstrual disorders
 - Rounded moon face and buffalo hump
 - Rx – surgical removal of tumor



Endocrine Disorders – Adrenal Gland

- ADDISON'S DISEASE
 - Hypofunction of adrenal cortex
 - Symps – bronzing of skin, hypoglycemia, hypotension, etc.
 - Rx – replace deficient hormones

Endocrine Disorders – Pancreas

- **DIABETES MELLITUS**

- Caused by decreased secretion of insulin
- Can be insulin dependent (juvenile) or noninsulin dependent
- Symps – polyuria, polyphagia, polydipsia, weight loss, blurred vision, and possible diabetic coma
- If not treated, excess glucose in blood (hyperglycemia) and glucose secreted in urine (glycosuria)
- Since glucose not available for cellular oxidation, body starts to burn up protein and fat
- If too much insulin is given, blood sugar may go too low (hypoglycemia -> insulin shock)

Endocrine Disorders – Pancreas

- If blood sugar gets too high – hyperglycemia -> diabetic coma
- Type II (non-insulin dependent) is most common, usually familial, occurs later in life, control with oral hypoglycemic drugs and diet
- Tests for Diabetes – blood sample measured in glucometer – done by patient in home – normal blood sugar 80-100 mg

Steroid Abuse in Sports

- Anabolic steroids (androgens) can help build bigger, stronger muscles
- Risks far outweigh temporary improvements
 - Male risks
 - Liver changes, atrophy of testicles, breast enlargement, and cardiovascular disease
 - Female risks
 - Amenorrhea, abnormal placement of body hair, baldness, voice changes