Syrian Private University

Medical Faculty

Medical Terminology

Endocrine System

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Lecture 11

The functions of the endocrine system cover a broad range of action. Endocrine activity affects the entire body: growth and development, metabolism, sexual activity, and even mental ability and emotions.

The endocrine system is a means of communication between one body part and another.

Anatomy and Physiology

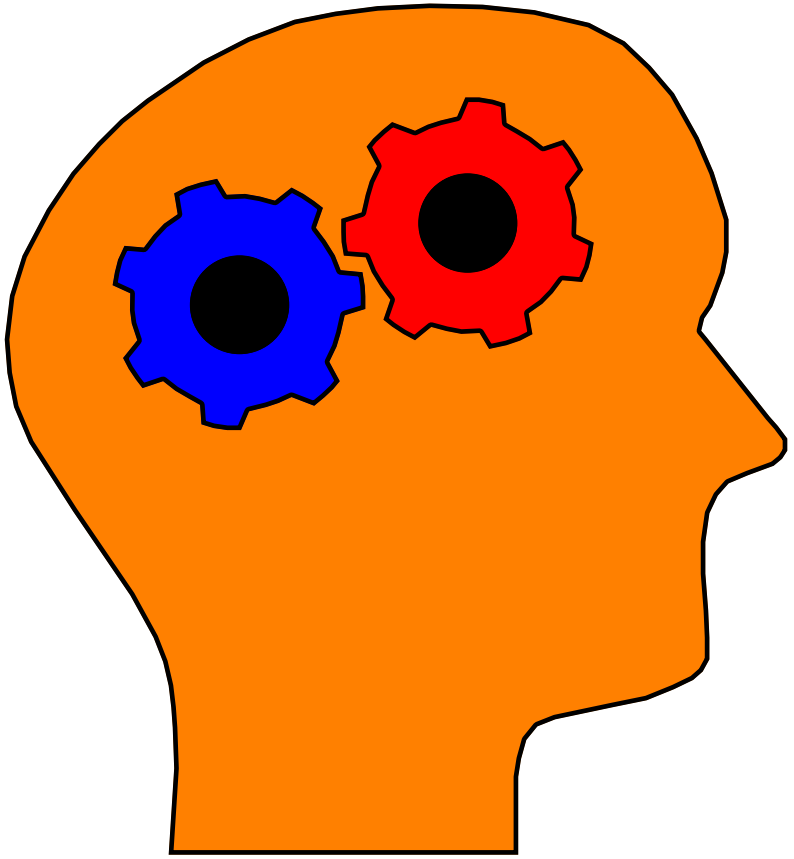
- Homeostasis a state of equilibrium
- Hormones (chemical messengers)
- Target Tissues or Target Organs
- Hypersecretion
- Hyposecretion

Hormones

- chemical substances produced by specialized cells (glands)
- released slowly, minute amounts, circulate in blood
- some hormones effect the entire body, some effect target organs
- most hormones are inactivated or excreted by the liver and kidneys

Pituitary or Master Gland

- posterior lobe
  - **neurohypophysis**
- anterior lobe
  - **adenohypophysis**



Anterior Lobe

- growth hormone GH somatotropin
- thyroid-stimulating hormone TSH
- lactogenic hormone Prolactin
- adrenocorticotropic hormone ACTH
- follicle-stimulating hormone FSH
- luteinizing hormone LH

Posterior Lobe

- antidiuretic hormone ADH
  - **decrease ADH causes increase urine output**
  - **increase ADH causes decrease urine output**
- oxytocin
  - **stimulates contraction of pregnant uterus, labor, and childbirth**
  - **stimulates milk secretion**

Thyroid Secretions

- thyroxine, T4
- triiodothytonine, T3
- regulates rate of cellular metabolism
- influences physical and mental development
- euthyroidism

- stimulates cellular metabolism by increasing the rate of oxygen use with subsequent energy and heat production
- Faster cellular metabolism increases the cell's demand for oxygen, so more O2 must be circulated.
- Increase O2 demand leads to increase CO2
- Increase demand on circulatory system leads to increase pulse rate and heart activity.

Parathyroid Glands

- four glands
- parathyroid hormone PTH
- regulates the level of circulating calcium and phosphate
- target organs: bones, intestines, kidneys

- Calcium is essential to blood-clotting mechanism
- Calcium increases the tone of heart muscle
- Calcium plays a significant role in muscle contraction
- When blood calcium levels drop, PTH is secreted to increase calcium levels

Adrenal Glands

- suprarenal glands
- adren/o or adrenal/o
- adrenal cortex
- adrenal medulla

Adrenal Cortex

- stimulated by ACTH from anterior pituitary
- mineralocorticoids - regulates water & salts
  - **aldosterone**
- glucocorticoids - regulates carbohydrate, lipid, and protein metabolism
  - **cortisol**
- sex hormones
  - **androgens - male**
  - **estrogen - female**

Adrenal Medulla

- epinephrine or adrenaline
  - **secreted in stress situations**
  - **stimulates sympathetic nervous system**
  - **increases HR, blood glucose, stimulates BP**
  - **vasoconstriction to shunt blood**
- norepinephrine or noradrenaline
  - **powerful vasopressor to increase BP**

Pancreas

- Endocrine and exocrine functions
- islets of Langerhans
- glucagon (Alpha cells)
  - **stimulates liver to convert glycogen to glucose**
- insulin (Beta cells)
  - **transports glucose into cells for metabolism and energy source**

Pineal Gland

- melatonin-may control biological cycles
  - **inhibit ovarian activity**
- serotonin-neurotransmitter, vasoconstrictor
  - **stimulates smooth muscles and inhibits gastric secretion**

Pituitary Pathology

- Growth Hormone GH
  - dwarfism - hyposecretion
  - giantism, acromegaly - hypersecretion
- Thyroid Stimulating Hormone TSH
  - cretinism (infants) - hyposecretion
  - myxedema (adults) - hyposecretion
  - Toxic goiter (adults - hypersecretion
  - exophthalmos

Pathology of Thyroid Gland

- anterior pituitary (TSH) controls circulating thyroxine level
- thyroiditis
- hypothroidism
- Myxedema
- cretinism

- thyrotoxicosis, thyroid storm
- hyperthyroidism
- goiter or thyromegaly
- exophthalmos

Procedures of thyroid gland

- thyroidectomy
- lobectomy

Pathology of Parathyroid

- hypoparathyroidism
- hypocalcemia
  - lowers electrical threshold
  - causes neurons to depolarize easier
- tetany
  - sustained muscular contraction
  - laryngeal muscle spasms leading to respiratory tract obstruction and death
  - sharp flexion of some skeletal muscles

Parathyroid Disorders
Hyperparathyroidism

- **hyperparathyroidism**
  - often due to benign tumor
  - demineralization of bones (osteitis fibrosa cystica)
  - osteoporosis

Pathology

- pheochromocytoma
  - adrenal medulla tumor
  - increase BP due to release of catacholamines
- Addison’s disease - decrease cortisol
  - hyponatremia, dehydration
  - hyperkalemia
- Cushing’s disease - increase cortisol
  - moon face, hirsutism

Diabetes Mellitus

- inadequate amount of insulin secreted
- in absence of insulin; glucose cannot enter the cells for normal metabolism
- results in hyperglycemia
- blood sugar may increase from 300 to 1200 mg/dl of blood and even higher
- cells deprived of principal nutrient, glucose
- glycosuria, diuresis, polydipsia, polyphagia

- Insulin-dependent diabetes mellitus IDDM
  - Type I
  - Juvenile diabetes
  - destruction of Beta cells
  - more serious form
  - requires daily insulin injections

- Non-insulin-dependent diabetes mellitus
  - NIDDM
  - type II
  - maturity onset diabetes
  - less severe, often diet controlled
  - oral hypoglycemic agents
- A prolonged, excessively high carbohydrate diet over time stimulates the beta cells to secrete insulin. Result: beta cells “burn out”.

- diabetic ketoacidosis (acidosis)
  - due to insulin deficiency, stress
  - metabolic shift results in excessive accumulation of ketones
- gestational diabetes mellitus
  - deficiency of insulin during pregnancy

- Diabetes Insipidus
  - Insufficient ADH
  - Inability of kidneys to respond to ADH
- extreme polydipsia and polyuria

Oncology

- Pancreatic Cancer
- Pituitary Tumors
- Thyroid Cancer