Lecture Outline

Chapter 10

The Endocrine System:
Endocrine Glands- are ________________

- Secrete hormones-__________________________

- Hormones-_________________________________

- Hormones affect…..
  - ______________________
  - ______________________
  - ______________________
  - ______________________

- Categories of hormones
  - ________________ – most hormones
  - ________________ hormones
**HYPOTHALAMUS**
- Releasing and inhibiting hormones: regulate the anterior pituitary
- Antidiuretic (ADH): water reabsorption by kidneys
- Oxytocin: stimulates uterine contraction and milk letdown

**PITUITARY GLAND**
- **Posterior Pituitary**
  - Release ADH and oxytocin produced by the hypothalamus
- **Anterior Pituitary**
  - Thyroid stimulating (TSH): stimulates thyroid
  - Adrenocorticotropic (ACTH): stimulates adrenal cortex
  - Gonadotropic (FSH, LH): egg and sperm production; sex hormone production
  - Prolactin (PL): milk production
  - Growth (GH): bone growth, protein synthesis, and cell division

**THYROID GLAND**
- Thyroxine ($T_4$) and triiodothyronine ($T_3$): increase metabolic rate; regulates growth and development
- Calcitonin: lowers blood calcium level

**ADRENAL GLAND**
- Adrenal cortex
  - Glucocorticoids (cortisol): raises blood glucose level; stimulates breakdown of protein
  - Mineralocorticoids (aldosterone): reabsorption of sodium and excretion of potassium
- Sex hormones: reproductive organs and bring about sex characteristics
- Adrenal medulla
  - Epinephrine and norepinephrine: active in emergency situations; raise blood glucose level

**PARATHYROID GLANDS**
- Parathyroid hormone (PTH): raises blood calcium level

**THYMUS GLAND**
- Thymosins: production and maturation of T lymphocytes

**PANCREAS**
- Insulin: lowers blood glucose level; formation of glycogen
- Glucagon: increases blood glucose level; breakdown of glycogen

**GONADS**
- **Testes**
  - Androgens (testosterone): male sex characteristics
- **Ovaries**
  - Estrogens and progesterone: female sex characteristics
How Hormones Function

2nd-messenger system

- 1st-__________binds to a___________on the plasma membrane
- 1st messenger-activates a______________
- __________sets in motion an__________________________

1. Hormone binds to a receptor in the plasma membrane.
2. Binding leads to activation of an enzyme that changes ATP to cAMP.
3. cAMP activates an enzyme cascade.
4. Many molecules of glycogen are broken down to glucose, which enters the bloodstream.
Intracellular mechanism of hormone function

- lipids diffuse across the plasma membrane
- Inside the cell, activating particular genes to produce cellular enzymes that cause cellular change.
Functions of hormones

1. affect concentrations

2. involved in

Release of hormones controlled by one or more of the following:

•

•

•

•
Hypothalamus - controls ______________

Neurosecretory cells produce

- Antidiuretic hormone (ADH)
  - Released when __________________________________________
  - Causes _____________________________________________
  - Raises _____________________________________________
  - *Diabetes insipidus* results ____________________________
- Oxytocin
  - Causes ______________________________________________
  - Causes ______________________________________________
Pituitary Gland

- Anterior pituitary: Controlled

- Hormones that affect:
  - Thyroid-stimulating hormone (TSH)
  - Adrenocorticotropic hormone (ACTH)
  - Gonadotropin hormones

- Effects of other hormones:
  - Prolactin (PRL)
  - Growth hormone (GH)

- Posterior pituitary:

2. These hormones are secreted into a portal system.

3. Each type of hypothalamic hormone either stimulates or inhibits production and secretion of an anterior pituitary hormone.

4. The anterior pituitary secretes its hormones into the bloodstream, which delivers them to specific cells, tissues, and glands.

- Kidney tubules and blood vessels: antidiuretic hormone (ADH)
- Smooth muscle in uterus: oxytocin
- Mammary glands: oxytocin
- Anterior pituitary:
  - Thyroid: thyroid-stimulating hormone (TSH)
  - Adrenal cortex: adrenocorticotropic hormone (ACTH)
- Posterior pituitary:
  - Mammary glands: prolactin (PRL)
  - Bones, tissues: growth hormone (GH)
  - Ovaries, testes: gonadotropin hormones (FSH, LH)
Effects of growth hormone

- Affects __________________
- Pituitary dwarfism results __________________
- Too much GH is produced during childhood, __________ __________________
Thyroid-

- Requires __________ to produce thyroid hormones
- Effects of thyroid hormone
  - ________________
  - ________________

Thyroid and Parathyroid Glands

- Thyroid gland
- Parathyroid gland
Simple Goiter

- Caused by

- Thyroid enlarges in response
Thyroid and Parathyroid

- Congenital hypothyroidism
  - Thyroid _________________
  - ______________________ of thyroid hormone
  - Individuals are __________

- Myxedema
  - _________________________
  - Characterized by
    - _______________________
    - _______________________
    - _______________________
    - _______________________
    - Slower __________________
    - Lowered _________________
    - Thick and puffy ___________
Hyperthyroidism (Grave’s Disease)

- Oversecretion

- __________________________ forms
  - Edema _________________________
  - Swelling _______________________

Symptoms include
  - __________________________
  - __________________________
  - __________________________
Calcitonin-

- Secreted when ____________________
  _______________________________________________________________________
- Brings about the deposit __________
  _______________________________________________________________________

Flowchart:
- **Calcitonin**
  - If calcium level rises above set point
  - Thyroid gland releases calcitonin
  - Homeostasis: Blood calcium level
  - High
  - Low
  - Blood calcium level falls
  - Parathyroid glands release parathyroid hormone (PTH)
  - If calcium level falls below set point
Parathyroid glands -

- Posterior surface of the ________________

- Produces ________________

- Causes ________________

- Causes ________________
  - Promotes the release of ______
  - Promotes the reabsorption of ______
  - Activates vitamin D in the kidneys, which stimulates ______

- Causes ________________
Adrenal Glands

Adrenal Cortex

- Outer portion – ______ layers, each produces ______________________

- Hormones
  - Provide______________________________
  - _________________________________
  - _________________________________
  - _________________________________
  - Male and female ____________________
Adrenal Medulla -

- Secretes ____________________
- Causes _____________________
- Provides a ___________________
1. Glucocorticoids (cortisol)

- Raises the blood level in at least 2 ways:
  - Counteracts the __________________
  - Can also make a person susceptible __________________

Hypothalamus
Releasing factor

Anterior pituitary
ACTH (through blood)

Adrenal cortex
Cortisol
2. Mineralcorticoids (aldosterone)

- Targets the kidney
- Promotes ________
- Promotes ________
- Promotes ________
Malfunction of the Adrenal Cortex

- **Addison Disease**
  - Hyposecretion of ________________________________
  - Excessive ACTH causes __________________________
  - Because glucose cannot be replenished without cortisol, ________________________________
  - Lack of aldosterone results in the development ____
Cushing Syndrome-

- Hypersecretion
- Tendency towards
- Excess aldosterone leads

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- long organ between kidneys

- Composed of two types of tissue
  - Exocrine
  - Endocrine tissue
Hormones of the pancreas

- **Insulin** - produced by **islets of Langerhans**
  - Secreted when **blood glucose levels are high**
  - Stimulates **glycogen breakdown** and **production of fatty acids**

- **Glucagon** - islets of Langerhans
  - Secreted when **blood glucose levels are low**
  - Stimulates **glycogen breakdown** and **production of fatty acids**
Diabetes Mellitus-

- Insulin-sensitive body cells are ____________

- Blood glucose level ____________ (hyperglycemia)

- Symptoms:
  - ______________
  - ______________
  - ______________
  - ______________
  - ______________
Two forms of diabetes mellitus

- **Type I**
  - Pancreas
  - Immune cells destroy the pancreatic islets

- **Type II**
  - Normal or elevated
  - Receptors on the cells do not

- **Long term complications of both**
  - 
  - 
  - 
  - 
  - 
Endocrine glands of the gonads

- **Testes produce**
  - Development
  - Female sex characteristics

- **Facial hair, larynx & vocal cords enlarge causing the voice to change**

- **Ovaries produce**
  - Development
  - Female sex characteristics

- **Secretion is controlled**
Pineal gland - located in the brain

- Produces ______________________
- Melatonin _____________________
The Importance of Chemical Signals

- Cells and organs communicate

- Chemical signals

  - Called

  - Humans produce
The endocrine system helps regulate the following:

- __________________________
- Fuel _______________________
- Blood ______________________
- __________________________
- Response ____________________