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Theme: Coordination in animals

S3 New Curriculum Biology-Chapter 4– Chemical coordination in humans

Coordination

Coordination in biology refers to how different parts of an organism work together to maintain balance, function, and survival. This involves communication between cells, tissues, and organs to respond to internal and external changes.

There are two main types of biological coordination:

1. **Hormonal/chemical Coordination** – Used by both plants and animals, hormones regulate body functions over longer periods. In animals, glands release hormones to control growth, metabolism, and reproduction. In plants, hormones like auxins and gibberellins help in growth and response to environmental changes.
2. **Nervous Coordination** – Found mostly in animals, this system relies on neurons and the brain to transmit signals quickly. It allows organisms to react to stimuli, move, and think.

Hormonal/chemical Coordination

Hormones are organic compounds produced in one part of the body, from which is transported -usually in the blood stream – to another part when it evokes a response.

In the human and other vertebrate hormones are secreted into the blood stream by endocrine glands.

Difference between hormones and enzymes

Hormones and enzymes are both vital biological substances, but they have distinct roles and characteristics:

1. **Function**
 - **Hormones:** Chemical messengers that regulate body processes like growth, metabolism, and reproduction. They travel through the bloodstream to target organs.
 - **Enzymes:** Biological catalysts that speed up chemical reactions in cells without being consumed in the process.

2. Production & Location

- **Hormones:** Secreted by endocrine glands (e.g., thyroid, adrenal, pancreas).
- **Enzymes:** Produced by various tissues, including glands, but mainly function within cells or digestive organs.

3. Action Mechanism

- **Hormones:** Act over longer periods, influencing bodily functions slowly.
- **Enzymes:** Work rapidly, breaking down or synthesizing molecules instantly.

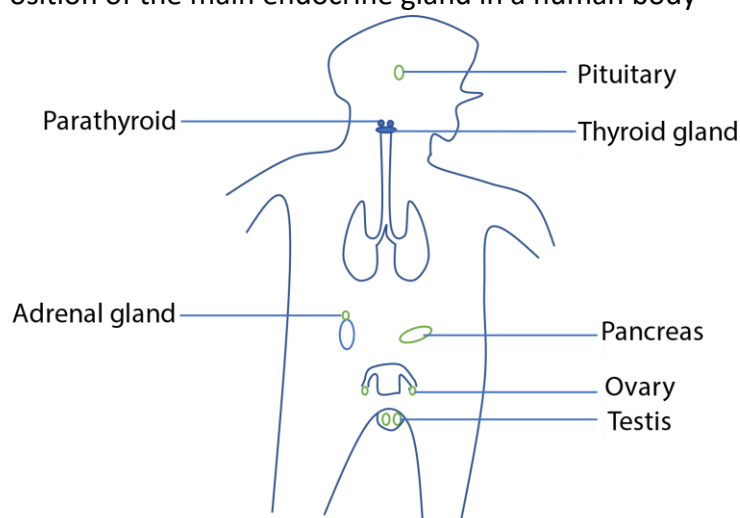
4. Composition

- **Hormones:** Can be proteins, steroids, or amino acid derivatives.
- **Enzymes:** Mostly proteins, often containing a specialized active site.

5. Examples

- **Hormones:** Insulin (regulates blood sugar), adrenaline (triggers fight-or-flight response).
- **Enzymes:** Amylase (digests carbohydrates), DNA polymerase (helps DNA replication).

Position of the main endocrine gland in a human body



The principle endocrine glands of mammal, hormones and functions of the hormones

	Gland	Hormone	main function
a.	Thyroid	Thyroxine	Raise basal metabolic rate
		Calcitonin	Opposes action of parathormone
b.	Parathyroid	Parathormone	Controls concentration of calcium and phosphate ions in blood
c.	Pancreas	insulin	lows blood sugar concentration
d.	Adrenal medulla	adrenaline	prepare body for emergency; metabolic rate increases,
e.	Adrenal cortex	Aldosterone	Controls concentration of K^+ and Na^+ in

			blood
		Cortisol	Prevent excessive immune response
		androgens	Promotes development of testes and secondary sexual characteristics
F	Pineal body	melatonin	causes concentration of melanin in frog's skin; promote sexual development in mammal
g.	Testes	Androgens	Promotes development of testes and secondary sexual characteristics
h.	Ovaries	Estrogens	promotes development of ovaries secondary sexual characteristic of female control menstrual cycle and pregnancy.
I	Pituitary (anterior lobe)	Thyroid stimulating hormone	Causes the thyroid gland to secrete thyroxine
		Adreno - corticotrophin (ACTH)	Cause adrenal cortex to secrete adrenal cortical hormones
		Growth hormones	Stimulate growth
		prolactin	Causes mammary gland to secrete milk
		Follicle stimulating hormone	Controls testes and ovary
		Luteinizing hormone	Controls testes and ovaries
	Pituitary (posterior lobe)	Antidiuretic hormone (ADH)	Causes reabsorption of water in kidney
		oxytocin	Causes contraction of uterus at birth

Hormonal disorder

Hormonal disorders occur when the body's endocrine system produces too much or too little of certain hormones, leading to imbalances that affect various bodily functions. These disorders can impact metabolism, growth, mood, reproduction, and overall health.

Common Hormonal Disorders

- (a) **Diabetes** : Caused by insufficient insulin (Type 1) or insulin resistance (Type 2), leading to high blood sugar levels.

Management of diabetes

Managing diabetes effectively helps prevent complications and improves quality of life. Here are key approaches for diabetes management:

(i) Healthy Eating

- Follow a **balanced diet** rich in whole grains, vegetables, lean proteins, and healthy fats.
- Control **carbohydrate intake** to manage blood sugar levels.
- Avoid processed foods and excessive sugars.
- Maintain **portion control** to prevent spikes in glucose.

(ii) Regular Physical Activity

- Exercise helps **lower blood sugar levels** and improve insulin sensitivity.
- Activities like walking, cycling, swimming, and strength training are beneficial.
- Aim for **at least 30 minutes** of moderate exercise most days.

(iii) Medication & Insulin Therapy

- Some individuals require **oral medication** (for Type 2 diabetes) or **insulin injections** (for Type 1 diabetes).
- Medication should be **taken as prescribed** by a doctor.
- Monitoring blood sugar helps **adjust dosage** when needed.

(iv) Blood Sugar Monitoring

- Check **glucose levels regularly** to ensure they stay within target ranges.
- Use a **glucometer or continuous glucose monitor** for tracking.
- Keep records and discuss results with a healthcare provider.

(v) Stress Management

- High stress can **raise blood sugar levels**, so relaxation techniques like yoga, meditation, or breathing exercises help.
- Adequate **sleep** is essential for blood sugar regulation.

(vi) Preventing Complications

- Regular medical check-ups help **monitor heart, kidney, and nerve health**.
- Foot care is important—diabetes can affect circulation and healing.
- Manage **cholesterol and blood pressure** to reduce risks of cardiovascular diseases.

(vii) Lifestyle Adjustments

- Maintain a **healthy weight** through diet and exercise.
- Avoid smoking and **limit alcohol consumption**.

- Educate yourself about diabetes to **make informed choices**.

(b) Thyroid Disorders –

- **Hypothyroidism** (underactive thyroid) slows metabolism, causing fatigue and weight gain.
- **Hyperthyroidism** (overactive thyroid) speeds metabolism, leading to weight loss and rapid heartbeat.

Causes & Treatment

Hormonal disorders can result from genetics, autoimmune diseases, tumors, infections, or stress. Treatment depends on the condition and may involve hormone therapy, medications, lifestyle changes, or surgery.

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Thanks

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