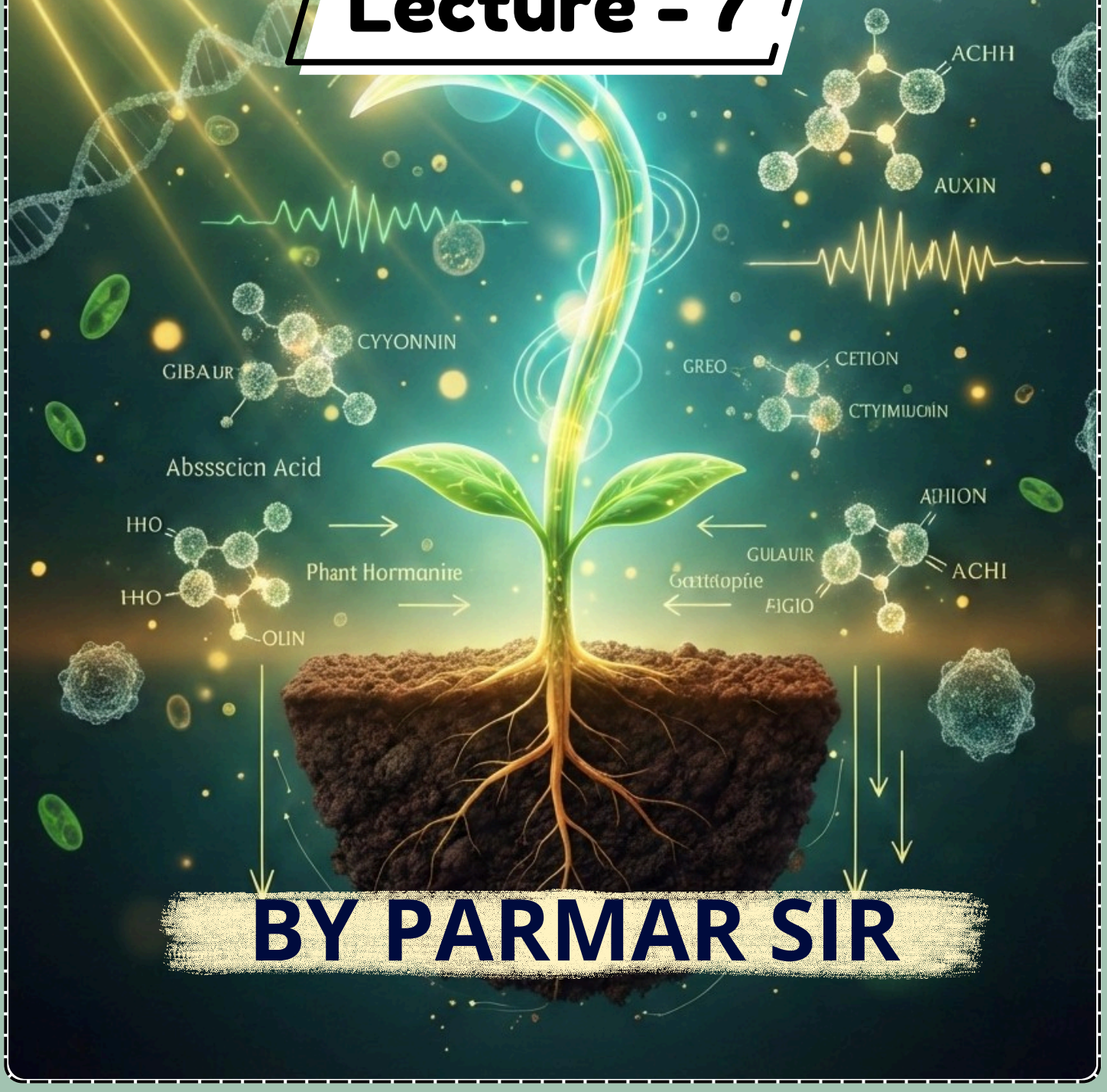
PARMAR SSC

Hormones & Plant Movement

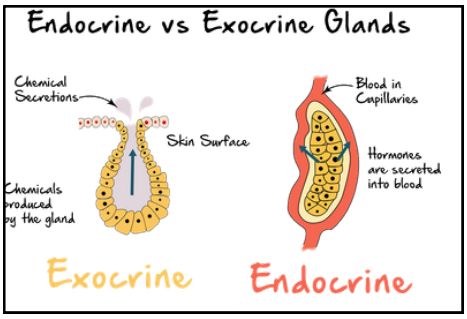
Lecture - 7



BY PARMAR SIR

Glands & Hormones

- Glands are organs in the body that produce and release substances, either hormones or other chemicals, to perform specific functions.



Types of Glands

- Mainly, glands are divided into two categories:
  - Endocrine Glands
  - Exocrine Glands

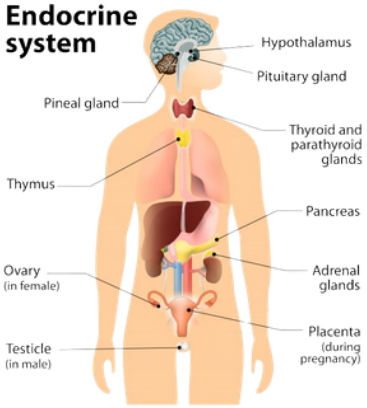
Features	Endocrine Glands	Exocrine Glands
Secretion	They release hormones	They release enzymes
Path/ Route	They release hormones directly into the blood	They secrete their enzymes using a duct
Mechanism	They are ductless glands	They have ducts

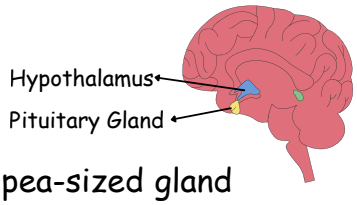
- Hormones discovered by: E. H. Starling.
- 1st hormone discovered: Secretin (1902).

Major Endocrine System

Hypothalamus

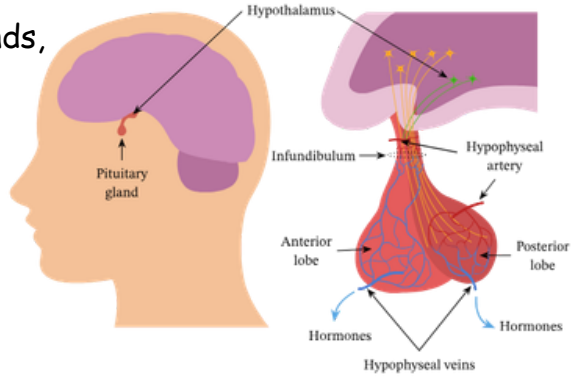
- The hypothalamus is a brain region crucial for regulating many bodily functions, including hormone release, body temperature, hunger, and sleep-wake cycles.
- The hypothalamus is responsible for regulating the secretion of hormones, and the pituitary gland releases these hormones into the bloodstream.





Pituitary Gland

- It is also known as the "**master gland**", this pea-sized gland is located at the base of the brain.
- It produces hormones that regulate other endocrine glands, including growth hormone, prolactin, and oxytocin.
- The pituitary gland is controlled by hypothalamus.



Pituitary Region:

1. Anterior Pituitary
2. Posterior Pituitary

Anterior Pituitary (Adenohypophysis)

- The anterior pituitary produces and secretes a variety of hormones that regulate various physiological processes, including growth, metabolism, reproduction, and stress response.

Hormones released

- **Prolactin**: It is involved in formation of milk.
- **Growth Hormone (Somatotropin):**
  - GHRH (Growth hormone-releasing hormone) releases growth hormones in anterior pituitary.
  - **Deficiency of GH leads to**: **Dwarfism** (shortness in height due to genetic or medical condition).
  - **Excess of GH causes**: **Gigantism** (In Children), Acromegaly (In Adults).

Posterior Pituitary (Neurohypophysis)

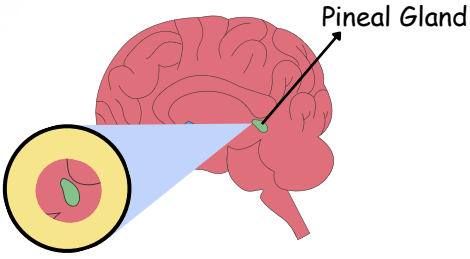
- The posterior pituitary stores and releases hormones produced by the hypothalamus, but does not produce hormones itself.

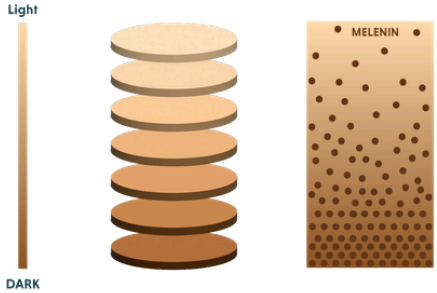
Hormones released

- **ADH (Antidiuretic hormone) Vasopressin:** It regulates the amount of water (reabsorption of H2O, helps control blood pressure).
  - **Effect of ADH deficiency:** If there is a deficiency of ADH, the kidneys cannot absorb water, leading to frequent urination.
  - **Water balance:** Due to this, the water level in the body decreases and a condition of dehydration can arise.
  - **Diabetes Insipidus:** This disease caused by the deficiency of ADH is called diabetes insipidus.
- **Oxytocin (Love hormone):** Involved in secretion of milk and stimulates the uterine muscle to contract during labour.

Pineal Gland

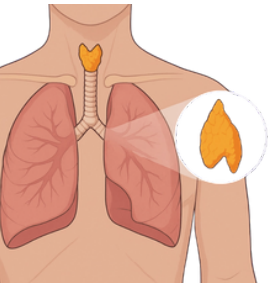
- The pineal gland is a tiny endocrine gland in the middle of our brain that helps regulate body's circadian rhythm (Sleep cycle) by secreting the hormone melatonin.
- Melatonin is a hormone secreted by the pineal gland in response to darkness, often called the "hormone of darkness".
- It helps regulate the sleep-wake cycle by sensing light and dark through signals received from the retina of the eye.





- Pineal gland also produces another hormone called serotonin, known as the "happy hormone." Only about 5–10% of serotonin is produced in the brain (pineal gland). Serotonin is not formed directly; the amino acid tryptophan enters the pineal gland and is converted into serotonin. During the night, this serotonin is further converted into melatonin.

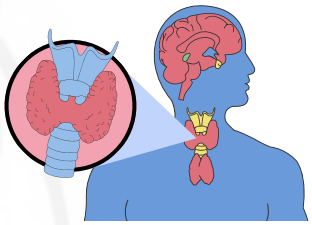
Thymus



- Located in the upper chest, behind the sternum (breastbone) and in front of the heart.
- It plays a crucial **role in the immune system, especially during childhood.**
- It responsible for the **maturation of T-lymphocytes (T-cells)**, which are essential for fighting infections.

Thyroid Gland

- The thyroid is a butterfly-shaped gland located in the neck.
- It produces a hormone called thyroxine, which plays a vital role in increasing the body's metabolism.
- The production of thyroxine requires iodine, a mineral obtained from our diet.

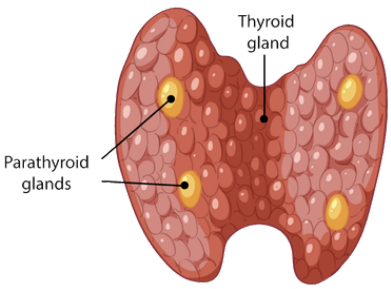


- **Thyroid produces ➜** T4 (Thyroxine) & T3 (Triiodothyronine)
  - **Functions of T4 & T3:**
    - Regulate Metabolism
    - Energy production
    - Body temp. ➜ Homeostasis
    - Heart rate

Hormonal Pathway
- **H ➜ TRH (Thyrotropin-Releasing Hormone):** The Hypothalamus (H) releases TRH.
- **P ➜ TSH (Thyroid-Stimulating Hormone):** The Pituitary gland (P) releases TSH to stimulate the thyroid.

- **Calcitonin** : Helps regulate Calcium level in Blood ➜ decreases Blood calcium levels
- A deficiency of iodine can lead to hypothyroidism, a condition where the body doesn't produce enough thyroid hormone.
- This deficiency may also cause the thyroid gland to enlarge, leading to a condition known as goitre.
- An excess production of iodine can result in hyperthyroidism, where the thyroid becomes overactive and produces too much thyroxine.

Parathyroid Gland

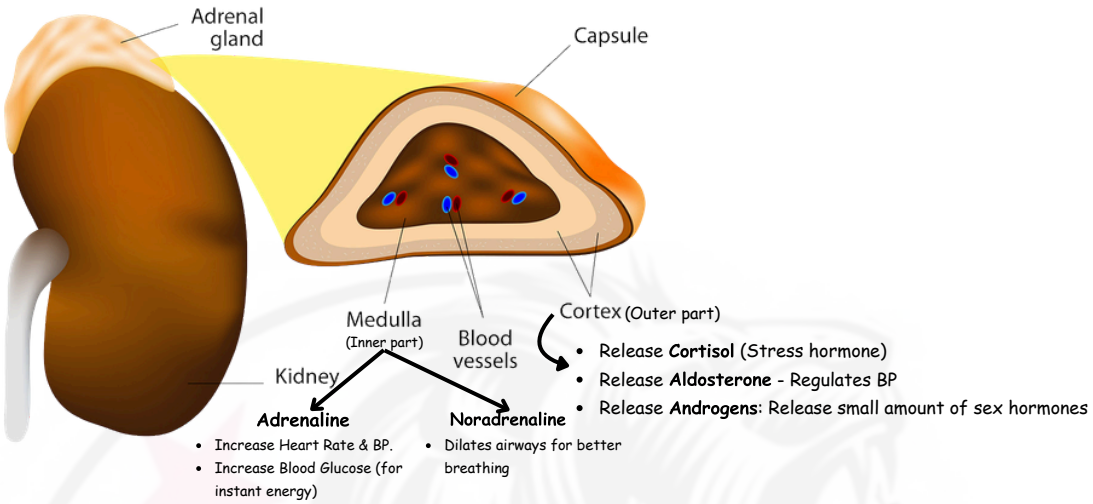


- The parathyroid glands are four small glands located behind the thyroid gland in the neck.
- The main role of the parathyroid glands is to regulate the level of calcium in the blood and bones.
- They do this by producing a hormone called parathyroid hormone (PTH)

Increase blood calcium level

Adrenal Gland

- It is a cap-like structure located above both the kidneys.
- It releases Adrenal hormone also known as "**Fight-or-Flight hormone**". It increases the blood pressure, heart rate, and metabolism in response to stress level.



- **Adrenaline & Noradrenaline:** Fight or Flight Response (Active during emergencies).

- **Deficiency causes:** Addison's disease (a rare chronic condition in which your adrenal glands don't produce enough of the hormones cortisol (stress hormone) and aldosterone).

The Atrial wall of human heart secretes a very important peptide hormone known as: ANF (Atrial Natriuretic Factor). ANF helps regulate the blood pressure.

HORMONES ARE MADE UP OF

Type	Made From	Examples	Speed	Duration
Peptide	Amino acids	Insulin, GH	Fast	Short
Steroid	Cholesterol	Cortisol, estrogen	Slow	Long
Amine	Amino acid derivatives	Adrenaline, T3/T4	Fast	Varies

Gonadas

- They are the primary reproductive organs.

Testes

- In male releases testosterone hormone.

Ovary

- In female releases Estrogen (responsible for female characteristics) and Progesterone (it supports menstruation and maintains pregnancy).

Major Exocrine Glands

- Enzymes are secreted by exocrine glands through ducts.

Sweat Glands

- They release sweat, a secretion, onto the skin's surface through ducts.

Salivary Glands

- These glands are a type of exocrine gland located in and around the oral cavity.
- They produce saliva, a fluid essential for digestion, lubrication, and protection of the mouth.

Liver

- The liver is positioned in the upper right portion of the abdomen, beneath the diaphragm.
- It is the largest gland of our body.
- The liver is responsible for numerous functions, including filtering blood, producing bile for digestion, metabolizing proteins, carbohydrates, and fats, and storing glycogen and vitamins.

Stomach

- The stomach helps break down food by squeezing it (mechanical) and mixing it with acids (HCL) and enzymes (chemical).
- Ghrelin released by stomach stimulates appetite hence it is known as "Hunger Hormone".

Heterocrine/Mixed Glands

- A heterocrine gland is a gland that functions as both an endocrine gland and an exocrine gland.

Pancreas

- Pancreas releases both hormones and enzymes (covered in digestive system) thus acting as a mixed gland.
- It is the second largest gland of our body.
- **Islets of Langerhans:**
  - These are cells scattered throughout the pancreas.
    1. **a-Cells:** Produces Glucagon converts Glycogen to Glucose through Glycogenolysis.
    2. **B-Cells**: Produces Insulin converts Glucose to Glycogen through Glycogenesis.
- Diabetes Mellitus is caused when not enough insulin is produced by the body.

PLANT HORMONES AND MOVEMENTS

Type	Hormones	Function
Growth Promoter	**Auxin**	• Elongation of stem • Promote Appical Dominance
	Gibberellin	• Germination or flowering in plants • Stem elongation
	Cytokinin	• Cell division • It inhibits apical dominance (lateral budding) • Delays senescence (Aging of plant) • New leaf formation
Growth Inhibitor	**Abscisic Acid**	• Stress hormone that inhibits growth
Gaseous hormone	**Ethylene**	• Gaseous hormone responsible for fruit ripening

Plant Movements

- Plant movements are of two types

1. **Tropic Movement** : Growth-dependent movements
2. **Nastic Movement**: Growth-independent movements

Tropic Movements

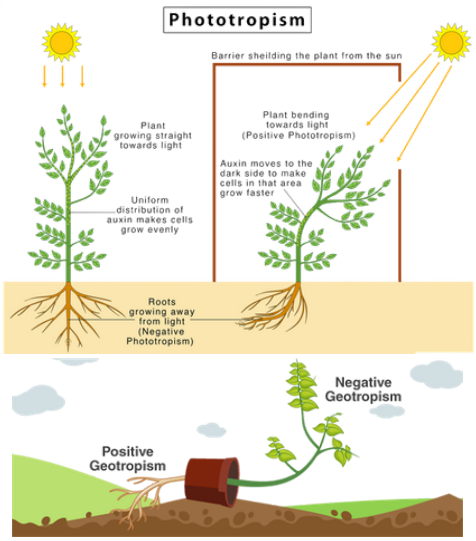
- They are directional and occur in response to stimuli like light, gravity, water, and chemicals.

(a) **Positive Tropism**: When a plant part moves towards the stimulus, it's considered positive tropism.

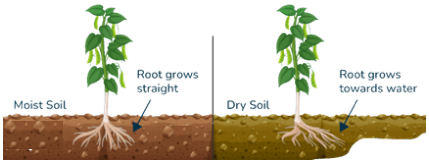
(b) **Negative Tropism**: When a plant part moves away from the stimulus, it's considered negative tropism.

Types of Tropic Movements

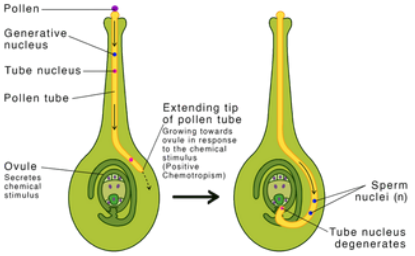
- **Phototropism**: Movement of plant in response to light. Shoots bend towards light (positive), while roots bend away from it (negative).
- **Geotropism**: Movement in response to gravity. Roots grow downwards towards the gravity (positive growth), while shoots grow upwards away from the gravity (negative growth).



- **Hydrotropism:** Movement in response to water.
- Roots grow towards water sources (positive growth).



- **Chemotropism:** Movement in response to chemicals.
- **E.g.** The movement of pollen tubes towards the ovary during fertilization.

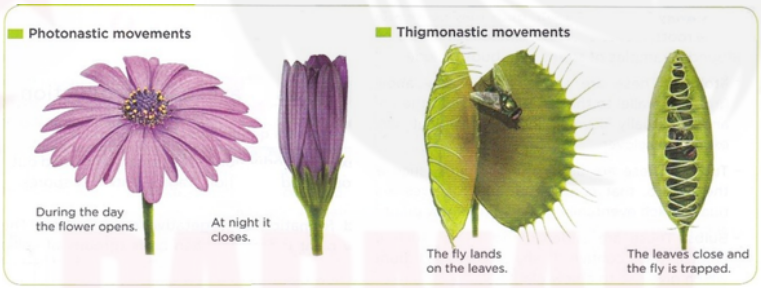


Nastic Movements

- They are non-directional movement of a plant part in response to an external stimulus, such as light, touch, or temperature.

(a) Photonastic Movement: The non-directional movement of plant part, usually flower petals, in response to changes in light intensity.

(b) **Thigmonastic Movement:** A non-directional response of plant or fungus to touch or vibration.





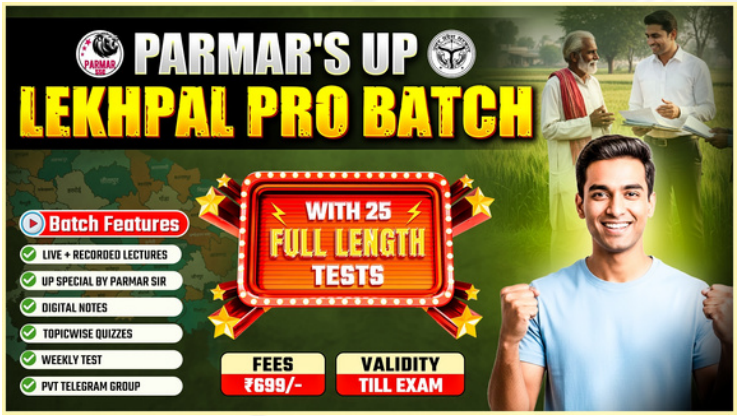


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