

Points to Remember

Plant hormones

Plant hormones : Control & coordination in plants is performed by chemical substances produced in it.

* **Growth promoting hormones** : Auxins, Cytokinins & Gibberellins

* **Growth inhibiting hormones** : Abscisic Acid & Ethylene

Types of Plant Hormones

Hormones	Description	Physiological effects
1. Auxins	<ul style="list-style-type: none"> Produced at the tip of stems & roots Then migrate to zone of elongation Named after Went's Experiment (<i>aveno coleoptiles</i>) <p style="text-align: center;">Types of Auxins</p> <p>Natural Auxins: IAA, PAA, IAN Synthetic Auxins: 2, 4D, IBA, NAA</p>	<ul style="list-style-type: none"> Promotes elongation of stems & coleoptiles. Induce root formation at low concentration and inhibit it at higher concentration. Apical dominance : apical buds suppress growth of lateral buds. Parthenocarpy - <i>Ex</i> : Grapes, Lime Prevent the formation of abscission layer.
2. Cytokinins	<ul style="list-style-type: none"> Promote cell division or cytokinesis in plant cells. Zeatin (cytokinin) from zea mays 	<ul style="list-style-type: none"> cell division (cytokinesis), cell enlargement, morphogenesis Growth of lateral buds in presence of epical buds. Richmond Lang effect : delays ageing in plants.
3. Gibberellins	<ul style="list-style-type: none"> Bakanae disease or foolish seedling disease – Internodal elongation in rice crops caused by <i>Gibberella fujikuroi</i>. Active substance - Gibberellic acid. 	<ul style="list-style-type: none"> Extraordinary elongation of internode. <i>Ex</i> : Corn, Pea Bolting: Rosette plants with gibberellin induces sudden shoot elongation followed by flowering. Promotes production of male flowers (cucurbits) Break dormancy of potato tubers. Parthenocarpic fruits - <i>Ex</i> : Tomato
4. Abscisic acid (ABA)	<p>Growth inhibitor - regulates abscission & dormancy found in chloroplast.</p> <p>Stress hormone : increases tolerance of plants to various kinds of stress.</p>	<ul style="list-style-type: none"> Promotes abscission (separation of leaves from branch) Causes stomatal closure promotes senescence in leaves by the loss of chlorophyll Induces bud dormancy in winter. <i>Ex</i> : Birch Inhibitor of lateral bud growth in tomato.
5. Ethylene	<ul style="list-style-type: none"> Gaseous plant hormone and growth inhibitor. Maximum during ripening of fruits. 	<ul style="list-style-type: none"> Ripening of fruits. <i>Ex</i> : Tomato, Apple, etc. Inhibits the elongation, hastens senescence stimulates formation of abscission zone in leaves Breaks the dormancy of buds, seeds & storage organs

Human Endocrine Glands / Ductless glands

☞ **Endocrinology** – Study of endocrine glands and its physiology.

☞ **Hormones** – Secretions of endocrine glands in minute quantities.

☞ **Exocrine glands** – have ducts to carry secretion. *Ex* : Salivary, Mammary and Sweat glands

Pituitary gland / hypophysis / Master gland

Structure	<ul style="list-style-type: none"> Pea shaped, located at the base of midbrain, attached to hypothalamus by pituitary stalk. 2 lobes : anterior lobe (adenohypophysis) & posterior lobe (neurohypophysis). <p>“Master gland” : It regulates and controls all other endocrine glands.</p>
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Hormones secreted by anterior lobe (Adenohypophysis)

1. Growth hormone (GH)	Development and enlargement of all tissues of the body.
2. Thyroid stimulating hormone (TSH)	Controls thyroid gland.
3. Adrenocorticotrophic hormone (ACTH)	Protein synthesis in adrenal cortex.
4. Gonadotropic hormones (GTH)	Essential for normal development of gonads.

Follicle stimulating hormone (FSH)	<ul style="list-style-type: none"> Male - stimulates the germinal epithelium of testes. Female - Initiates growth and development of ovarian follicles.
Luteinizing hormone (LH)	<ul style="list-style-type: none"> Male - secretes testosterone Female - causes ovulation, secretes estrogen & progesterone

5. Prolactin (PRL) / lactogenic hormone	Mammary gland development & production of milk after child birth.
Hormones secreted by posterior lobe (Neurohypophysis)	
Vasopressin/Antidiuretic hormone (ADH)	Increases reabsorption of water & reduces loss of water through urine.
Oxytocin	Helps in contraction of uterus & milk ejection after child birth.
Thyroid Gland	
Structure	<ul style="list-style-type: none"> • Two lobes on either side of trachea - connected by isthmus. • Glandular follicles filled with thyroglobulin and lined by cuboidal epithelium.
Personality hormone	a) Triiodothyronine (T3) b) Tetraiodothyronine or Thyroxine (T4)
Functions	<ul style="list-style-type: none"> • Maintains Basal Metabolic Rate (BMR), body temperature, cell metabolism. • Controls growth of the body and bone formation. • Essential for normal physical, mental and personality.
Parathyroid Gland	
Structure	Four small oval bodies, situated on posterior surface of thyroid lobes.
Functions	<ul style="list-style-type: none"> • Regulates calcium and phosphorus metabolism in the body. • They act on bone, kidney, intestine to maintain blood calcium levels.
Pancreas (Islets of Langerhans)	
Structure	Elongated, yellowish gland situated in the loop of stomach and duodenum. <i>It acts both as Exocrine (secretes pancreatic juice for digestion) and Endocrine (made up of Islets of Langerhans : Alpha cells – glucagon, Beta cells - insulin).</i>
Functions	<p>Insulin : Helps in conversion of glucose to glycogen & promotes the transport of glucose. Decreases the concentration of glucose in blood.</p> <p>Glucagon : Helps in breakdown of glycogen to glucose in liver. Increases blood glucose levels.</p>
Adrenal Gland / Supra renal glands	
Structure	located above each kidney. outer part - adrenal cortex & inner part - adrenal medulla.
Hormones of Adrenal Cortex - Corticosteroids	
Glucocorticoids	<ul style="list-style-type: none"> • cortisol(life saving hormone) & corticosterone are secreted by zona fasciculata. • They regulate cell metabolism, anti-inflammatory & anti-allergic agent.
Mineralocorticoids	<ul style="list-style-type: none"> • Mineralocorticoids secreted by zona glomerulosa is aldosterone. • Helps to reabsorb sodium ions from renal tubules & regulates electrolyte balance, blood pressure, etc.,
Hormones of Adrenal Medulla (Emergency / flight, fright & fight hormones)	
Structure	Composed of chromaffin cells .
a) Epinephrine (Adrenaline) b) Norepinephrine (Noradrenalin)	<ul style="list-style-type: none"> • Produced during stress & emotion • It promotes conversion of glycogen to glucose. • Increases heartbeat, blood pressure and respiration rate. • Dilation of the pupil in eye. • Decreases blood flow through skin.
Reproductive Glands (Gonads)	
Testes (Male Gonads (or) Male Reproductive gland)	
Structure	Composed of seminiferous tubules, Leydig cells(endocrine) and sertoli cells.
Testosterone	Influences spermatogenesis, stimulates protein synthesis & controls muscular growth Development of secondary sexual characters(hair on body & face, deep voice, etc.,)

Ovary (Female Gonads (or) Female Reproductive gland)

Structure	Located in the pelvic cavity of the abdomen.
Estrogen	Produced by graafian follicles of the ovary. Functions: changes that occur during puberty, oogenesis, maturation of ovarian follicles and development of secondary sexual characters(breast development, etc.,)
Progesterone	Produced from corpus luteum, formed in ovary from ruptured follicle during ovulation. Functions : premenstrual changes, maintains pregnancy, formation of placenta, etc.,

Thymus gland

Structure	<ul style="list-style-type: none"> • Partly an endocrine gland and partly a lymphoid gland. • Located in the upper part of the chest covering the lower end of trachea.
Thymosin	<ul style="list-style-type: none"> • Stimulatory effect on immune function. • Stimulates the production & differentiation of lymphocytes.

Gland

Dysfunction

Pituitary	<p>Growth hormone dysfunction:</p> <ul style="list-style-type: none"> • Dwarfism : Decreased secretion of growth hormone in children. • Gigantism : Over secretion of growth hormone in children. • Acromegaly: Excess secretion of growth hormone in adults. <p>Vasopressin / ADH deficiency - Diabetes insipidus : Increase in urine output (polyuria).</p>
Thyroid	<p>Condition of Thyroid gland fails to secrete the normal level of hormones.</p> <p>Hypothyroidism: Decreased secretion of the thyroid hormones.</p> <ul style="list-style-type: none"> • Goitre : Inadequate supply of iodine in diet. Marked swelling in neck. • Cretinism (children) : stunted growth, mental defect, lack of skeletal development. • Myxoedema (Adults) : mentally sluggish, puffiness of face & hand. <p>Hyperthyroidism : Excess secretion of thyroid hormones leads to Grave's disease.</p>
Parathyroid	<p>Removal of parathyroid gland during thyroidectomy ⇒ decrease in parathormone.</p> <ul style="list-style-type: none"> • Tetany : Muscle spasm (sustained contraction of muscles in face, larynx, etc.,) • Painful cramps of the limb muscles.
Pancreas	<p>Diabetes mellitus: deficiency of insulin.</p> <ul style="list-style-type: none"> • Hyperglycemia - Increase in blood sugar level. • Glycosuria - Excretion of excess glucose in the urine. • Polyuria - Frequent urination. • Polydipsia - Increased thirst. • Polyphagia - Increase in appetite.

Human Hormones

<ul style="list-style-type: none"> ★ Personality hormone – Thyroid hormone ★ Antidiuretic hormone – Vasopressin ★ Lactogenic hormone – Prolactin ★ Tetraiodothyronine - Thyroxine ★ Male sex hormone – Testosterone ★ Female sex hormone – Estrogen & Progesterone 	<ul style="list-style-type: none"> ★ Hormones of adrenal cortex – Corticosteroids ★ Glucocorticods – cortisol & Corticosterone ★ Mineralocorticoids – aldosterone ★ Life saving hormone – Cortisol ★ Time messenger – Melotin from pineal gland ★ Emergency hormone – Adrenaline & Noradrenaline
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Plant Hormones

★ Plant hormone – Abscisic acid	★ Gaseous plant hormone – Ethylene
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