

**Subject: Physiology of Coordination
(BS Zoology 6th Semester)**

Steroid and Non-Steroid Hormones

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Introduction to Steroid Hormones

- **What are Steroid Hormones?**
- Steroid hormones are a class of lipophilic (fat-soluble) hormones derived from cholesterol. They are secreted by:
 - Adrenal cortex (e.g., cortisol, aldosterone)
 - Gonads (ovaries/testes) (e.g., estrogen, testosterone, progesterone)
 - Placenta during pregnancy (e.g., progesterone, estrogens)

Major Types of Steroid Hormones

Class	Hormones	Main Sources	Functions
Glucocorticoids	Cortisol	Adrenal cortex	Regulates metabolism, stress response, immune suppression
Mineralo-corticoids	Aldosterone	Adrenal cortex	Regulates sodium and potassium balance
Androgens	Testosterone	Testes (also adrenal)	Development of male traits, muscle growth
Estrogens	Estradiol, Estrone	Ovaries	Development of female traits, menstrual cycle
Progestogens	Progesterone	Ovaries, placenta	Prepares uterus for pregnancy, maintains pregnancy

Steroid Hormone (e.g., cortisol)



Released into blood → Bound to carrier protein



Diffuses into target cell



Binds intracellular receptor (cytoplasm or nucleus)



Receptor-hormone complex → Conformational change



Enters into nucleus and binds with DNA



Gene transcription → mRNA → Protein synthesis



Cellular response (metabolism, growth, reproduction, etc.)

Examples of Steroid Hormone Actions

Hormone	Target Tissue	Action
Cortisol	Liver, immune cells	Increases gluconeogenesis, suppresses immune response
Aldosterone	Kidney (distal tubules)	Promotes Na ⁺ reabsorption, K ⁺ excretion
Testosterone	Muscles, reproductive organs	Promotes muscle growth, male sex traits
Estrogen	Uterus, breast tissue	Regulates menstrual cycle, promotes secondary sex traits
Progesterone	Uterus, mammary glands	Prepares uterus for implantation, supports pregnancy

Introduction to Non-Steroid Hormones

- **What are Non-Steroid Hormones?**
- Non-steroid hormones are hormones that are not derived from cholesterol and cannot pass through the lipid bilayer of the cell membrane because they are water-soluble (hydrophilic).
- They include:
 - Amino acid derivatives (e.g., adrenaline)
 - Peptide hormones (e.g., insulin)
 - Protein hormones (e.g., growth hormone)

Types of Non-Steroid Hormones

Type	Examples	Source
Amino Acid Derivatives	Epinephrine (adrenaline), Norepinephrine, Thyroxine (T ₄), Melatonin	Adrenal medulla, Thyroid gland, Pineal gland
Peptide Hormones	Oxytocin, Antidiuretic hormone (ADH)	Hypothalamus, posterior pituitary
Protein Hormones	Insulin, Glucagon, Growth hormone (GH), Prolactin	Pancreas, anterior pituitary
Glycoproteins	Thyroid-stimulating hormone (TSH), Luteinizing hormone (LH), Follicle-stimulating hormone (FSH)	Anterior pituitary

Non-Steroid Hormone (e.g., insulin)



Binds to receptor on plasma membrane



Activates second messenger (e.g., cAMP)



Activates protein kinase



Phosphorylation of target proteins



Rapid cellular response (e.g. Glucose intake)

Examples of Non-Steroid Hormones & Their Effects

Hormone	Source	Target	Action
Insulin	Pancreas (β -cells)	Liver, muscle	Promotes glucose uptake and storage
Glucagon	Pancreas (α -cells)	Liver	Stimulates glycogen breakdown
ADH (Vasopressin)	Posterior pituitary	Kidneys	Promotes water reabsorption
TSH	Anterior pituitary	Thyroid gland	Stimulates release of T_3 and T_4
Epinephrine	Adrenal medulla	Various organs	Triggers fight-or-flight response

Comparison: Steroid vs. Non-Steroid Hormones

Feature	Steroid Hormones	Non-Steroid Hormones
Source	Cholesterol-based	Amino acids/proteins
Solubility	Lipid-soluble	Water-soluble
Receptor location	Intracellular (cytoplasm/nucleus)	Plasma membrane
Action	Alters gene transcription	Second messengers, enzyme activation
Speed	Slow (hours)	Fast (seconds to minutes)
Transport	Bound to proteins in blood	Free in blood
Storage	Not stored, made on demand	Stored in vesicles

THANK YOU