

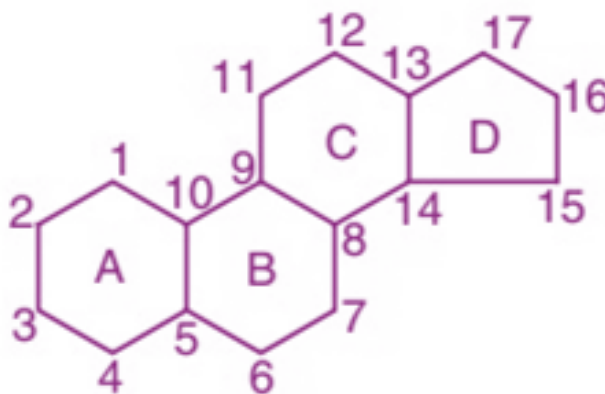
Drugs Acting on Endocrine System

Nomenclature of Steroid Drugs

Steroid Structure Basics:

Core Structure:

- Steroids share a common tetracyclic structure composed of three cyclohexane rings (A, B, C) and one cyclopentane ring (D), known as the **steroid nucleus**.



Functional Groups:

- Variations in functional groups attached to the core structure differentiate steroid types.

Naming Conventions:

Prefixes and Suffixes:

- **-olone:** Indicates a ketone group (e.g., Testosterone).
- **-ate:** Ester forms used in prodrugs (e.g., Prednisone).
- **-olone vs. -ol:** **-ol** denotes alcohol groups (e.g., Etonogestrel).

Classification-Based Names:

- Glucocorticoids: e.g., Hydrocortisone
- Mineralocorticoids: e.g., Fludrocortisone
- Androgens: e.g., Dihydrotestosterone
- Estrogens: e.g., Estradiol
- Progestogens: e.g., Progesterone

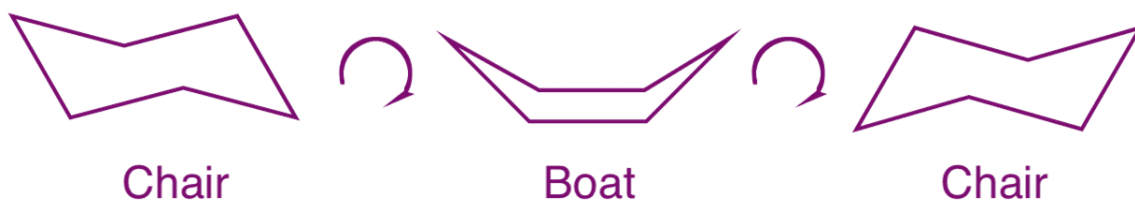
Examples:

- **Corticosteroids:** Prednisone, Dexamethasone
- **Anabolic Steroids:** Nandrolone, Oxandrolone

Stereochemistry of Steroid Drugs

Importance of Stereochemistry:

- **3D Orientation:** The spatial arrangement of atoms affects receptor binding and biological activity.
- **Chirality Centers:** Steroids contain multiple chiral centers, leading to various isomers with distinct effects.



Key Stereochemical Features:

Alpha (α) and Beta (β) Configurations:

- Define the orientation of functional groups relative to the steroid nucleus.

Double Bonds and Rings:

- **Δ^4 , Δ^5 , Δ^9 , etc.:** Indicate the position of double bonds, influencing drug activity and metabolism.

Substituent Positions:

- **C17 α vs. C17 β :** Placement of hydroxyl or other groups at carbon 17 affects potency and receptor affinity.

Examples:

- **Dexamethasone vs. Betamethasone:** Minor stereochemical differences lead to variations in glucocorticoid potency.
- **Testosterone vs. Dihydrotestosterone (DHT):** DHT has a different stereochemistry, making it a more potent androgen.

Metabolism of Steroid Drugs

Primary Sites of Metabolism:

- **Liver:** Main organ responsible for steroid metabolism through enzymatic processes.
- **Gut and Kidneys:** Participate in conjugation and excretion.

Key Metabolic Pathways:

1. Hydroxylation:

- Addition of hydroxyl groups by **Cytochrome P450** enzymes.

- Increases water solubility for excretion.

2. Oxidation and Reduction:

- Modifies functional groups, altering activity and facilitating elimination.

3. Conjugation:

- **Glucuronidation:** Addition of glucuronic acid.
- **Sulfation:** Addition of sulfate groups.
- Enhances solubility and reduces toxicity.

4. De-esterification:

- Ester forms (prodrugs) are converted to active drugs (e.g., **Prednisone** to **Prednisolone**).

Factors Affecting Metabolism:

- **Enzyme Variability:** Genetic differences can influence enzyme activity, affecting drug levels.
- **Interactions:** Other drugs can inhibit or induce metabolic enzymes, altering steroid efficacy and safety.
- **Route of Administration:** Oral steroids undergo first-pass metabolism, reducing bioavailability compared to intravenous forms.

Examples:

- **Prednisone:** Metabolized to **Prednisolone** in the liver.
- **Testosterone:** Converted to DHT or Estrogen via specific enzymes like 5 α -reductase and aromatase.



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