Drugs acting on Autonomic Nervous System

The Nervous System: An Overview

- The nervous system is a complex network of nerves and cells, known as neurons, that transmit signals between different parts of the body.
- It essentially functions as the body's electrical wiring.
- The nervous system is divided into two main components:
    1. **Central Nervous System (CNS)**
    2. **Peripheral Nervous System (PNS)**

Peripheral Nervous System (PNS)

- The peripheral nervous system consists of the nerves and ganglia outside the brain and spinal cord.
- It connects the CNS to the rest of the body.

The PNS is divided into two main parts:

A. Somatic Nervous System

- Controls voluntary movements.
- Composed of nerves that connect the brain and spinal cord to muscles and sensory receptors in the skin.

B. Autonomic Nervous System

- Controls involuntary body functions.
- It is further divided into two subdivisions:
    I. **Sympathetic Division**: Prepares the body for stressful or emergency situations ("fight or flight").
    II. **Parasympathetic Division**: Controls body processes during normal conditions (rest and digestion).

Drugs Acting on the Sympathetic Nervous System (SNS)



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1. Adrenergic Agonists (Sympathomimetics)

Stimulate the SNS by acting on adrenergic receptors.

A. Alpha Agonists

- ↑ Vasoconstriction, used for hypertension, nasal congestion.
- Example: Phenylephrine.

B. Beta Agonists

- Selective/non-selective, used for asthma, heart conditions.
- Examples:
  - β1-selective (heart): Metoprolol (hypertension).
  - β2-selective (lungs): Albuterol (asthma).
  - Non-selective: Isoproterenol.

2. Adrenergic Antagonists (Sympatholytics)

Block adrenergic receptors, inhibiting SNS effects.

A. Alpha Blockers

- Used in hypertension, benign prostatic hyperplasia (BPH).
- Example: Prazosin.

B. Beta Blockers

- Used in hypertension, heart disease, anxiety.
- Example: Propranolol.

Direct Acting: Sympathomimetic Agents

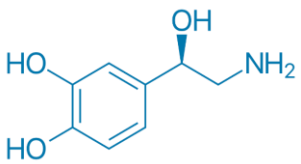
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1. Nor-Epinephrine (Norepinephrine)*

Chemical Name:

- (R)-4-(2-amino-1-hydroxyethyl)benzene-1,2-diol

Chemical Structure:



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Uses:

- Acute hypotension
- Cardiac arrest
- Vasoconstrictor in shock

Stability & Storage:

- Light-sensitive; store in amber containers.
- Aqueous solutions are unstable; pH-dependent degradation (optimal pH 3–4).
- Refrigeration (2–8°C) recommended.

Formulations:

- Injectable solution (IV infusion)

Popular Brand Names:

- Levophed
- Arterenol

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2. Epinephrine (Adrenaline)

Chemical Name:

- (R)-4-[1-hydroxy-2-(methylamino)ethyl]benzene-1,2-diol

Uses:

- Anaphylaxis
- Cardiac arrest
- Bronchospasm
- Prolongation of local anesthetic action

Stability & Storage:

- Light and air-sensitive
- Store in tightly closed, light-resistant containers
- Solutions discolor with oxidation (pink to brown)

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Formulations:

- Injection (SC, IM, IV)
- Inhaler, auto-injectors (EpiPen)

Popular Brand Names:

- Adrenaline
- EpiPen
- Adrenaclick

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3. Phenylephrine

Chemical Name:

- (R)-3-[(1-hydroxy-2-phenylethyl)amino]phenol hydrochloride

Uses:

- Nasal decongestant
- Ocular vasoconstrictor
- Hypotension during anesthesia

Stability & Storage:

- Stable under standard conditions
- Protect from moisture and light
- Store below 25°C

Formulations:

- Oral tablets, nasal sprays, ophthalmic drops, injectable

Popular Brand Names:

- Neo-Synephrine
- Sudafed PE
- Vazculep (injection)

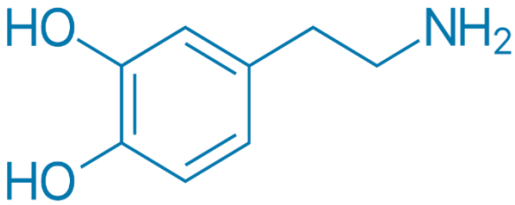
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4. Dopamine*

Chemical Name:

- 4-(2-aminoethyl)benzene-1,2-diol

Chemical Structure:



Uses:

- Shock and heart failure
- Hypotension
- Improves renal perfusion at low doses

Stability & Storage:

- Oxidation sensitive
- Light-sensitive; store in amber glass vials
- Refrigerate (2–8°C)

Formulations:

- Injectable solution (IV)

Popular Brand Names:

- Intropin
- Dopastat (discontinued in some regions)

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5. Terbutaline

Chemical Name:

- (RS)-α-[(tert-butylamino)methyl]-3,5-dihydroxybenzyl alcohol

Uses:

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