

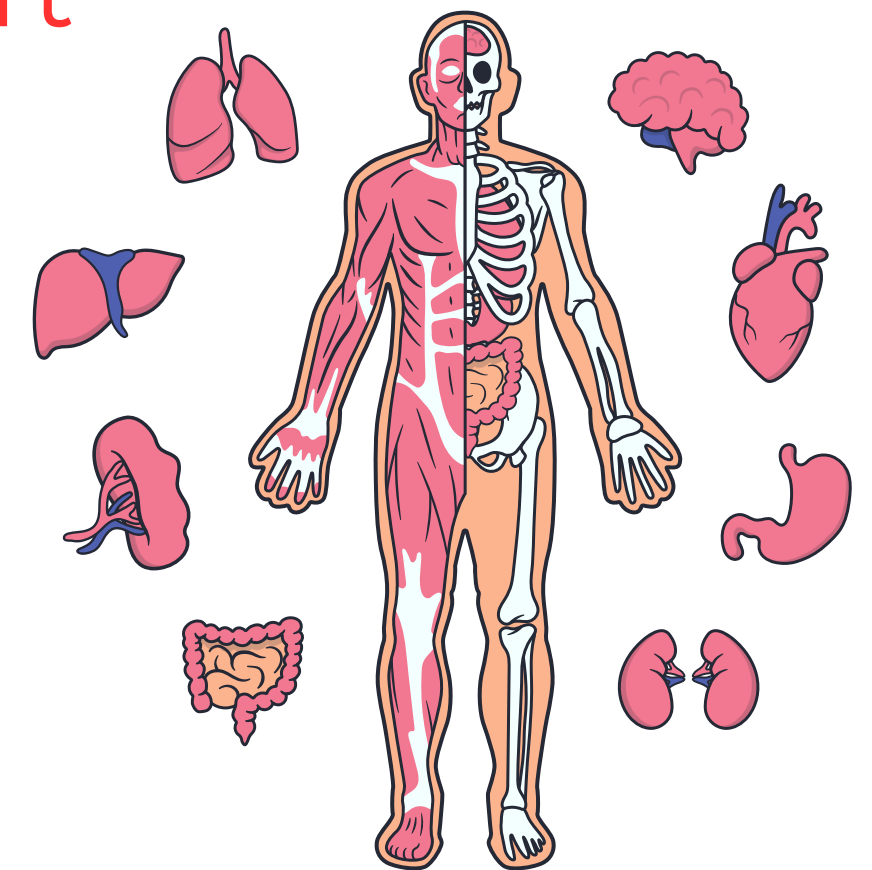
Adrenergic Agonists and Antagonists



جامعة ساوة
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Introduction

- The **adrenergic system** is part of the **autonomic nervous system (ANS)**.
- It uses **norepinephrine (noradrenaline)** and **epinephrine (adrenaline)** as neurotransmitters.
- These chemicals act on **adrenergic receptors** located in different organs.
- The adrenergic system controls functions such as **heart rate, blood pressure, pupil size, and airway diameter**.
- Drugs that act on this system are divided into **adrenergic agonists** and **adrenergic antagonists**.

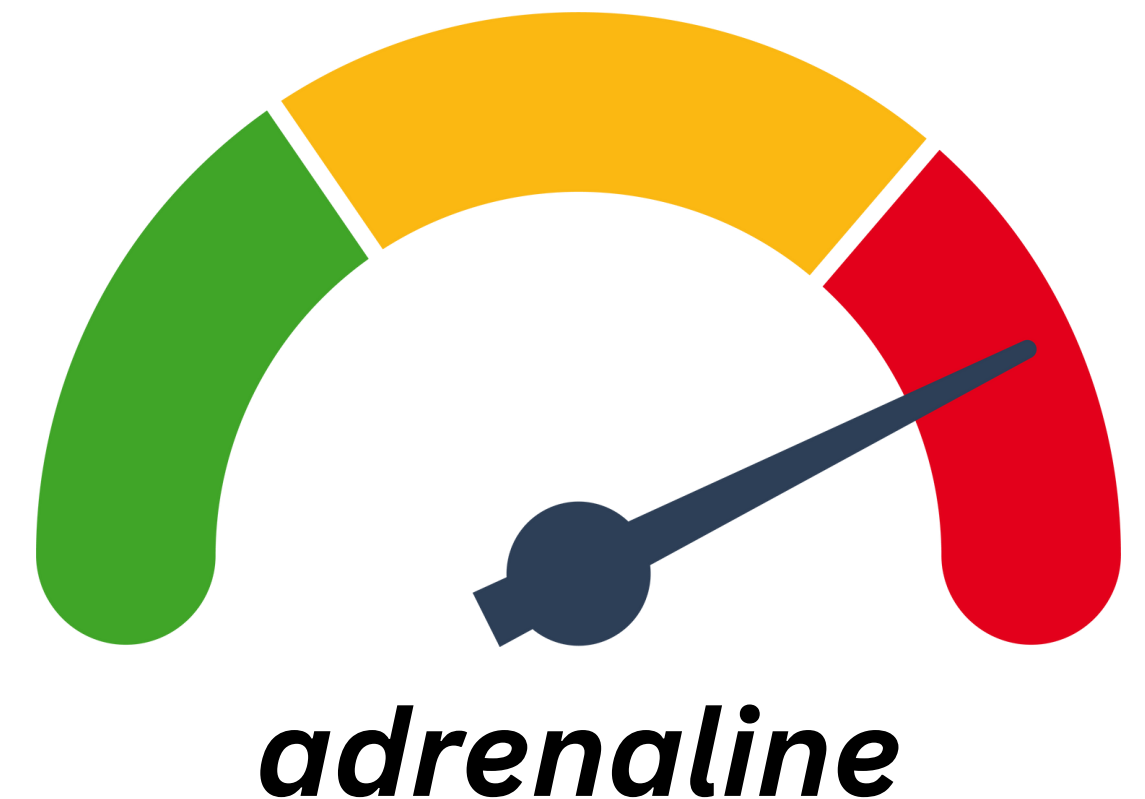


Introduction

Receptor	Location	Main Function
α_1	Blood vessels, eyes, urinary bladder	Vasoconstriction, pupil dilation, urinary retention
α_2	Nerve endings (presynaptic)	Decrease norepinephrine release (negative feedback)
β_1	Heart	Increase heart rate, contractility, and cardiac output
β_2	Lungs, blood vessels, uterus	Bronchodilation, vasodilation, relax uterine muscle
β_3	Adipose tissue	Lipolysis (breakdown of fats)

Adrenergic Agonists

- Adrenergic agonists are drugs that stimulate **adrenergic receptors**.
- They are **similar** in the effects of adrenaline and noradrenaline.
- Can be **direct-acting**, **indirect-acting**, or **mixed-acting**.



Classification of Adrenergic Agonists

1. Direct-Acting Agonists:

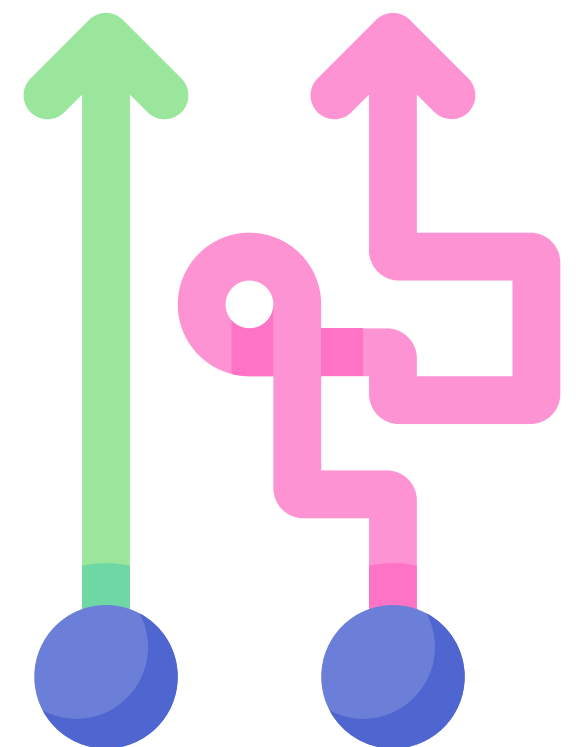
- Act directly on adrenergic receptors.
- **Example:** Epinephrine, Norepinephrine, Phenylephrine, Isoproterenol.

1. Indirect-Acting Agonists:

- Increase release of norepinephrine or inhibit its reuptake.
- **Example:** Amphetamine, Tyramine.

1. Mixed-Acting Agonists:

- Have both direct and indirect actions.
- **Example:** Ephedrine, Pseudoephedrine.



Epinephrine (Adrenaline)

Acts on all α and β receptors.

Effects:

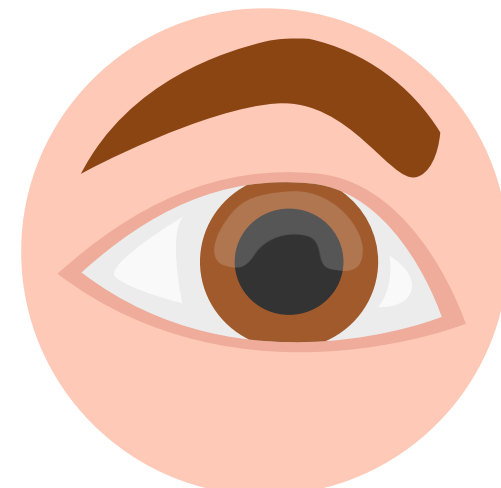
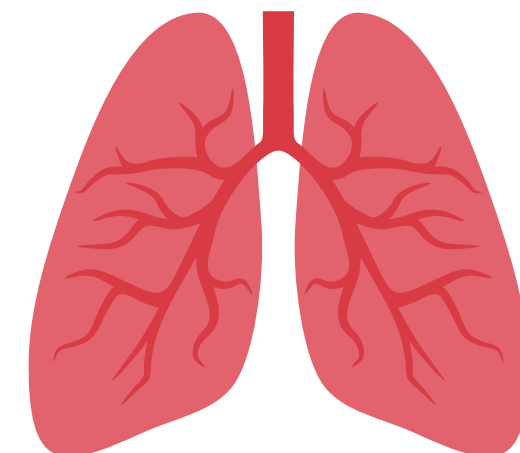
- elevate $\uparrow$ Heart rate and blood pressure (β_1)
- Bronchodilation (β_2)
- Pupil dilation (α_1)

Clinical uses:

- Anaphylactic shock
- Cardiac arrest

Side effects:

- Anxiety, tremor, headache, palpitations.



Norepinephrine (Noradrenaline)

Acts mainly on α_1 , α_2 , and β_1 receptors.

Effects:

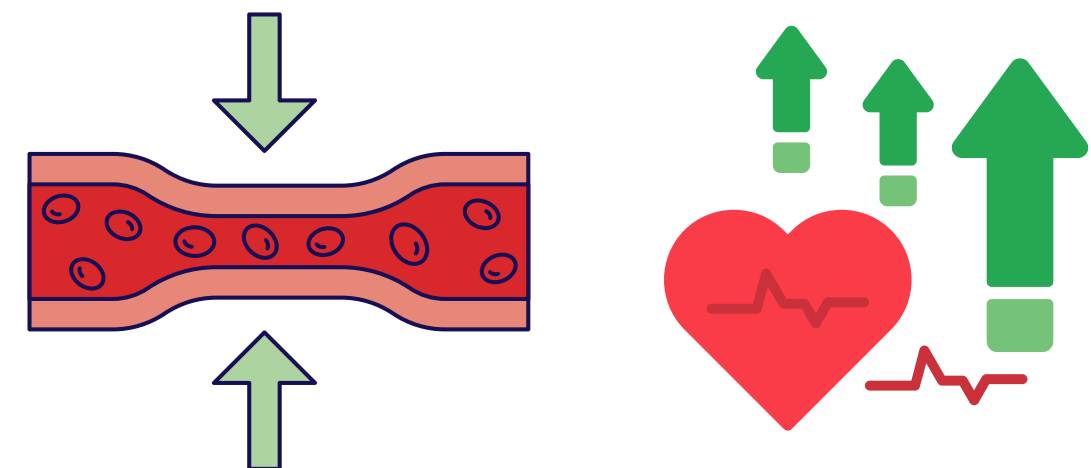
- Strong vasoconstriction result in elevate $\uparrow$ blood pressure.
- Slight increase in heart rate.

Clinical uses:

- Severe hypotension (shock)

Side effects:

- Hypertension, arrhythmia, tissue necrosis if injected outside vein.



Phenylephrine

Selective α_1 agonist.

Effects:

- Vasoconstriction, pupil dilation.

Uses:

- Nasal decongestant.
- Eye drops for pupil dilation.
- Treat hypotension during anesthesia.

Side effects:

- Hypertension, rebound nasal congestion (with overuse).



Salbutamol (Albuterol)

Selective β_2 agonist.

Effects:

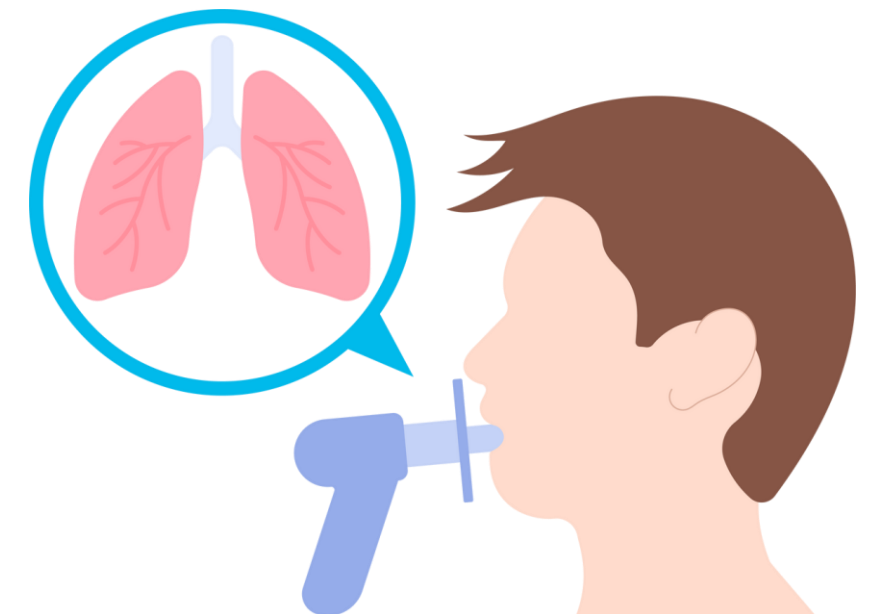
- Bronchodilation.

Uses:

- Asthma, chronic obstructive pulmonary disease (COPD).

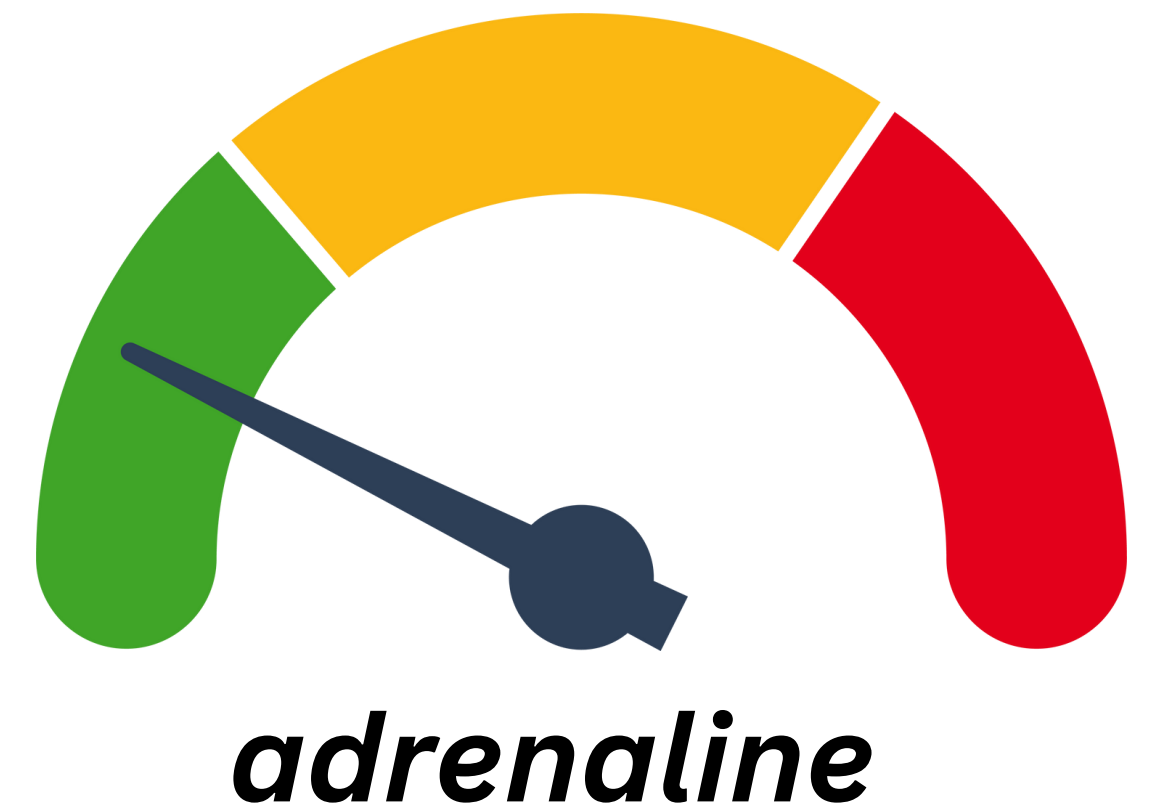
Side effects:

- Tremor, tachycardia, nervousness.



Adrenergic Antagonists

- Block adrenergic receptors and oppose the effects of **adrenaline and noradrenaline**.
- Used mainly in cardiovascular diseases.



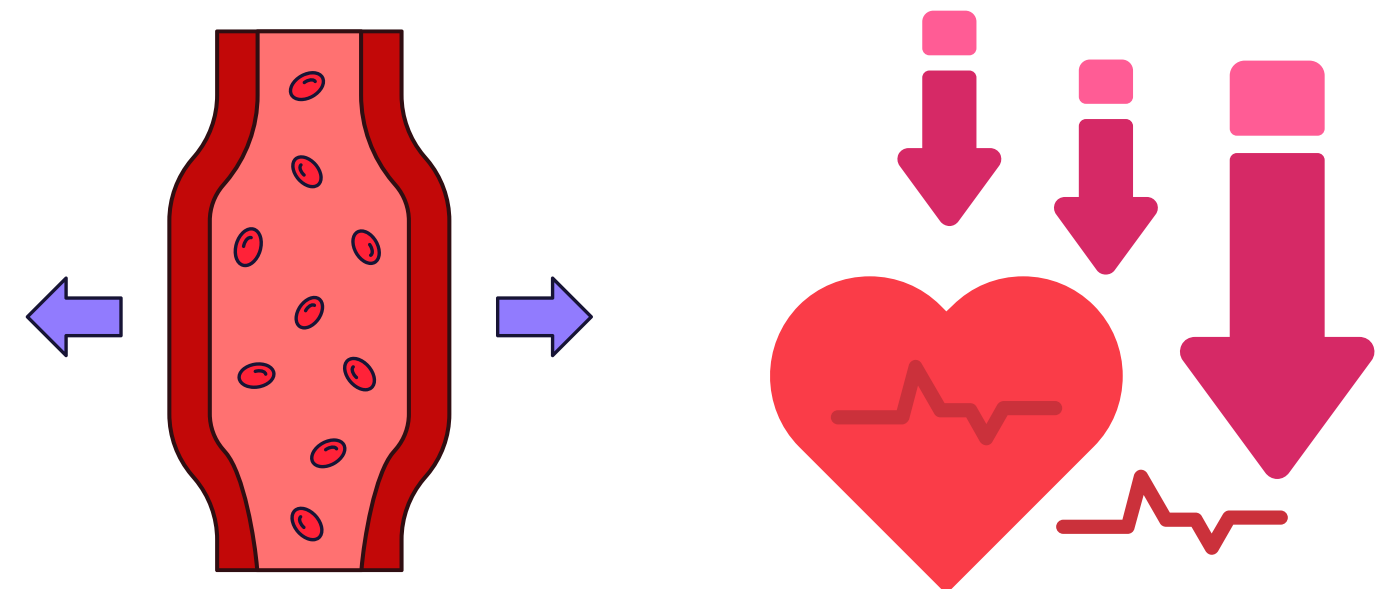
Classification of Adrenergic Antagonists

1. Alpha blockers (α -blockers):

- Block α receptors $\rightarrow$ cause vasodilation.
- Example: Prazosin, Phentolamine.

1. Beta blockers (β -blockers):

- Block β receptors $\rightarrow$ reduce heart rate and blood pressure.
- Example: Propranolol, Atenolol, Metoprolol.



Alpha Blockers

1. Prazosin: Selective α_1 blocker.

- Causes vasodilation → decreases blood pressure.
- Uses: Hypertension, benign prostatic hyperplasia (BPH).
- Side effects: Postural hypotension, dizziness.

1. Phentolamine: Non-selective α blocker.

- Used in pheochromocytoma diagnosis and hypertensive crisis.

Beta Blockers

1. Non-selective β -blockers: Block β_1 and β_2 receptors.

- Example: Propranolol.

1. Selective β_1 -blockers: Mainly act on heart.

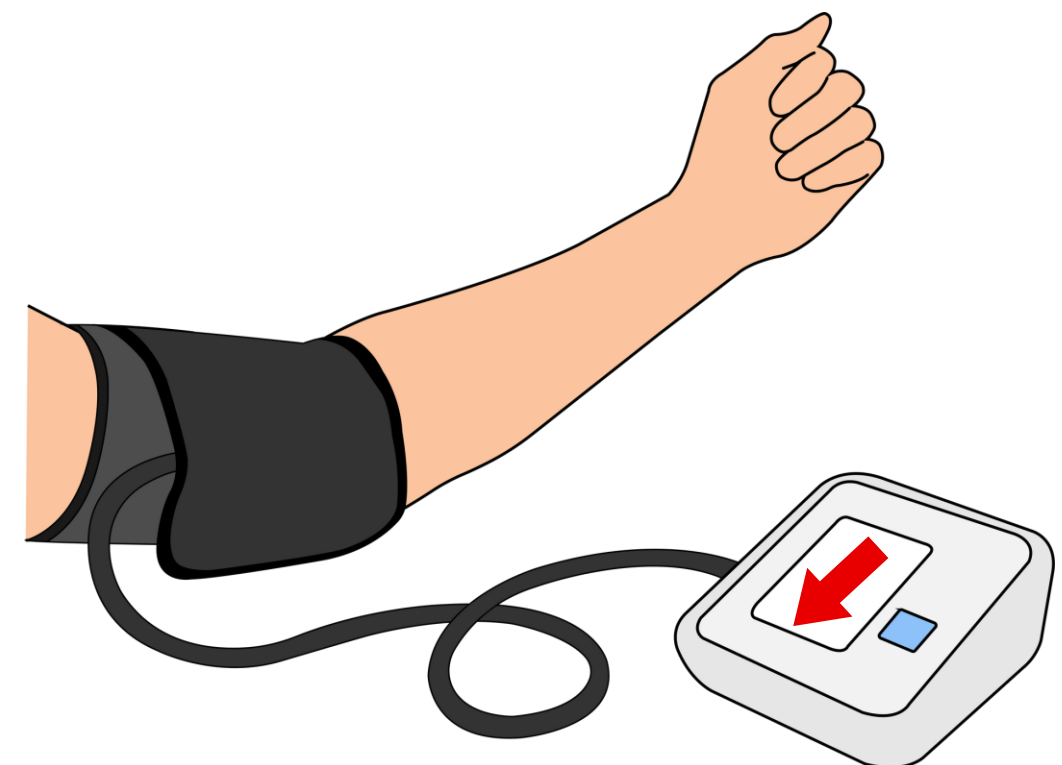
- Example: Atenolol, Metoprolol.

General Effects:

- decrease $\downarrow$ Heart rate and contractility.
- decrease $\downarrow$ Blood pressure.
- decrease $\downarrow$ Oxygen demand of the heart.

Uses:

- Hypertension
- Angina pectoris
- Myocardial infarction (heart attack)
- Arrhythmia
- Glaucoma (eye drops)



Side Effects of Beta Blockers

1. Bradycardia (slow heart rate)
2. Hypotension
3. Bronchoconstriction (especially in asthmatic patients)
4. Fatigue and depression

Contraindications

- *Beta blockers are contraindicated in **asthma and COPD** patients due to bronchoconstriction.*
- *Alpha blockers should be used carefully in patients with **low blood pressure**.*