

Drug/NT Name	Chemical Nature & Source	Receptor Affinity	ADME (Pharmacokinetics)	Pharmacodynamics (Detailed Actions)	Therapeutic Uses	Side Effects & Contraindications	Route of Administration
Acetylcholine (ACh)	Quaternary ammonium compound	Muscarinic (M) & Nicotinic (N)	<p>A: Not absorbed orally (highly ionized).</p> <p>D: Does not pass BBB.</p> <p>M: Rapidly hydrolyzed by True & Pseudo Cholinesterases.</p> <p>E: Renal excretion.</p>	<p>Muscarinic: Bradycardia, vasodilation (VD), decreased BP. Miosis, accommodation for near vision, increased lacrimation. Bronchoconstriction & increased secretions. Bladder wall contraction & sphincter relaxation.</p> <p>Nicotinic: Muscle contraction (Nm), stimulation of Autonomic Ganglia (Nn).</p>	Not used clinically due to transient action and lack of selectivity.	(Not used as a drug, but destroyed by gastric enzymes).	IV (transient effect), not given orally.
Adrenaline (Epinephrine)	Natural Catecholamine (from suprarenal medulla)	$\alpha + \beta$ (non-selective)	<p>A: Ineffective orally (rapid liver metabolism).</p> <p>D: Does not pass BBB.</p> <p>M: Substrate for MAO and COMT.</p>	<p>CVS: +ve Inotropic, Chronotropic, Dromotropic effects (β_1). Increased systolic BP.</p> <p>Smooth Ms: Bronchodilation (β_2), active mydriasis (α), relaxation of bladder</p>	Cardiac resuscitation, acute bronchial asthma, anaphylactic shock, with local anesthetics (delay absorption), epistaxis (nasal pack),	<p>Side Effects: Cerebral hemorrhage, ventricular fibrillation, anxiety, tremors, insomnia.</p> <p>Contra: Hypertension, hyperthyroidism, coronary heart disease.</p>	SC, Inhalation, Intracardiac, IV (only in extreme emergencies).

			<p>E: VMA in urine.</p>	<p>wall and pregnant uterus.</p> <p>Metabolism: Glycogenolysis (Hyperglycemia), lipolysis (increased FFA), calorogenic action.</p>	<p>open-angle glaucoma.</p>		
<p>Noradrenaline (NE)</p>	<p>Natural Catecholamine</p>	<p>Strong α + Weak β_1</p>	<p>A: Oral ineffective. Not given SC/IM (causes necrosis).</p> <p>D: Does not pass BBB.</p> <p>M/E: Similar to Adrenaline.</p>	<p>CVS: Strong vasoconstriction (VC), increased both systolic and diastolic BP. Causes Reflex Bradycardia via vagal stimulation.</p> <p>Eye: Contraction of dilator pupillae (Mydriasis).</p>	<p>Acute hypotensive states (shock), post-sympathectomy.</p>	<p>Side Effects: Severe hypertension, tissue necrosis at injection site.</p> <p>Contra: With local anesthesia in extremities (Gangrene).</p>	<p>IV Infusion only (diluted 1/1000 in saline/glucose).</p>
<p>Isoprenaline</p>	<p>Synthetic Catecholamine</p>	<p>β only ($\beta_1 + \beta_2$)</p>	<p>A: Not given orally.</p> <p>DME: Same as Adrenaline.</p>	<p>CVS: Strong cardiac stimulant (β_1). Vasodilation in skeletal muscles (β_2) leading to hypotension.</p> <p>Smooth Ms: Relaxes bronchi, GIT, and uterus.</p>	<p>Heart Block, Bronchial asthma.</p>	<p>Side Effects: Tachycardia, palpitation, arrhythmia.</p>	<p>IV Infusion, Sublingual, Inhalation, IM, SC.</p>

Dopamine	Natural Catecholamine	D, β_1 , α (Dose-dependent)	<p>D: Does not pass BBB.</p> <p>M: Substrate for MAO and COMT.</p> <p>$t_{1/2}$: Very short (2 mins).</p>	<p>Low Rate (2-3 μg): VD of renal/mesenteric vessels (D_1), increases urine output.</p> <p>Moderate Rate (5-8 μg): Cardiac stimulation (β_1).</p> <p>High Rate (10-12 μg): Generalized vasoconstriction (α).</p>	Shock (Cardiogenic, Hemorrhagic, Septic), Heart failure with hypotension.	Side Effects: Ventricular arrhythmia, nausea, vomiting.	Slow IV Infusion with ECG monitoring.
Dobutamine	Synthetic Catecholamine	Selective β_1 + Weak α	M: Rapidly destroyed (like Dopamine).	Heart: Increases force of contraction (+ve inotropic) more than HR. No effect on peripheral resistance (PR).	Acute heart failure, cardiogenic shock (myocardial infarction).	Side Effects: Tachycardia, palpitation, nausea.	IV Infusion (must be stopped gradually).
Phenylephrine	Synthetic Non-Catecholamine	Selective α_1 agonist	<p>A: Effective orally.</p> <p>D: Passes BBB but no CNS action.</p> <p>Duration: Long duration.</p>	Potent vasoconstriction (VC), increases BP. Weaker than NE but longer-acting.	Nasal decongestant, mydriatic eye drops (for fundus exam), hypotensive states.	Side Effects: Rebound congestion upon stopping.	Oral, Local (Eye/Nose drops), Parenteral.

Amphetamine	Synthetic Non-Catecholamine	$\alpha + \beta$ (Indirect: releases NE)	D: Passes BBB easily (potent CNS effect). M: Not destroyed by MAO.	CNS: Euphoria, alertness, delays fatigue. Other: Anorexigenic (suppresses appetite), mild analgesic, facilitates spinal reflexes.	Narcolepsy, ADHD (low dose), morphine toxicity (analeptic).	Side Effects: Addiction, insomnia, schizophrenia (large dose). Contra: Tachycardia.	Oral (e.g., Adderall), IM, IV.
Ephedrine	Natural Alkaloid (Non-Catecholamine)	$\alpha + \beta$ (Mixed/Dual action)	A: Orally effective and stable. D: Passes BBB. M: Slow liver metabolism, not destroyed by MAO. E: Excreted unchanged in acidic urine.	Similar to Adrenaline but weaker, slower, and longer-acting. Exhibits Tachyphylaxis . Facilitates neuromuscular transmission.	Bronchial asthma, nasal decongestant, Myasthenia Gravis, Narcolepsy, Nocturnal enuresis.	Side Effects: Insomnia, anxiety, urinary retention in elderly prostatic patients.	Oral, Local (Nose/Eye), SC, IM.
Tyramine	Natural (Found in aged cheese, yogurt)	$\alpha + \beta$ (Indirect)	M: Metabolized by MAO.	Indirectly releases Noradrenaline from storage vesicles.	(No clinical use; important for food-drug interactions).	Cheese Reaction: Severe hypertensive crisis in patients taking MAO Inhibitors.	Found in diet.
Salbutamol	-	Selective β_2 agonists	Short Acting (SABA).	Potent bronchodilation.	Treatment of acute	-	Inhalation (Aerosol).

Terbutaline					asthma attacks.		
Salmeterol / Formoterol	-	Selective β_2 agonists	Long Acting (LABA).	Prolonged bronchodilation.	Prophylaxis of bronchial asthma and COPD.	-	Inhalation.
Ritodrine / Nylidrin	-	β_2 agonists	-	Uterine relaxation & peripheral vasodilation.	Delay premature labor, threatened abortion, painful menstruation, peripheral vascular disease.	-	-
Naphazoline / Xylometazoline	-	α agonists	Longer duration locally.	Nasal vasoconstriction.	Nasal decongestants (Newer group, less irritant than Phenylephrine).	-	Local (Nose drops).

❖ Remember

Receptor Type	Key Locations	Main Effects (Actions)	Mechanism / Second Messenger
Alpha 1	Blood vessels (skin/m.m.), Eye, Bladder sphincter, Male sex organs.	Vasoconstriction , Active Mydriasis (pupil dilation), Urinary retention , and Ejaculation .	$G\alpha_q$ (Increases IP_3 ·DAG and Ca^{++}).
Alpha 2	Presynaptic nerve endings, some blood vessels, Pancreas.	Inhibits neurotransmitter release (Negative Feedback), decreases insulin secretion.	$G\alpha_i$ (Decreases cAMP).
Beta 1	Heart (SA node, AV node, myocardium), Kidneys.	Increases all cardiac properties (Inotropic, Chronotropic, Dromotropic) and increases Renin release.	$G\alpha_s$ (Increases cAMP).

Beta 2	Smooth muscle (Bronchi, GI, Bladder, Uterus), Skeletal muscle blood vessels, Liver.	Bronchodilation, Vasodilation in skeletal muscles, relaxes uterine/bladder walls, and Glycogenolysis (increases blood sugar).	G\alpha_s (Increases cAMP).
Beta 3	Adipose (fat) tissue, Bladder.	Lipolysis (fat breakdown) and bladder relaxation.	G\alpha_s (Increases cAMP).
Dopamine 1	Renal, mesenteric, coronary, and cerebral blood vessels.	Vasodilation , increases renal blood flow and urine output.	G\alpha_s (Increases cAMP).
Muscarinic 1	CNS, Gastric parietal cells, Autonomic ganglia.	Increases Gastric acid secretion.	G\alpha_q (Increases IP_3 and Ca^{++}).
Muscarinic 2	Heart (Atria and conducting tissue).	Cardiac inhibition: Bradycardia (slow heart rate) and delayed AV conduction.	G\alpha_i (Decreases cAMP).
Muscarinic 3	Exocrine glands, Smooth muscle (Eye, GI, Bladder, Bronchi).	Increases secretions (saliva, sweat, lacrimation), Miosis (pupil constriction), Bronchoconstriction , and bladder/bowel contraction.	G\alpha_q (Increases IP_3 and Ca^{++})
Nicotinic (N_m)	Neuromuscular junction (Skeletal muscle).	Skeletal muscle contraction.	Ligand-gated ion channels (Na^+/K^+ flux).
Nicotinic (N_n)	Autonomic Ganglia, Adrenal medulla, CNS.	Stimulation of postganglionic neurons and secretion of Epinephrine/NE from the adrenal medulla.	Ligand-gated ion channels (Na^+/K^+ flux).