

Pharmacology Drug Chart

Cholinergic Agonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Acetylcholine	Muscarinic	↓ HR, CO and BP ↑ Salivary Secretions ↑ Secretions and Motility in the GIT ↑ Bronchiolar Secretions Miosis (Constriction of the Pupil)	
Bethanechol	Muscarinic	Stimulates the detrusor while relaxing the trigone and sphincter causing urination in Nonobstructive retention i.e. postoperative and postpartum	Sweating, Salivation, Flushing, ↓ BP, Nausea, Abdominal Pain, Diarrhea, and Bronchospasam
Carbachol	Muscarinic	Similar to Bethanechol to treat urinary retention Used on the Eye to cause Miosis ↓ Intraocular Pressure to treat Glaucoma	When used to treat Glaucoma there are little to no side effects b/c of direct administration
Pilocarpine	Muscarinic	Miosis ↓ Intraocular Pressure in BOTH Narrow and Wide angle Glaucoma	Can enter the brain and cause CNS disturbances ↑ Sweating ↑ Salivation

Anticholinesterases - Irreversible			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Organophosphates	Covalently bonds to AChase	Chronic treatment of Open-angle Glaucoma	Death ☹

Anticholinesterases - Reversible			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Physostigmine	Competitive Inhibitor of AChase	↑ Intestinal Motility ↑ Bladder Motility Miosis ↓ Intraocular Pressure Used to treat an overdose of Atropine	Bradycardia Can enter the CNS and high doses may cause convulsions
Neostigmine	Competitive Inhibitor of AChase	↑ Intestinal Motility ↑ Bladder Motility Antidote for Tubocurarine Treatment of Myasthenia Gravis	Sweating, Salivation, Flushing, ↓ BP, Nausea, Abdominal Pain, Diarrhea, and Bronchospasam

Cholinergic Antagonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Atropine	Non-specific Muscarinic Blocker via Competitive Binding	Mydriasis (Dilation of the Pupil) Relaxes the GIT Antispasmodic activity in the Bladder Treatment of Organophosphate overdose by blocking the effects of excess ACh caused by Anti-AChase Blocks secretions of the upper and lower respiratory tract	Dry Mouth Blurred Vision Tachycardia Constipation ↑ Intraocular Pressure (Bad for Glaucoma) Enters the CNS to cause Confusion, Hallucinations, Depression and collapse of the Circulatory and Respiratory systems

Ganglionic and Neuromuscular Blockers			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Nicotine		Low Dose - Ganglionic stimulation by depolarization High Dose - Ganglionic blockade Sympathetic Stimulation followed by paralysis of the ganglia	Irritability and Tremors Intestinal Cramps and Diarrhea ↑ HR ↑ BP ↑ Rate of Metabolism of other drugs - Induction
Hexamethonium (Trimethaphan)	Competitive Nicotinic Ganglionic Blocker	Used for the emergency lowering of BP	
Tubocurarine	Nondepolarizing NM Blocker	Low Dose - Nicotinic Receptor and competitively blocks the binding of ACh High Dose - blocks the Ion Channels of the End Plate Used to relax skeletal muscle during surgery	Histamine Release Ganglionic Blockade ↓ BP
Succinylcholine	Depolarizing NM Blocker	Rapid endothelial intubations	Hyperthermia Apnea due to the paralysis of the Diaphragm

Direct Acting Adrenergic Agonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Epinephrine - FIGHT OR FLIGHT	Low Dose β Med Dose D High Dose α	<u>ACTIONS</u> Positive Inotropic β 1 Positive Chronotropic β 1 ↑ CO ↓ TPR Vasoconstriction in Skin and Viscera α 1 Vasodilation in Liver and Skeletal Muscle β 2 ↓ Renal blood flow ↑ Systolic Pressure ↓ Diastolic Pressure Bronchodilation β 2 ↑ Glycogenolysis in Liver β 2 ↑ Release of Glucagon β 2 ↓ Release of Insulin α 2 ↑ Lipolysis - β 1 Receptors in Adipose Tissue <u>THERAPEUTIC USES</u> ↓ Intraocular Pressure (↓ Aqueous Humor) Used to treat Anaphylactic Shock Used to treat acute Asthma	CNS Disturbances Hemorrhage Cardiac Arrhythmias Pulmonary Edema
Norepinephrine	Mostly α 1, α 2 are for Negative Feedback β 1	↑ TPR ↑ BP	Reflex Bradycardia

Isoproterenol / Isoprenaline	β_1 and β_2 Decreased Uptake	Positive Inotropic Positive Chronotropic Vasodilation of Skeletal Muscle Bronchodilation	CNS Disturbances Hemorrhage Cardiac Arrhythmias Pulmonary Edema
Dopamine	High Dose α Med Dose β Low Dose D	\uparrow TPR \uparrow CO \downarrow TPR Drug of choice for shock because it \uparrow Renal and Splanchnic blood flow Treatment of CHF	Sympathetic Stimulation Nausea Hypertension Arrhythmias
Dobutamine	β_1	\uparrow CO Treatment of CHF	Use with caution in Atrial Fibrillation because the drug \uparrow atrioventricular conduction
Phenylephrine	α_1 and α_2 but mostly α_1	Resistant to COMT Vasoconstriction \uparrow Systolic Pressure \uparrow Diastolic Pressure Mydriasis	Reflex Bradycardia Hypertensive Headache Cardiac Irregularities
Clonidine	α_2	\downarrow BP due to its action on the CNS Treatment of Hypertension Treatment for the withdrawal from Opiates and Benzodiazepines	
Salbutamol	β_2	Bronchodilation Treatment of Asthma	Reflex Tachycardia
α-Methyldopa	α_2 Agonist	Treatment of Hypertension \downarrow TPR \downarrow BP Organ Blood Flow is NOT Reduced	Sedation Drowsiness

Indirect Acting Adrenergic Agonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Amphetamine	α , β , CNS	CNS stimulant in the treatment of children with ADD Also used in the treatment of Depression, Narcolepsy and Appetite Control	\uparrow BP \uparrow HR

Mixed Acting Adrenergic Agonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Ephedrine	α , β , CNS	Resistant to COMT and MAO Treatment of Asthma Nasal Decongestant \downarrow Fatigue \uparrow Athletic Performance	\uparrow BP \uparrow HR

α Adrenergic Antagonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Phenoxybenzamine	α_1 and α_2 Irreversible and Noncompetitive	Treatment of Pheochromocytoma - a catecholamine secreting tumor	Postural Hypotension Epinephrine Reversal Nasal Congestion Nausea Vomiting May induce Tachycardia Inhibits Ejaculation

Phentolamine	$\alpha 1$ and $\alpha 2$ Competitive	Used in the diagnosis of Pheochromocytoma	Postural Hypotension Tachycardia Cardiac Stimulation Epinephrine Reversal Anginal Pain Arrhythmias
Prazosin	$\alpha 1$ Competitive	Treatment of Hypertension ↓ TPR Alternative to surgery in benign Prostatic Hypertrophy thus improving urine flow	First Dose Effect Syncope Postural Hypotension Lack of Energy Nasal Congestion Headache

β Adrenergic Antagonists			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Propranolol	$\beta 1$ and $\beta 2$ Nonselective	↓ Intraocular Pressure ↓ Aqueous Humor Treatment of Migraine Curbing the effects of Hyperthyroidism Treatment of STABLE Angina (NOT ACUTE) Can aid in the prevention a Second MI	Bronchoconstriction Arrhythmias Sexual Impairment (unclear as to why) ↓ Glycogenolysis ↓ Glucagon - Adverse of Insulin dependent diabetics
Atenolol	$\beta 1$ Selective Cardioselective	Treatment of Hypertension ↓ BP Treatment of Angina Treatment of Atrial and Ventricular Arrhythmia Treatment of Tachycardia	May compromise respiratory activity in Asthmatics

Labetalol	α 1 Antagonist β 1 Antagonist β 2 Partial Agonist	Vasodilation ↓ BP ↓ HR Treatment of Hypertension - Especially useful for patients with Asthma and Diabetics due to the β 2 partial agonist effect	Postural Hypotension α 1 Dizziness α 1
------------------	--	--	---

Drugs Affecting Neurotransmitter Release			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Reserpine	Mg^{2+} / ATP Dependent Transporter	<u>ACTION</u> Blocks the Mg^{2+} / ATP Dependent transporter from transporting Norepinephrine, Dopamine and Serotonin from the cytoplasm into the storage vesicles <u>THERAPEUTIC USES</u> Treatment of Hypertension	Causes the ultimate depletion of Norepinephrine in the adrenergic neuron Sympathetic function is greatly impaired May cause Bradycardia
Guanethidine		Mechanism 1 - Displaces Norepinephrine from storage vesicles Mechanism 2 - Blocks the release of stored Norepinephrine Treatment of Hypertension (Rarely Used) ↓ BP ↓ HR	Postural Hypotension Male sexual function interference Hypertensive Crisis in patients with Pheochromocytoma due to a supersensitivity to Norepinephrine
Cocaine	Na^+ / K^+ ATPase	Inhibits reuptake 1 of Norepinephrine from the synaptic cleft by blocking Na/K ATPase	Causes the accumulation of Norepinephrine in the synaptic space Causes an enhancement of Sympathetic activity

Antiarrhythmic Drugs			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Quinidine Class IA Na ⁺ Channel Blocker	Binds to Open and Inactive Na Channels to Prevent Influx	Slows Phase 0 Depolarization Treatment of Atrial, AV, and Ventricular Arrhythmias	May cause SA and AV Block Asystole May induce ventricular Tachycardia
Lidocaine Class IB Na ⁺ Channel Blocker	Binds to Open and Inactive Na Channels to Prevent Influx	Shortens Phase 3 Repolarization Suppresses arrhythmias caused by abnormal automaticity within the cells Treatment of Ventricular Arrhythmias during MI Drug of choice for the emergency treatment of Cardiac Arrhythmias - Wide therapeutic to toxic ratio	Drowsiness Slurred Speech Agitation Confusion Convulsions Ventricular Arrhythmias Does not slow down conduction therefore it is not useful for AV junction arrhythmias
Flecainide Class IC Na ⁺ Channel Blocker	Binds to Open and Inactive Na Channels to Prevent Influx	Markedly Slows Phase 0 Depolarization Treatment of Refractory Ventricular Arrhythmias	Negative Inotropic Can aggravate CHF Ventricular Tachycardia Dizziness Blurred Vision

Propranolol Class II β Adrenoreceptor Blocker REPEAT	$\beta 1$ and $\beta 2$ Nonselective	Suppresses Phase 4 Depolarization \downarrow cAMP causes \downarrow Ca^{2+} Influx in Cardiac Tissue which leads to \downarrow CO \downarrow HR \downarrow Intraocular Pressure \downarrow Aqueous Humor Treatment of Migraine Curbing the effects of Hyperthyroidism Treatment of STABLE Angina (NOT ACUTE) Treatment of arrhythmias caused by \uparrow sympathetic activity Can aid in the prevention of a Second MI	Bronchoconstriction Arrhythmias Sexual Impairment (unclear as to why) \downarrow Glycogenolysis \downarrow Glucagon
Amiodarone Class III K^+ Channel Blocker	Binds to K Channels to Diminish Outward Current During Repolarization	Prolongs Phase 3 Repolarization Treatment of severe Supraventricular and Ventricular Tachycardia Has Class I, II, III, IV Effects	Interstitial Pulmonary Fibrosis GI Intolerance Hyper or Hypothyroidism Liver Toxicity Neuropathy Muscle Weakness Blue Skin (Iodine accumulation)
Verapamil Class IV Ca^{2+} Channel Blocker	Binds to Voltage Gated Ca Channels to Decrease the Inward Current	Shortens Action Potential Greater effect on the heart than on vascular smooth muscle Treatment of Atrial Dysrhythmias Treatment of Reentrant Supraventricular Tachycardia Reduction in Atrial Flutter Treatment of Hypertension	Negative Inotropic \downarrow BP due to peripheral vasodilation

Diltiazem Class IV Ca^{2+} Channel Blocker	Binds to Voltage Gated Ca Channels to Decrease the Inward Current	Shortens Action Potential Greater effect on the heart than on vascular smooth muscle Treatment of Atrial Dysrhythmias Treatment of Reentrant Supraventricular Tachycardia Reduction in Atrial Flutter Treatment of Hypertension	Negative Inotropic ↓ BP due to peripheral vasodilation
Digoxin	Blocks Na/K Channels and Reverses Ca/Na Antiport to ↑ Intracellular Ca	Shortens the refractory period in both the atria and the ventricles while prolonging the effective refractory period and decreasing the conduction velocity	Can cause Ectopic ventricular beats Ventricular Tachycardia or Fibrillation
Adenosine	Inhibits cAMP Dependent Ca and ↑ K Conduction (Hyperpolarization)	Slows AV Nodal Conduction Treatment of Supraventricular Tachycardia	Flushing Shortness of Breath AV Block
Mg²⁺	Unknown	Treatment of Digitalis Induced Arrhythmias Treatment of Ventricular Tachycardia	

Cardiac Glycosides			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Digitalis Digoxin Digitoxin	Reversibly Binds with the Na/K ATPase	Digoxin is used in the treatment of severe left ventricular systolic dysfunction Positive Inotropic - improved circulation leads to ↓ TPR and eventually ↓ HR Negative Chronotropic	Progressively more severe Dysrhythmia Supraventricular Tachycardia Ventricular Fibrillation Complete Heart Block Small therapeutic level before Digitalis Toxicity - Ca overload together with diuretics Hyperkalemia Anorexia, Nausea and Vomiting Headache, Fatigue, Confusion, Blurred Vision, Alteration of Color Perception and Haloes

Phosphodiesterase Inhibitors			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Milrinone / Amrinone	Inhibits Phosphodiesterase Enzyme	↑ cAMP causes ↑ Ca ²⁺ Influx in Cardiac Tissue which leads to ↑ CO ↑ Vasodilation Treatment of CHF	Toxicity and Death ☹

Antihypertensive Drugs			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Thiazide Diuretics Bendrofluazide	Mechanism Unknown	Treatment of Hypertension ↑ Water and Na Excretion ↓ BP ↓ TPR ↓ CO ↓ [Ca ²⁺] in the Urine	Induce Hypokalemia and Hyperuricemia Can induce Hyperglycemia Gout Diabetics Mellitus
Loop Diuretics		Cause ↓ Renal Vascular Resistance and ↑ Renal Blood Flow ↑ [Ca ²⁺] in the Urine Used on patients with poor renal function rather than the Thiazide Diuretics	
Propranolol REPEAT	β ₁ and β ₂ Nonselective	↓ Intraocular Pressure ↓ Aqueous Humor Treatment of Migraine Curbing the effects of Hyperthyroidism Treatment of STABLE Angina (NOT ACUTE) Can aid in the prevention of a Second MI	Bronchoconstriction Arrhythmias Sexual Impairment (unclear as to why) ↓ Glycogenolysis ↓ Glucagon
Atenolol REPEAT	β ₁ Selective Cardiosselective	Treatment of Hypertension ↓ BP Treatment of Angina Treatment of Atrial and Ventricular Arrhythmia Treatment of Tachycardia	May compromise respiratory activity in Asthmatics

Labetalol REPEAT	α 1 Antagonist β 1 Antagonist β 2 Partial Agonist	Vasodilation ↓ BP ↓ HR Treatment of Hypertension - Especially useful for patients with Asthma and Diabetics due to the β 2 partial agonist effect	Postural Hypotension α 1 Dizziness α 1
ACE Inhibitors Captopril	Blocks the ACE enzyme	↓ Peripheral Vascular Resistance without affecting CO, HR or Contractility Treatment of Hypertension	Dry Cough due to a diminished rate of Bradykinin Inactivation Renal Damage Rashes Fever First Dose Effect Syncope
Angiotensin II Antagonists: Losartan	Highly Selective Angiotensin II Receptor Blocker (AT_1 Subtype)	Similar to ACE Inhibitors Vasodilation Blocks Aldosterone Secretion No Dry cough because Bradykinin is not affected	Improved of ACE Inhibitors Fetotoxic
Prazosin REPEAT	α 1 Competitive	Treatment of Hypertension ↓ TPR Alternative to surgery in benign Prostatic Hypertrophy thus improving urine flow	First Dose Effect Syncope Postural Hypotension Lack of Energy Nasal Congestion Headache

Verapamil Class IV Ca^{2+} Channel Blocker REPEAT	Binds to Ca Channels to Decrease the Inward Current	Shortens Action Potential Greater effect on the heart than on vascular smooth muscle Treatment of Atrial Dysrhythmias Treatment of Reentrant Supraventricular Tachycardia Reduction in Atrial Flutter Treatment of Hypertension	Negative Inotropic ↓ BP due to peripheral vasodilation
Diltiazem Class IV Ca^{2+} Channel Blocker REPEAT	Binds to Ca Channels to Decrease the Inward Current	Shortens Action Potential Greater effect on the heart than on vascular smooth muscle Treatment of Atrial Dysrhythmias Treatment of Reentrant Supraventricular Tachycardia Reduction in Atrial Flutter Treatment of Hypertension	Negative Inotropic ↓ BP due to peripheral vasodilation
Clonidine REPEAT	α_2 Agonist	↓ BP due to its action on the CNS Treatment of Hypertension Treatment for the withdrawal from Opiates and Benzodiazepines	
α-Methyldopa REPEAT	α_2 Agonist	Treatment of Hypertension ↓ TPR ↓ BP Organ Blood Flow is NOT Reduced	Sedation Drowsiness

Reserpine REPEAT	Mg^{2+} / ATP Dependent Transporter	<u>ACTION</u> Blocks the Mg^{2+} / ATP Dependent transporter from transporting Norepinephrine, Dopamine and Serotonin from the cytoplasm into the storage vesicles <u>THERAPEUTIC USES</u> Treatment of Hypertension	Causes the ultimate depletion of Norepinephrine in the adrenergic neuron Sympathetic function is greatly impaired May cause Bradycardia
----------------------------	---	---	---

Vasodilators			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Hydralizine		Atrial Dilation ↓ TPR Treatment of Hypertension	Tachycardia GI discomfort Hirsutism
Minoxidil		Atrial Dilation ↓ TPR Treatment of Hypertension	Tachycardia GI discomfort Hirsutism

K ⁺ Sparing Diuretics			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Spirolactene	Competes with Aldosterone Receptors	Leads to Na Secretion and K Retention Weak Diuretic	Hyperkalemia

Autacoids			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
Prostaglandins		Abortion Peptic Ulcers Inhibits the secretion of HCl in the stomach Erectile Dysfunction (Alprostadil)	With Alprostadil there is pain at the site of injection
Histamine	H ₁ H ₂ H ₁ and H ₂	Bronchial and Intestinal Smooth Muscle Contraction ↑ NO ↑ Production of Nasal and Bronchial Mucus Stimulates Itch and Pain and Sensory Nerve Endings ↑ Gastric HCl secretion ↓ Systemic BP ↓ Peripheral Resistance Positive Inotropic (H ₁ and H ₂) Positive Chronotropic (H ₂) Capillary Permeability Vasodilation Triple Response - Wheal Formation, Reddening and Halo	Respiratory Symptoms ↓ Lung Capacity Intestinal Cramps Diarrhea

Antihistamines			
Drug Name	Receptor	Therapeutic Uses	Adverse Effects
H₁ Receptor Blockers Chlorpheniramine	H ₁ Receptor Competitive	Treatment of Allergic Conditions CANNOT treat Bronchial Asthma Motion Sickness and Nausea Treatment of Insomnia	Sedation Dry Mouth Drug Interactions (MAO Inhibitors) Overdose in Children Tremor Vertigo
H₂ Receptor Blockers Cimetidine	H ₂ Receptor Competitive	Treatment of Peptic Ulcers ↓ Gastric HCl Secretion	