

IQRA NATIONAL UNIVERSITY

(ALLIED HEALTH SCIENCES)

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PROGRAM: BS DENTAL

SEMESTER: 4th

(ASSIGNMENT)

SUBJECT: PHARMACOLOGY

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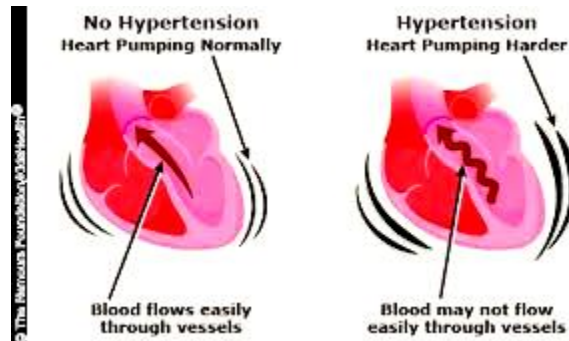
DATE: 09 July 2020

ASSIGNMENT

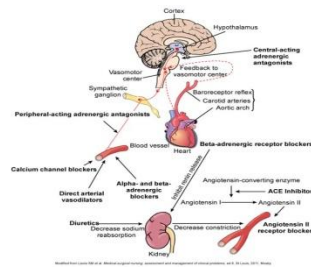
DISCUSS VARIOUS DRUGS CLASSES USED FOR HYPERTENSION AND CARDIAC FAILURE.

HYPERTENSION:

Increase blood pressure (pressure exerted by blood against the wall of blood vessels) in arteries called hypertension. It is common cardiovascular disease.



DRUGS USED FOR HYPERTENSION:



1. **DIURETICS:** Diuretic drugs increase urine output by the kidney (Act on V2 receptor) (i.e., promote diuresis). This is accomplished by altering how the kidney handles sodium. If the kidney excretes more sodium, then water excretion will also increase and decrease in blood volume – cardiac output will decrease--- and last BP decrease.

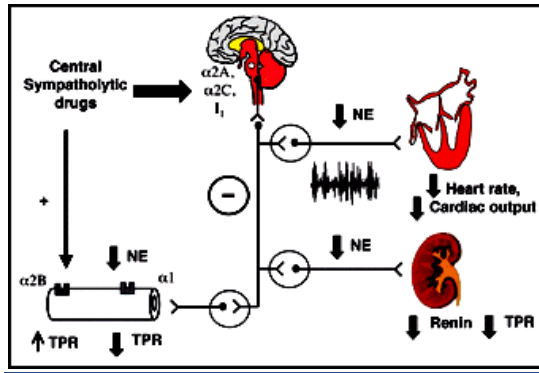


Agents: Thiazides diuretics (chlorthalidone), Loop diuretics (Furosemide), K+ sparing diuretics (Spironolactone)

2. **SYMPATHOLYTIC DRUGS:**

➤ **Central Sympatholytics (α-2 Agonists):**

Central sympatholytic drugs reduce blood pressure mainly by stimulating central α₂-adrenergic receptors in the brainstem centers, thereby reducing sympathetic nerve activity and neuronal release of norepinephrine to the heart and peripheral circulation. Vessel will become dilate than decreased PR and also decreased BP

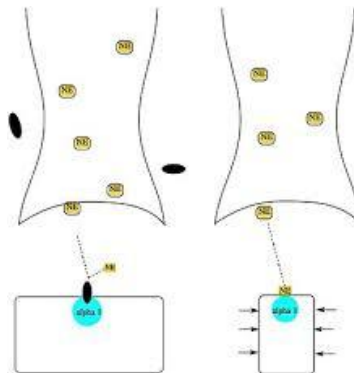


Drugs: clonidine, methyldopa

Site of Action: CNS medullary, cardiovascular centers

➤ **SYMPATHOLYTIC DRUGS α-1 Adrenergic blockers (Antagonists):**

α-1 adrenergic blocker Blocks the α-1 receptor (in post synaptic neuron as well as in vascular smooth muscles) that will cause vasodilatation due to relaxation of vascular smooth muscles, after vasodilatation the PR become decreased and also reduces preload by pooling of blood, than the cardiac output also decreased and last the BP become normal or decrease



Drugs: Prazocin, Terazosin

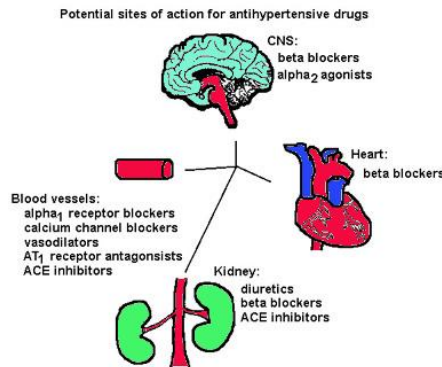
Site of Action: peripheral arterioles, smooth muscle

➤ **β-ADRNERGIC BLOCKERS (ANTAGONISTS):**

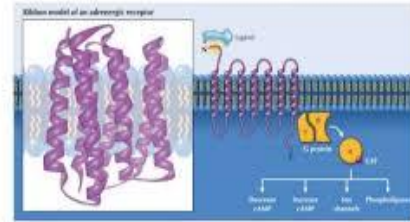
Beta blockers, also known as beta-adrenergic blocking agents, are medications that reduce your blood pressure. Beta blockers work by blocking the effects of

the hormone epinephrine, also known as adrenaline. Beta blockers cause your heart to beat more slowly and with less force, which lowers blood pressure

- Heart (blocks b -1 receptor), kidney (depresses RAS system-)



Beta adrenergic blockers



Moderator → Dr. Ali Ahmad
Resident → Dr. Karun Kumar (JR – II)

Drugs: Non Selective (Propranolol, Timolol, Pindolol), Cardio-selective (Atenolol, Metoprolol (acts only on beta-1 receptor))

Site of Action: heart, kidney.

➤ **b-1 DUAL ALPHA & BETA RECEPTOR ANTAGONISTS:**

It is useful in hypertensive emergencies

Alpha & Beta Blockers

- Mechanism:
 - Block cardiac contractility
 - Decrease HR (Beta 1)
 - Block secretion of renin
 - Vasodilation of veins
- Medications:
 - Labetalol
 - Carvedilol (Coreg®)

The diagram illustrates the renin-angiotensin system (RAS) and its regulation. Key components include:

- Angiotensin II:** Stimulates sympathetic nerve terminals (releasing norepinephrine, epinephrine, and renin) and the sympathetic ganglia (releasing norepinephrine).
- Angiotensin I:** Stimulates vascular smooth muscle (causing vasoconstriction) and the sympathetic ganglia.
- Angiotensin II Receptor Blockers (ARBs):** Block the effects of Angiotensin II on its receptors.
- ACE Inhibitors:** Block the conversion of Angiotensin I to Angiotensin II.
- Other drugs:** Calcium channel blockers, diuretics, and vasodilators are also shown to affect the RAS.

Drugs: Labetalol (3:1 ratio of beta: alpha blocking activity),

Carvedilol

3. **VASODIALATOR:** Vasodilators are medications that open (dilate) blood vessels. They affect the muscles in the walls of your arteries and veins, preventing the muscles from tightening and the walls from narrowing. As a result, blood flows more easily through your vessels. Therefore, dilation of arteries and arterioles leads to an immediate decrease in arterial blood pressure and heart rate

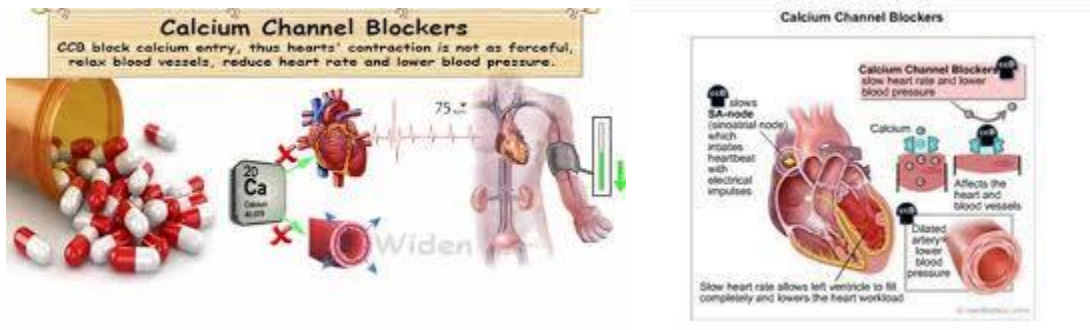
- Releases NO ----stimulation of guanylyl cyclase---- more conversion of GTP to cGMP-----activate protein kinase----- myosin phosphorylation & combination with actin inhibited----relaxation of vascular inhibit *MLCK phosphorylation-smooth muscles



Drugs: Arteriolar (Hydralazine), Arterio-venular: Sodium Nitroprusside (USED IN EMERGENCY SITUATION)

4. CALCIUM CHANNEL BLOCKERS (CCBs): Calcium channel blockers lower your blood pressure by preventing calcium from entering the cells of your heart and arteries. Calcium causes the heart and arteries to contract more strongly. By blocking calcium, calcium channel blockers allow blood vessels to relax and open

- Blocks long acting voltage sensitive calcium channels

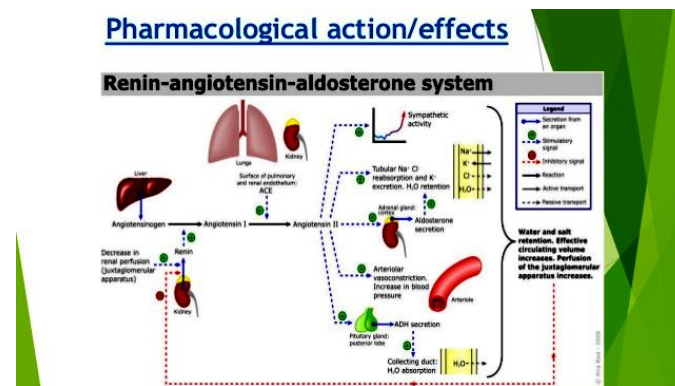


Drugs: verapamil; nifedipine; diltiazem; amlodipine: felodipine

Site of Action: Vascular smooth muscle K+, Ca+, Na+

5. DRUGS ACTING ON RENIN ANGIOTENSIN SYSTEM (RAS):

- Inhibit generation of Angiotensin II
- Inhibit degradation of bradykinin which is potent vasodilator
- Dilates both arteries & vein
- Blood flow to vital organs increases
- Decrease aldosterone production indirectly



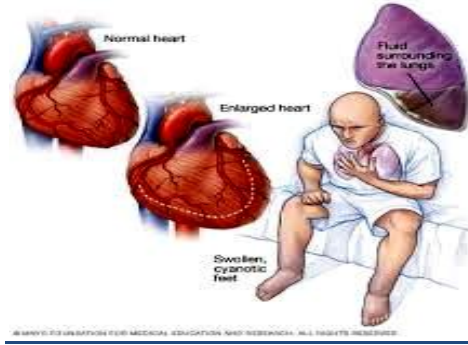
Drugs:

1. ACE inhibitors: captopril; enalapril; lisinopril
2. renin inhibitors: Aliskiren; remikinen
3. AT1 receptor antagonists: losartan; candesartan

CARDIAC HEART FAILURE:

It is a serious condition, and usually there's no cure. The heart failure is a term used to describe a heart that cannot keep up with its workload. The body may not get the oxygen it needs. OR

A chronic condition in which the heart is unable to pump a sufficient quantity of blood to meet the needs of peripheral tissues Primary symptoms



DRUGS USED FOR CARDIAC HEART FAILURE:

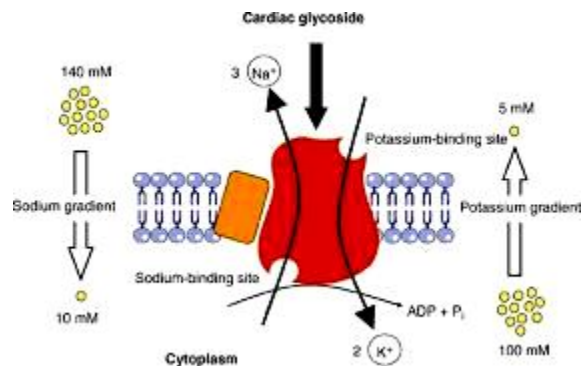
There are two strategies which have basic goals in congestive heart failure is to improve the heart's pumping ability.

1. Increase cardiac contractile performance (positive inotropic effect)
2. Decrease cardiac work load

➤ **Drugs that increase myocardial contraction force**

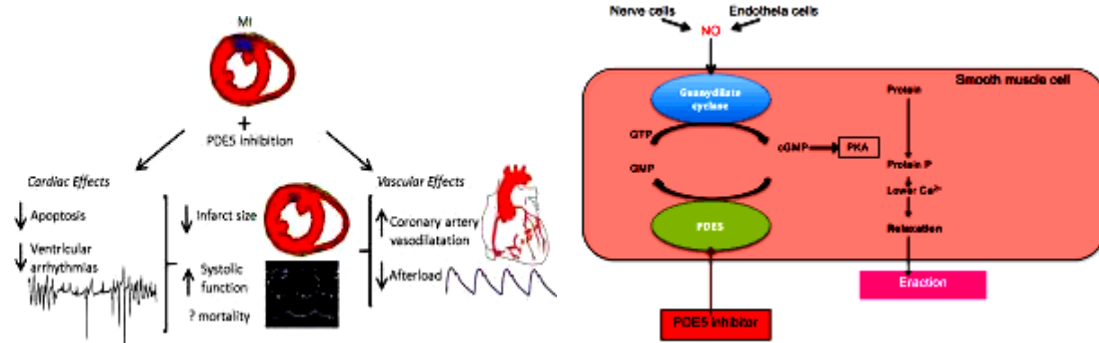
1. **CARDIAC GLYCOSIDES:** By inhibiting the Na^+/K^+ -ATPase, cardiac glycosides cause intracellular sodium concentration to increase. ... Inhibition of the Na^+/K^+ -ATPase in vascular smooth muscle causes depolarization, which causes smooth muscle contraction and vasoconstriction.

- Digoxin (Lanoxin)
- Digitoxin (Digitaline)

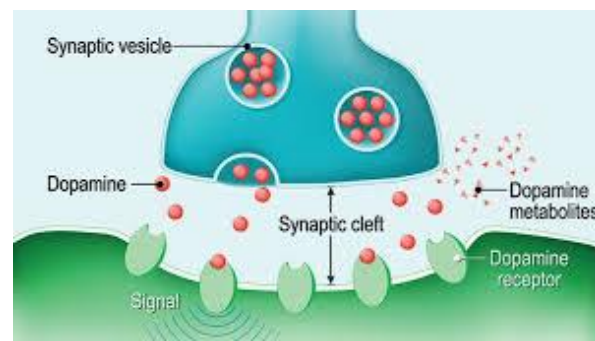


2. **Phosphodiesterase Inhibitors:** In patients with heart failure, inhibitors of enzymes in the PDE3 family of cyclic nucleotide phosphodiesterases are used to raise intracellular cAMP content in cardiac muscle, with inotropic actions

- Inamrinone
- Milrinone



3. **Dopamine and Dobutamine:** Dopamine and dobutamine exert a fairly specific positive inotropic effect, presumably through their ability to stimulate beta-1 receptors on the myocardium. Other beta-1 agonists (epinephrine, prenalterol, etc.) will also increase myocardial contractility, but most of these other beta-1 agonists will also increase heart rate or have other side effects that prevent their use in congestive heart failure



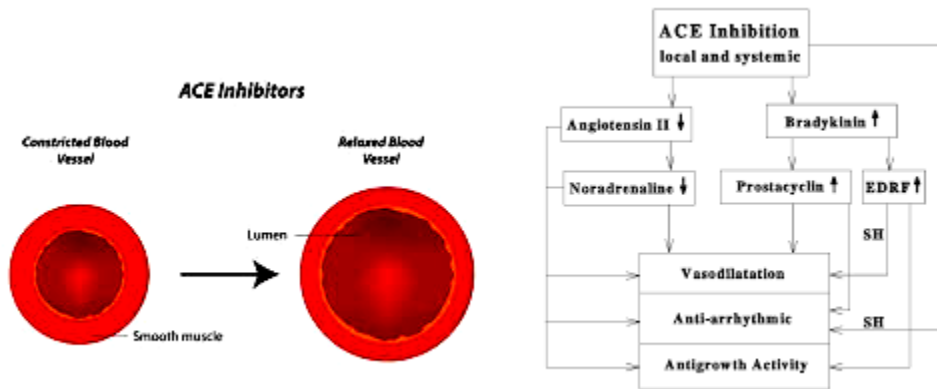
➤ **Decrease cardiac work load**

1. **Drugs Affecting the Renin-Angiotensin System:**

- **ACE inhibitors:** ACE inhibitors block the action of a protein (enzyme that doing the converting of Angiotensin I into Angiotensin II) that causes blood vessels to narrow. As a result, blood vessels relax and widen. This lowers blood pressure and makes it easier for your heart to pump blood. These medicines also help your body release water and salt (sodium), which also helps lower blood pressure AND last result the workload of heart become

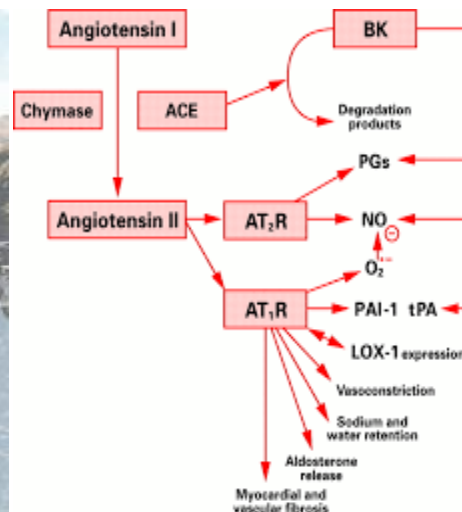
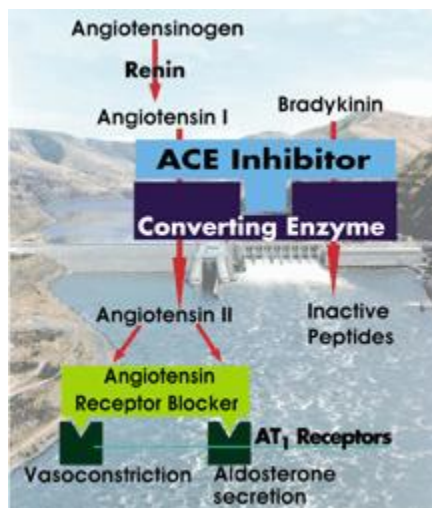
decrease

- Captopril (Capoten)
- Enalapril (Vasotec)



➤ **Angiotensin II Receptor Blockers:** Angiotensin II receptor blockers (also called ARBs), prevent angiotensin II from binding to receptors on vascular tissues; block the effects of a substance called angiotensin II. It causes blood vessels to constrict, which can lead to high blood pressure. ARBs help expand blood vessels to lower blood pressure and make it easier for the heart to pump blood

- Candesartan
- Losartan
- Valsartan

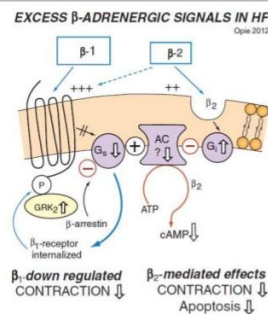


2. **Beta Blockers:** Beta-blockers help treat diastolic heart failure, because they slow the heart rate and allow more time for your heart to fill with blood. This allows the left ventricle to fill more completely and increases the volume of blood that the heart pumps with each heartbeat (ejection fraction)

Beta blockers bind to beta-1 receptors on the myocardium and block the effects of norepinephrine and epinephrine. These drugs therefore normalize sympathetic stimulation of the heart--- help reduce heart rate & and myocardial contraction force

- Acebutolol (Sectral)
- Atenolol (Tenormin)
- Carteolol (Cartrol)
- Carvedilol (Coreg)
- Labetolol (Normodyne, Trandate)
- Metoprolol

Beta blockers in heart failure

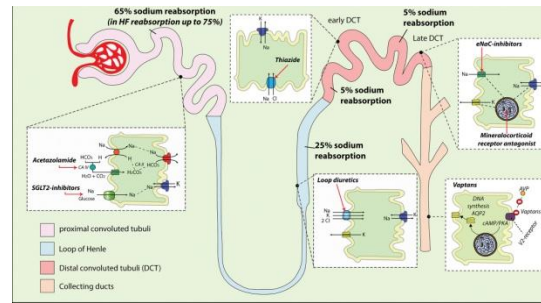


3. **Diuretics:** Through their effects on sodium and water balance, diuretics decrease blood volume and venous pressure. This decreases cardiac filling (preload) and, by the Frank-Starling mechanism, decreases ventricular stroke volume and cardiac output, which leads to a fall in arterial pressure

Diuretics work by inhibiting the reabsorption of sodium from the nephron, which, in turn, decreases the amount of water that is normally reabsorbed with sodium, thus increasing water excretion. This effect reduces congestion caused by fluids retained in the body and decreases cardiac preload by

excreting excess fluid in the vascular system.

- Furosemide
- Thiazide diuretics
- Spironolactone
- Eplerenone



4. **Vasodilators:** vasodilator drugs relax the smooth muscle in blood vessels, which causes the vessels to dilate. Dilation of arterial (resistance) vessels leads to a reduction in systemic vascular resistance, which leads to a fall in arterial blood pressure

Produces vasodilatation by blocking alpha-1 receptors on vascular smooth

decrease cardiac workload by decreasing peripheral vascular resistance

- Prazosin
- Hydralazine
- Organic nitrates



THANK YOU SO MUCH

