



Antihypertensive Drugs: Classes and Mechanisms

Antihypertensive drugs are used to lower **high blood pressure (hypertension)** and reduce the risk of complications like heart disease, stroke, and kidney failure.

1. Diuretics ("Water Pills")

- Help the kidneys **remove excess sodium and water**, reducing blood volume and lowering BP.
- **Examples:**
 - **Thiazide diuretics** – Hydrochlorothiazide (HCTZ), Chlorthalidone
 - **Loop diuretics** – Furosemide, Bumetanide (used in severe cases)
 - **Potassium-sparing diuretics** – Spironolactone, Amiloride

✓ **Best for:** Mild to moderate hypertension, heart failure, and fluid retention.

⚠ **Side effects:** Dehydration, low potassium (except in potassium-sparing types).

2. Beta-Blockers (BBs)

- Reduce heart rate and cardiac output by blocking **beta-adrenergic receptors**.
- **Examples:**
 - Propranolol (non-selective)
 - Metoprolol, Atenolol (selective)
 - Carvedilol, Labetalol (used in heart failure and pregnancy)

✓ **Best for:** Heart disease, post-heart attack, migraine prevention.

⚠ **Side effects:** Fatigue, dizziness, slow heart rate.



3. Angiotensin-Converting Enzyme (ACE) Inhibitors

- Prevent **angiotensin II** formation, a hormone that narrows blood vessels.
- **Examples:**
 - Lisinopril, Enalapril, Ramipril

✓ **Best for:** Hypertension with diabetes, kidney protection.

⚠ **Side effects:** Dry cough, high potassium, angioedema (rare).

4. Angiotensin II Receptor Blockers (ARBs)

- Block **angiotensin II receptors**, relaxing blood vessels.
- **Examples:**
 - Losartan, Valsartan, Telmisartan

✓ **Best for:** Those who cannot tolerate ACE inhibitors (no cough).

⚠ **Side effects:** High potassium, dizziness.

5. Calcium Channel Blockers (CCBs)

- Prevent calcium entry into heart and blood vessel cells, relaxing them.
- **Examples:**
 - **Dihydropyridines:** Amlodipine, Nifedipine (mainly lower BP)
 - **Non-dihydropyridines:** Verapamil, Diltiazem (also slow heart rate)

✓ **Best for:** Elderly patients, high BP with angina.

⚠ **Side effects:** Swelling (edema), headache, dizziness.

6. Alpha-Blockers



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- Block **alpha receptors**, preventing blood vessel constriction.

- **Examples:**

- Prazosin, Doxazosin

✅ **Best for:** Hypertension with prostate enlargement (BPH).

⚠️ **Side effects:** Dizziness, low BP when standing (orthostatic hypotension).

7. Central Acting Agents

- Reduce BP by acting on the **brain's central nervous system**.

- **Examples:**

- Clonidine, Methyldopa

✅ **Best for:** Severe hypertension, pregnancy (Methyldopa).

⚠️ **Side effects:** Sedation, dry mouth, rebound hypertension if stopped suddenly.

8. Direct Vasodilators

- Directly **relax blood vessels**.

- **Examples:**

- Hydralazine, Minoxidil

✅ **Best for:** Resistant hypertension, heart failure (Hydralazine + Nitrates).

⚠️ **Side effects:** Fluid retention, fast heart rate, excessive hair growth (Minoxidil).

Combination Therapy

Many patients require **two or more drugs** to control hypertension effectively. Common combinations:



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- ✓ ACE inhibitors/ARBs + Diuretics
 - ✓ CCBs + Beta-blockers
 - ✓ Diuretics + Beta-blockers
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Choosing the Right Antihypertensive

- ✓ **Diabetics/Kidney Disease?** → ACE inhibitors or ARBs
- ✓ **Elderly patients?** → CCBs, Diuretics
- ✓ **Pregnancy?** → Methyldopa, Labetalol
- ✓ **Heart disease history?** → Beta-blockers, ACE inhibitors