**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**

* 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:  
✔️ ACE inhibitors/ARBs + Diuretics  
✔️ CCBs + Beta-blockers  
✔️ Diuretics + Beta-blockers

**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