

Name: Mannitol**Class:** Diuretic (Non-Metabolized Osmotic Diuretic)**Mech.:** Filtered into tubule space → ↑↑ tubular fluid osmolality → ↓ fluid reabsorption → ↑ excretion of water and some Na⁺.**Absorption:** IV only (oral → osmotic diarrhea). Takes effect in 10 min.**Dist.:****Metab.:****Excretion, t_{1/2}:** 1.2 hr.**Toxicity/S.E.s:** ↑ plasma osmolality. If GFR is reduced (e.g., renal failure or CHF), mannitol stays in ECF → water movement from cells to ECF → potential production/exacerbation of heart failure and hyponatremia. C/i—CHF, renal failure.**Utility:** Prophylaxis against renal dysfunction (e.g., in major surgical procedures).**Special Features:****Name: Furosemide (Lasix)****Class:** Diuretic (Loop Diuretic)**Mech.:** Blocks the Na⁺/K⁺/Cl⁻ co-transporter in the apical membrane of the thick ascending limb of Henle's loop → ↑ excretion of urinary water, Na⁺, K⁺, Ca²⁺, & Mg²⁺. Also causes venous and renal vasodilation.**Absorption:** Oral, IV. Takes effect in 20 min.**Dist.:** **Metab.:****Excretion, t_{1/2}:** 1-1.5 hr. Shorter duration than thiazides.**Toxicity/S.E.s:** Hypokalemia (esp. dangerous if pt. is on digitalis), Ca²⁺ & Mg²⁺ depletion, metabolic alkalosis, volume contraction, mild hyperglycemia, thiazide-like lipid changes, sulfonamide allergy cross-rxn, ototoxicity. C/i—pts. susceptible to volume contraction from excessive diuresis (e.g., elderly), and pts. susceptible to problems w/hypokalemia (e.g., cirrhosis, digitalis). Adverse rxn w/lithium, aminoglycosides. Altered doses of anti-diabetic agents required.**Utility:** Diuresis for hypertension when a short-acting diuretic is indicated. Treat HTN refractory to thiazides. Very useful in conditions refractory to less potent diuretics (e.g., CHF, renal insufficiency, nephrotic synd.). Treat hypercalcemia.**Special Features:** Most potent diuretics available. Can cause excretion of up to 20% of filtered Na⁺.**Name: Acetazolamide (Diamox)****Class:** Diuretic (Carbonic Anhydrase Inhibitor)**Mech.:** Inhib. of CA → ↓ reabsorption of NaHCO₃ in prox. tubule. K⁺ is exchanged for Na⁺ in distal tubule. Net = ↑ in urinary HCO₃⁻, K⁺, and water excretion.**Absorption:** Oral. Takes effect in 30 min.**Dist.:****Metab.:****Excretion, t_{1/2}:** 13 hr.**Toxicity/S.E.s:** Metabolic acidosis, hypokalemia. C/i—cirrhosis.**Utility:** Treat glaucoma and ↑ CNS pressure. Alkalinize urine. Prevent altitude sickness. Diuresis.**Special Features:** Relatively weak diuretic. Generally prescribed for non-diuretic purposes. Effectiveness reduced w/continued therapy because plasma [HCO₃⁻] falls.**Name: Bumetanide (Bumex)****Class:** Diuretic (Loop Diuretic)**Mech.:** Blocks the Na⁺/K⁺/Cl⁻ co-transporter in the apical membrane of the thick ascending limb of Henle's loop → ↑ excretion of urinary water, Na⁺, K⁺, Ca²⁺, & Mg²⁺. Also causes venous and renal vasodilation.**Absorption:** Oral, IV. Takes effect in 20 min.**Dist.:** **Metab.:****Excretion, t_{1/2}:** 1-1.5 hr.**Toxicity/S.E.s:** Hypokalemia (esp. dangerous if pt. is on digitalis), Ca²⁺ & Mg²⁺ depletion, metabolic alkalosis, volume contraction, mild hyperglycemia, sulfonamide allergy cross-rxn, ototoxicity. C/i—pts. susceptible to volume contraction from excessive diuresis (e.g., elderly), and pts. susceptible to problems w/hypokalemia (e.g., cirrhosis, pts. taking digitalis).**Utility:** Diuresis for hypertension when a short-acting diuretic is indicated. Very useful in conditions refractory to less potent diuretics, including CHF, renal insufficiency, and nephrotic synd. Also used to treat hypercalcemia.**Special Features:** Most potent diuretics available. Far more potent than furosemide. Can cause excretion of up to 20% of filtered Na⁺.

Name: Ethacrynic Acid (Edecrin)**Class:** Diuretic (Loop Diuretic)**Mech.:** Blocks the $\text{Na}^+/\text{K}^+/\text{Cl}^-$ co-transporter in the apical membrane of the thick ascending limb of Henle's loop \rightarrow \uparrow excretion of urinary water, Na^+ , K^+ , Ca^{2+} , & Mg^{2+} . Also causes venous and renal vasodilation.**Absorption:** Oral, IV. Takes effect in 20 min.**Dist.:** **Metab.:****Excretion, $t_{1/2}$:** 1-1.5 hr.**Toxicity/S.E.s:** Hypokalemia (esp. dangerous if pt. is on digitalis), Ca^{2+} & Mg^{2+} depletion, metabolic alkalosis, volume contraction, mild hyperglycemia, ototoxicity. C/i—pts. susceptible to volume contraction from excessive diuresis (e.g., elderly), and pts. susceptible to problems w/hypokalemia (e.g., cirrhosis, pts. taking digitalis).**Utility:** Diuresis for hypertension when a short-acting diuretic is indicated. Very useful in conditions refractory to less potent diuretics, including CHF, renal insufficiency, and nephrotic synd. Also used to treat hypercalcemia.**Special Features:** More ototoxic than other loop diuretics. Most potent diuretics available. Can cause excretion of up to 20% of filtered Na^+ .**Name: Hydrochlorothiazide (Hydrodiuril)****Class:** Diuretic (Thiazide)**Mech.:** Inhib. Na^+ & Cl^- transport in the cortical thick ascending limb and the early distal tubule \rightarrow \uparrow NaCl and water excretion, & \downarrow excretion of Ca^{2+} and uric acid.**Absorption:** Oral \rightarrow good absorption. Takes effect in 1 hr.**Dist.:** **Metab.:** **Excretion, $t_{1/2}$:** Short duration of action.**Toxicity/S.E.s:** Hypokalemia, hyponatremia, hyperuricemia, weakness, hypercalcemia, metabolic alkalosis, postural hypotension, hypercholesterolemia, hypertriglyceridemia, hyperglycemia (in patients w/DM), and rare hypersensitivity rxns. C/i—pts susceptible to problems with hypokalemia (cirrhosis, pts on digitalis), hyperuricemia (gout), or hypercalcemia. Adverse rxns w/digitalis, lithium. Altered doses of anti-diabetic agents required. Long-term NSAID use may decrease anti-HTN effects.**Utility:** Treat hypertension, CHF, nephrotic synd., other Na^+ -retaining states. Reduce Ca^{2+} excretion (e.g., prevention of kidney stones).**Special Features:** Most commonly prescribed class of diuretics. Most frequently used anti-HTN class of agents. Milder diuretic action than loop diuretics. Rel. ineffective in renal insuff.**Name: Chlorthalidone (Hygroton)****Class:** Diuretic (Thiazide)**Mech.:** Inhib. Na^+ & Cl^- transport in the cortical thick ascending limb and the early distal tubule \rightarrow \uparrow NaCl and water excretion, & \downarrow excretion of Ca^{2+} and uric acid.**Absorption:** Oral \rightarrow good absorption. Takes effect in 1 hr.**Dist.:****Metab.:****Excretion, $t_{1/2}$:****Toxicity/S.E.s:** Hypokalemia, hyponatremia, hyperuricemia, hypercalcemia, metabolic alkalosis, postural hypotension, hyperglycemia (in patients w/DM), and rare hypersensitivity rxns. C/i—pts susceptible to problems with hypokalemia (cirrhosis, pts on digitalis), hyperuricemia (gout), or hypercalcemia.**Utility:** Treat hypertension, CHF, nephrotic synd., other Na^+ -retaining states. Reduce Ca^{2+} excretion (e.g., prevention of kidney stones).**Special Features:** Most commonly prescribed class of diuretics. Milder diuretic action than loop diuretics. Rel. ineffective in renal insuff.**Name: Spironolactone (Aldactone)****Class:** Diuretic (Potassium Sparing Diuretic) (Aldosterone Antagonist)**Mech.:** Competitive inhib. of aldosterone \rightarrow block of aldost.-stim. Na^+ reabsorption and K^+/H^+ excretion in late distal tubule and collecting duct. Also reduces aldost.-stim. ammoniogenesis throughout the nephron.**Absorption:** Oral. Takes up to 2 days to be effective.**Dist.:****Metab.:** Hepatic.**Excretion, $t_{1/2}$:** 20 hr.**Toxicity/S.E.s:** Hyperkalemia, gynecomastia, amenorrhea. Absolutely contraindicated w/hyperkalemia.**Utility:** Most efficacious in pts. w/high plasma levels of aldosterone (e.g., 1° hyperaldosteronism due to an adrenal tumor or hyperplasia; 2° hyperaldost. due to cirrhosis, etc.).**Special Features:** Only diuretic that acts through the blood side of the tubule. Rel. weak diuretic.

Name: Metolazone (Mykrox)**Class:** Diuretic (Thiazide-Like)**Mech.:** Inhib. Na^+ & Cl^- transport in the cortical thick ascending limb and the early distal tubule \rightarrow \uparrow NaCl and water excretion, & \downarrow excretion of Ca^{2+} and uric acid.**Absorption:** Oral \rightarrow good absorption. Takes effect in 1 hr.**Dist.:** **Metab.:** **Excretion, $t_{1/2}$:****Toxicity/S.E.s:** Hypokalemia, hyponatremia, hyperuricemia, hypercalcemia, metabolic alkalosis, postural hypotension, hyperglycemia (in patients w/DM), and rare hypersensitivity rxns. *C/i*—pts susceptible to problems w/hypokalemia (cirrhosis, pts on digitalis), hyperuricemia (gout), or hypercalcemia.**Utility:** The only distal nephron diuretic efficacious in patients w/severe renal insufficiency. Treat hypertension, CHF, nephrotic synd., other Na^+ -retaining states. Reduce Ca^{2+} excretion (e.g., prevention of kidney stones).**Special Features:** Strongest inhib. of Na^+ & water reabsorption of the thiazide and thiazide-like diuretics. Often given in comb. w/a loop diuretic. Milder**Name: Triamterene (Dyrenium)****Class:** Diuretic (Potassium Sparing Diuretic)**Mech.:** Inhib. Na^+ channel in the apical membrane of the late distal tubule and collecting duct \rightarrow block of electrochemical gradient that drives K^+ & H^+ secretion \rightarrow diuresis & \downarrow excretion of K^+ & H^+ . Weak anti-HTN activity.**Absorption:** Oral**Dist.:****Metab.:****Excretion, $t_{1/2}$:** 1° = kidney. 3 hr.**Toxicity/S.E.s:** Hyperkalemia (most severe), n/v (most common), metabolic acidosis. Hyponatremia may occur in old folks. Absolutely contraindicated with hyperkalemia. Adverse rxns w/lithium, ACE inhibitors. Rare renal failure w/NSAIDs.**Utility:** Usu. given w/another diuretic (often thiazide or loop). Combination usu. \rightarrow normal K^+ excretion. Used to prevent or correct hypokalemia, and to avoid K^+ depletion in pts. on digitalis.**Special Features:** Rel. weak diuretic.**Name: Amiloride (Midamor)****Class:** Diuretic (Potassium Sparing Diuretic)**Mech.:** Inhib. Na^+ channel in the apical membrane of the late distal tubule and collecting duct \rightarrow block of electrochemical gradient that drives K^+ & H^+ secretion \rightarrow diuresis & \downarrow excretion of K^+ & H^+ .**Absorption:** Oral**Dist.:****Metab.:****Excretion, $t_{1/2}$:** 1° = kidney. 6 hr.**Toxicity/S.E.s:** Hyperkalemia (most severe), n/v (most common), metabolic acidosis. Hyponatremia may occur in old folks. Absolutely contraindicated with hyperkalemia.**Utility:** Usu. given w/another diuretic (often thiazide or loop). Combination usu. \rightarrow normal K^+ excretion.**Special Features:** Rel. weak diuretic.

Type of my disciples. - To those human beings who are of any concern to me I wish suffering, desolation, sickness, ill-treatment, indignities - I wish that they should not remain unfamiliar with profound self-contempt, the torture of self-mistrust, the wretchedness of the vanquished: I have no pity for them, because I wish them the only thing that can prove today whether one is worth anything or not - that one endures.

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