

Drug Drug Interactions

Type of Interaction	Object / Affected Drug	Pricipitant / Interacting Drug	Effect / Influence on Object Drug
ABSORPTION INTERACTIONS			
Complexation & Adsorption	Cephrofloxacine, Penicillamine	Antacids, Food & Mineral supplements containing Al, Mg, Fe, Zn, Ca ions	Formation of poorly soluble and unabsorbable complex with heavy metal ions.
Alteration of GI pH	Sulphonamides, Aspirin, Ferrous sulphate	Antacids	Enhanced dissolution and absorption rate.
	Sulphonamides, Aspirin, Ferrous sulphate	Sodium bicarbonate, Calcium carbonate	Decreased dissolution and hence absorption.
Alteration of Gut Motility	Aspirin, Diazepam, Levodopa, Mexiletine	Metoclopramide	Rapid gastric emptying; increased rate of absorption.
	Levodopa, Lithium carbonate, Mexiletine	Anticholinergics	Delayed gastric emptying; decreased rate of absorption.
Alteration of GI Microflora	Digoxin	Antibiotics	Increased bioavailability due to destruction of bacterial flora that inactivates digoxin in lower intestine.
Malabsorption Syndrome	Vitamin A, B12, Digoxin	Neomycin	Inhibition of absorption due to malabsorption.
COMPETITIVE DISPLACEMENT INTERACTIONS			
	Anticoagulants	Phenylbutazone, Chloral hydrate	Increased clotting time; increased risk of hemorrhage.
	Tolbutamide	Sulphonamides	Increased hypoglycemic effect.
METABOLISM INTERACTIONS			

1. Enzyme Induction	Corticosteroids, Oral contraceptives, Coumarins, Phenytoin	Barbiturates	Decreased plasma levels; decreased efficacy of object drugs.
	Oral contraceptives, Oral hypoglycaemics	Rifampicin	Decreased plasma levels.
2. Enzyme Inhibition	Tyramine-rich food	MAO inhibitors	Enhanced absorption of unmetabolised tyramine.
	Coumarins	Metronidazole, Phenylbutazone	Increased anticoagulant activity.
	Alcohol	Disulfiram, Metronidazole	Increased plasma acetaldehyde levels.
EXCRETION INTERACTIONS			
Changes in Active Tubular Secretion	Penicillin, Cephalosporins, Nalidixic acid	Probenecid	Elevated plasma levels of acidic drugs.
Changes in Urine pH	Amphetamine	Antacids, Thiazides, Acetazolamide	Increased passive reabsorption of basic drugs; increased risk of toxicity.
Changes in Renal Blood Flow	Lithium bicarbonate	NSAIDs	Decreased renal clearance of lithium; risk of toxicity.
PHARMACODYNAMIC DRUG-DRUG INTERACTIONS			
Additive Effect	CNS depressants (e.g., alcohol, benzodiazepines, opioids)	Other sedatives, antihistamines	Enhanced CNS depression, increased sedation and respiratory suppression.
	Antihypertensives	Diuretics or other antihypertensives	Excessive fall in blood pressure, postural hypotension.
Synergistic Effect	Sulfonamides	Trimethoprim	Potential of antibacterial effect (synergistic therapy).
	Levodopa	Carbidopa	Potential of dopaminergic activity, enhanced antiparkinsonian effect.

Antagonistic Effect	NSAIDs	Antihypertensive drugs (ACE inhibitors, β -blockers)	Reduced antihypertensive efficacy.
	Levodopa	Antipsychotics (e.g., chlorpromazine, haloperidol)	Reduced antiparkinsonian effect due to dopamine receptor blockade.
	Insulin or Oral hypoglycemics	Corticosteroids	Hyperglycemia; antagonism of hypoglycemic effect.
Opposing Pharmacologic Actions	Warfarin	Vitamin K or estrogens	Decreased anticoagulant effect; increased clotting risk.
	β -blockers	β -agonist bronchodilators	Functional antagonism; reduced bronchodilator response.
DRUG–FOOD INTERACTIONS			
Alteration of Absorption	Tetracyclines, Fluoroquinolones	Milk and dairy products (Ca^{2+} -rich food)	Formation of insoluble chelates; decreased drug absorption.
	Iron supplements	Tea, coffee	Tannins inhibit iron absorption.
	Digoxin	High-fiber foods, bran	Decreased absorption due to binding with fiber.
Metabolic Interactions	Statins (Simvastatin, Atorvastatin)	Grapefruit juice	Inhibition of CYP3A4; increased plasma concentration and toxicity risk.
	Theophylline	High-carbohydrate diet	Altered metabolism; variable plasma levels.
Pharmacologic / Physiologic Effect	Warfarin	Foods rich in vitamin K (spinach, cabbage, broccoli)	Decreased anticoagulant effect.
	MAO inhibitors	Tyramine-rich foods (cheese, red wine, bananas)	Hypertensive crisis due to accumulation of norepinephrine.
	Alcohol	Metronidazole, Disulfiram	Disulfiram-like reaction—flushing, nausea, vomiting.

DRUG–DISEASE INTERACTIONS			
	β-blockers	Asthma, COPD	Bronchoconstriction; worsening of respiratory symptoms.
	Metformin	Renal impairment	Lactic acidosis risk due to reduced clearance.
	Corticosteroids	Diabetes mellitus	Exacerbation of hyperglycemia, impaired glucose control.
	NSAIDs	Peptic ulcer disease	Increased risk of gastric irritation, bleeding, or ulcer perforation.
	Sedatives, Opioids	Sleep apnea, COPD	Enhanced respiratory depression.
	Estrogens, Oral contraceptives	Liver disease	Impaired metabolism, increased toxicity risk.
	ACE inhibitors, Potassium-sparing diuretics	Renal failure	Severe hyperkalemia, arrhythmia risk.