

In the name of ALLAH

DRUG INTERACTION CLINICAL CONSIDERATIONS

Dr. Morteza Nabiee

Clinical Pharmacy Specialist

A top-down view of various pharmaceuticals scattered on a white surface. The collection includes two large groups of bright pink, oval-shaped tablets. There are also several capsules in various colors: green, purple, orange, yellow, and red. Other individual pills include a white tablet with a score line, a yellow tablet, and a pink tablet. The text 'BASIC CONCEPTS' is centered in the upper right quadrant in a bold, black, serif font.

BASIC CONCEPTS

▶ **What is a drug interaction?**

An interaction is said to occur when the effects of one drug are changed by the presence of another drug, herbal medicine, food, drink or by some environmental chemical agent.

▶ **How seriously should interactions be regarded and handled?**

▶ **Mechanisms of drug interactions:**

- Pharmacokinetic
- Pharmacodynamic

BASIC CONCEPTS

A series of white diagonal lines of varying lengths and thicknesses, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

Risk Factors for Drug Interactions^{1,12-33}

Category	Risk Factor	Potential Effect
Patient characteristics Demographics	Age (< 5 years and ≥ 65 years)	Alterations in drug distribution; ↓ clearance which may result in drug accumulation
	Female gender	↓ ability to metabolize compared to males
Social factors	Nutrition	Affects cytochrome p450 activity (e.g., grapefruit juice inhibits CYP 3A4 activity)
	Smoking	Affects cytochrome p450 activity (i.e., induces CYP 1A2)
	Alcohol	Affects cytochrome p450 activity specifically CYP 2E1
Organ dysfunction	↓ renal function	↓ clearance, which may result in ↑ serum concentrations of drug and accumulation
	↓ hepatic function	↓ metabolism, which may result in ↑ serum concentrations and accumulation of the parent drug and/or metabolite
	Heart Failure (HF)	↑ risk due to number of medications prescribed with comorbidities
	Chronic obstructive pulmonary disease (COPD)	↑ risk due to number of medications prescribed with comorbidities
Metabolic and endocrine	Obesity	↑ distribution of lipophilic drugs
	Fatty liver	Altered metabolism
	Hypoproteinemia	↑ serum drug concentration
Genetic ^a	Genetic polymorphisms (ultrarapid, extensive, intermediate, or poor metabolizers)	Altered metabolism
Acute medical conditions	Dehydration	↑ serum drug concentrations
	Hypotension	↓ clearance
	Hypothermia	↓ clearance
	Infection	↑ catabolism

Risk Factors for Drug Interactions^{1,12-33}

Category	Risk Factor	Potential Effect
Drug characteristics	Narrow therapeutic index (NTI)	↑ risk of dose-related adverse drug events
	Highly protein bound	↑ free fraction (active drug) from protein displacement
	Small volume of distribution	Drug confined to the plasma
	Cytochrome p450 substrate	↓↑ serum drug concentration with coadministration inducer or inhibitor precipitant drug
	P-glycoprotein substrate	↓↑ serum drug concentration with coadministration inducer or inhibitor precipitant drug
Other factors	Polypharmacy	Risk of adverse drug interactions ↑ with increase in number of medicines
	Number of prescribers	Number of prescribed drugs ↑ with multiple prescribers
	Number of pharmacies utilized	Number of prescribed drugs ↑ with multiple pharmacies; Pharmacist may not have knowledge of all drugs prescribed to patient
	Self-prescribing	OTC medicines interacting with prescribed medicines
	Duration of hospital stay	Susceptible to hospital-acquired conditions and subsequent drug therapy

▶ Pharmacokinetic interactions

- ❑ Drug absorption interactions
- ❑ Drug distribution interactions
- ❑ Drug metabolism interactions
- ❑ Drug excretion interactions

BASIC CONCEPTS



□ Drug absorption interactions

- **Effects of changes in gastrointestinal pH**

H₂-RA + Ketoconazole

- **Adsorption, chelation and other complexing mechanisms**

Quinolone + Calcium carbonate

- **Changes in gastrointestinal motility**

Propantheline + Acetaminophen

- **Induction or inhibition of drug transporter proteins**

Digoxin + Rifampin

BASIC CONCEPTS



□ Drug distribution interactions

- **Protein-binding interactions**

Coumarins + Phenytoin

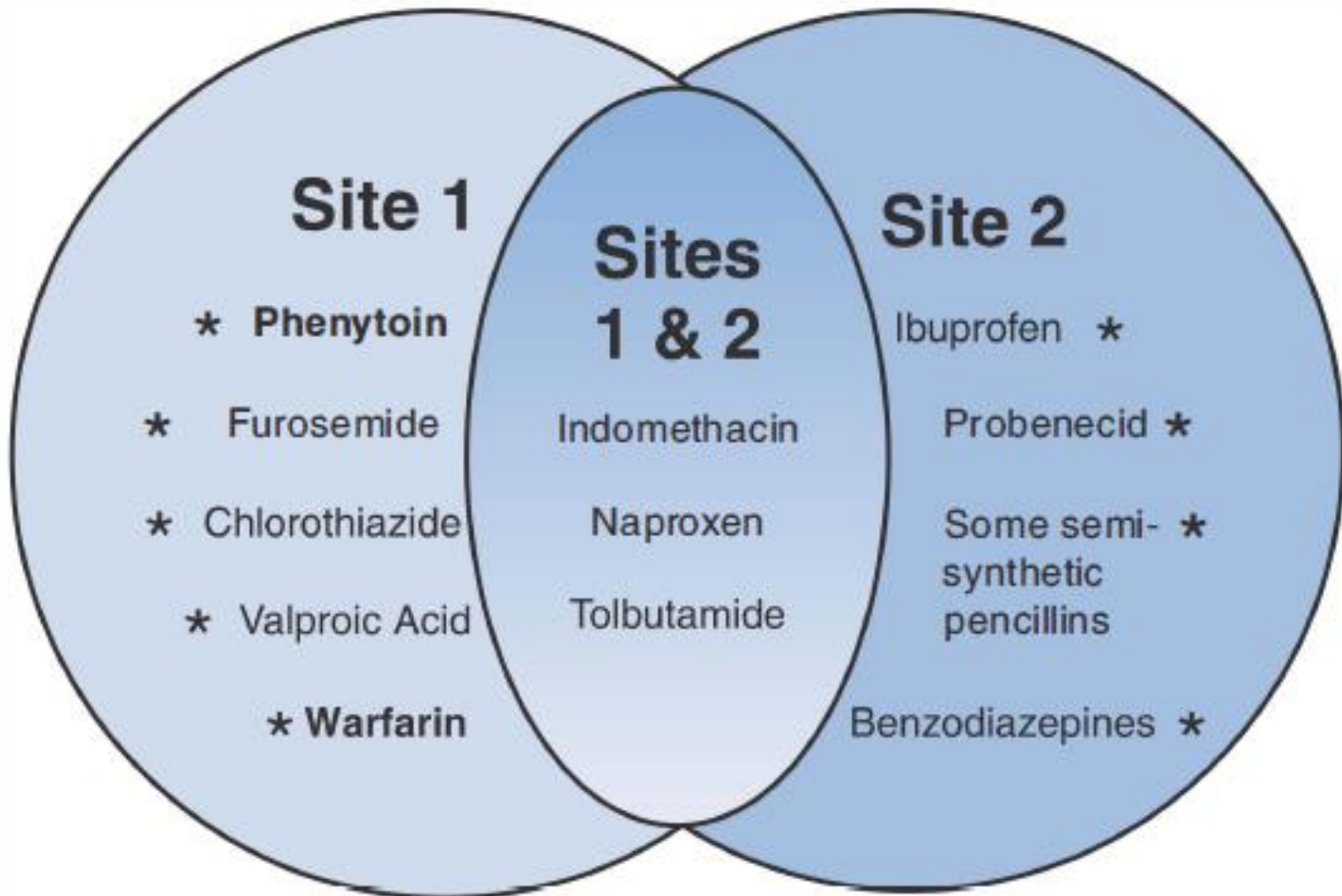
- **Induction or inhibition of drug transport proteins**

Protease inhibitors + Azoles

BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

Albumin: Two High Affinity Binding Sites



□ Drug metabolism interactions

- **Changes in first-pass metabolism**

 - Hydralazine + Propranolol

- **Enzyme induction**

 - Rifampin + Cyclosporin

- **Enzyme inhibition**

 - Sildenafil + Ritonavir

BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

SUBSTRATES

Amiodarone
Taxol

Diazepam
Omeprazole
Citalopram

Naproxen
S-Warfarin
Phenytoin

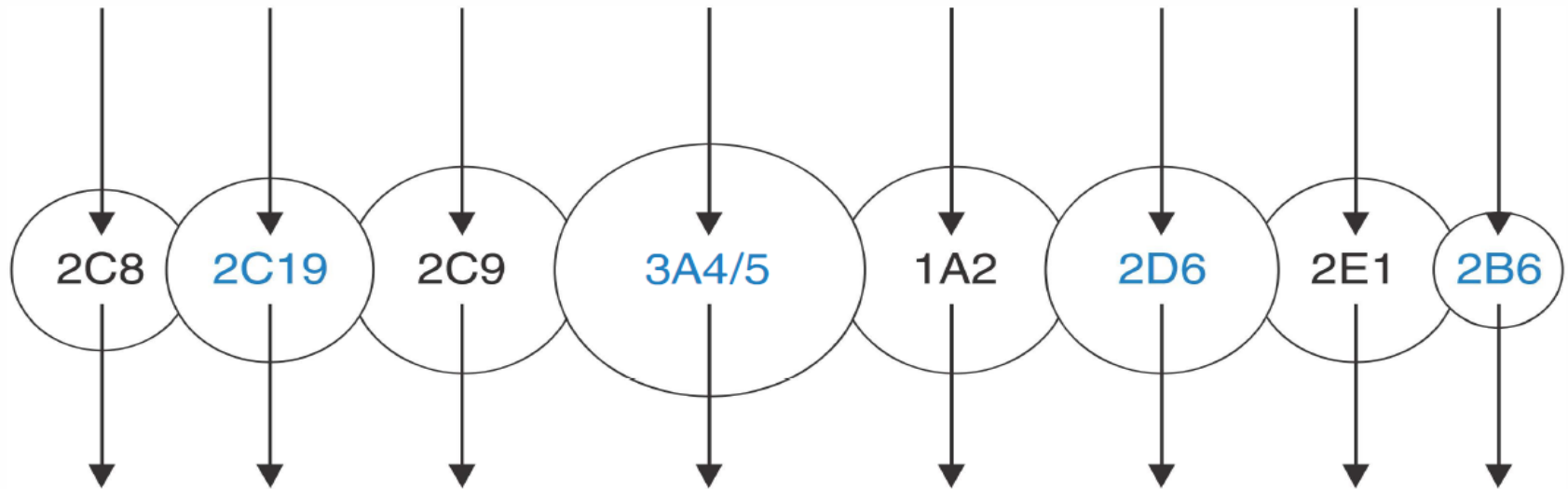
Nifedipine
Erythromycin
Cyclosporine

Caffeine
Theophylline

Desipramine
Paroxetine
Flecainide

Chlorzoxazone
Ethanol
Halothane

Efavirenz



INHIBITORS

Gemfibrozil

Fluvoxamine

Fluconazole

Itraconazole
Clarithromycin
Ritonavir

Amiodarone

Quinidine
Paroxetine

Disulfiram

INDUCERS

Rifampin

Carbamazepine

Rifampin

Omeprazole

Ethanol

Rifampin

□ Drug excretion interactions

- **Changes in urinary pH**
Aspirin + Antacids
- **Changes in active renal tubular excretion**
Methotrexate + Salicylates
- **Changes in renal blood flow**
Lithium + NSAIDs
- **Biliary excretion and the entero-hepatic shunt**
Hormonal contraceptives + Antibacterials
Glibenclamide + Cyclosporine
-

BASIC CONCEPTS



▶ Pharmacodynamic interactions

- ❑ **Additive or synergistic interactions**
- ❑ **Antagonistic or opposing interactions**
- ❑ **Drug or neurotransmitter uptake interactions**

BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

□ Additive or synergistic interactions

- ✓ **The serotonin syndrome**
- ✓ Antipsychotics + Antimuscarinics
- ✓ Antihypertensives + Drugs that cause hypotension
- ✓ Beta-agonist bronchodilators + Potassium-depleting drugs
- ✓ CNS depressants + CNS depressants
- ✓ Drugs that prolong the QT interval + Other drugs that prolong the QT interval
- ✓ Nephrotoxic drugs + Nephrotoxic drugs
- ✓ ACE inhibitors + Potassium-sparing diuretics

BASIC CONCEPTS

□ Antagonistic or opposing interactions

- ✓ Coumarins + Vitamin K
- ✓ Antidiabetics + Glucocorticoids
- ✓ Levodopa + Antipsychotics

BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

□ **Drug or neurotransmitter uptake interactions**

Tricyclic antidepressants + Inotropes and Vasopressors

BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

❑ Drug-herb interactions

St John's wort (*Hypericum perforatum*)

❑ Drug-food interactions

Cruciferous vegetables and charcoal-broiled meats

Grapefruit juice

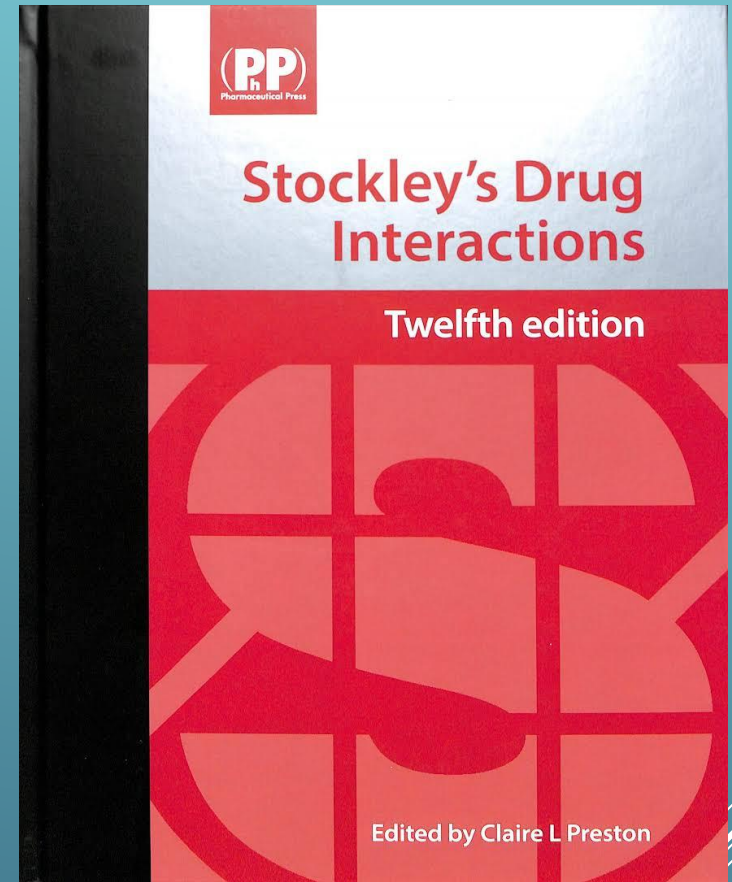
BASIC CONCEPTS

A series of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide, creating a modern, abstract graphic element.

REFERENCES & DATABASES

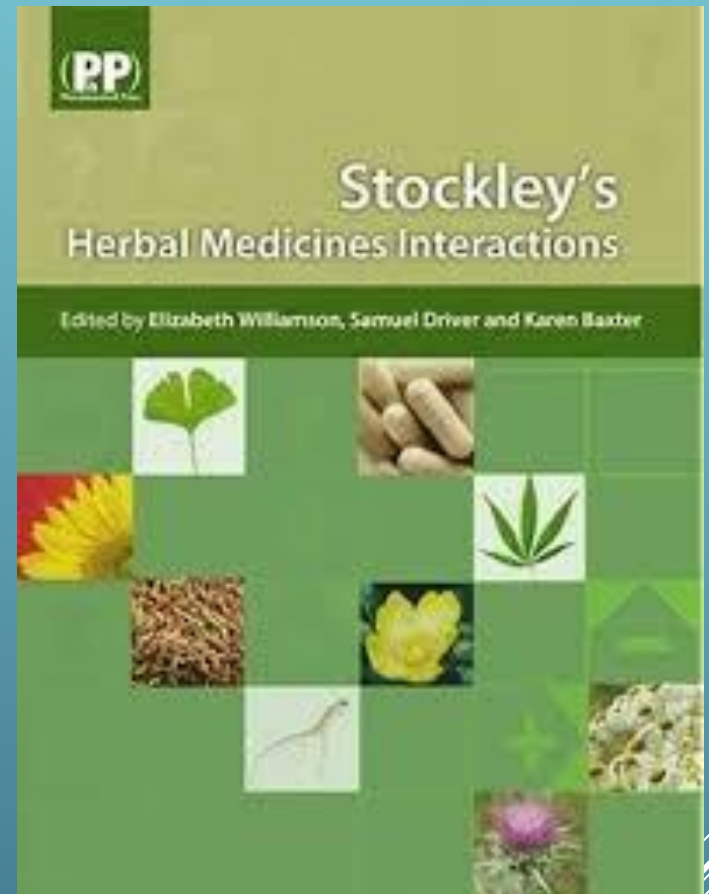


Stockley's Drug Interactions



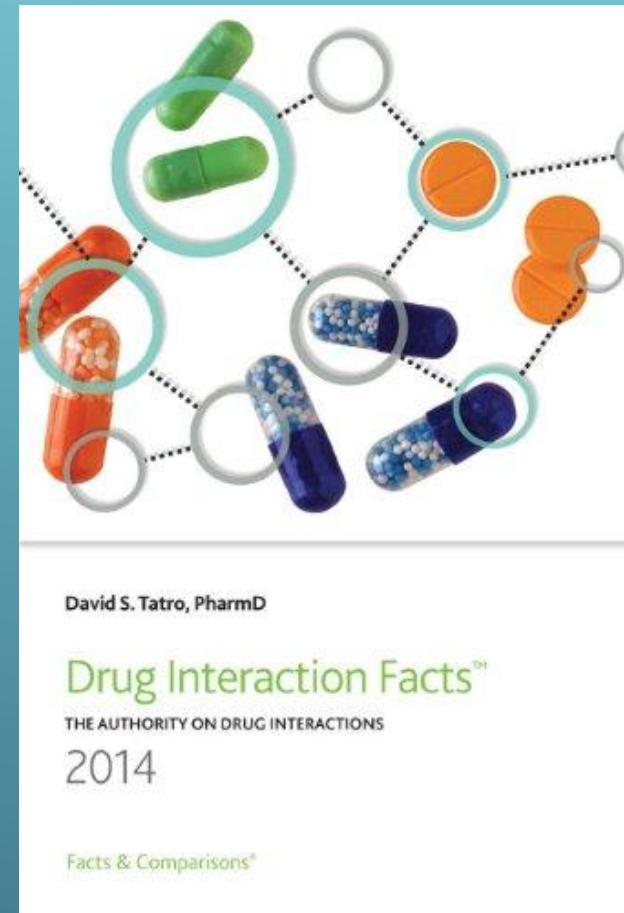
REFERENCES AND DATABASES

Stockley's Herbal Medicines Interactions



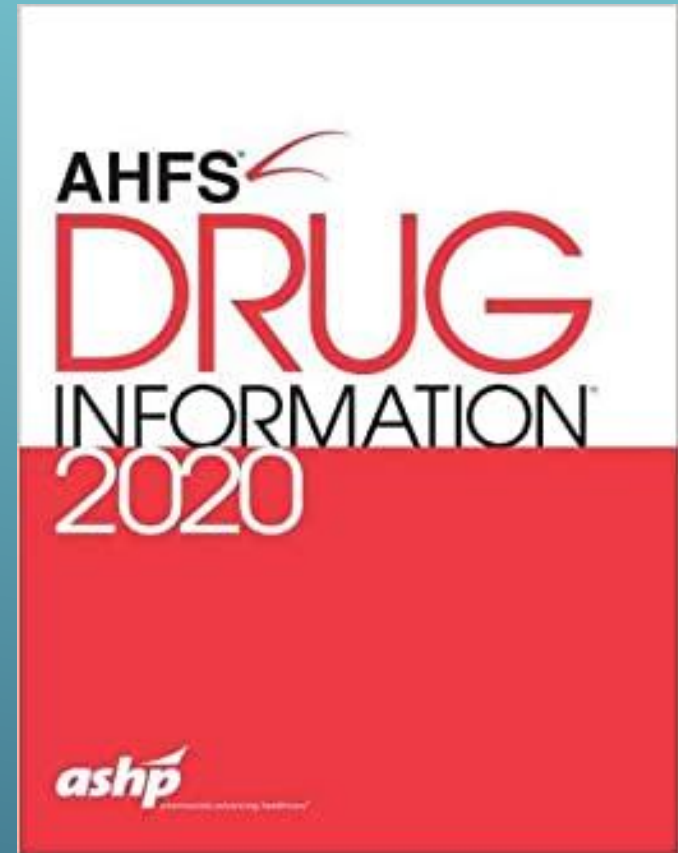
REFERENCES AND DATABASES

Drugs Interaction Facts



REFERENCES AND DATABASES

AHFS Drug Information



REFERENCES AND DATABASES

Lexicomp Drug Interaction

UpToDate®

Lexicomp® Drug Interactions

Add items to your list by searching below.

ITEM LIST

Clear List Analyze

- OLANzapine
- Phenytoin

Display complete list of interactions for an individual item by clicking item name.

NOTE: This tool does not address chemical compatibility related to I.V. drug preparation or administration.

© 2020 UpToDate, Inc. and/or its affiliates. All Rights Reserved.

X Avoid combination	C Monitor therapy	A No known interaction
D Consider therapy modification	B No action needed	More about Risk Ratings

1 Result Filter Results by Item [Print](#)

C OLANzapine
Phenytoin (CYP1A2 Inducers (Weak))

DISCLAIMER: Readers are advised that decisions regarding drug therapy must be based on the independent judgment of the clinician, changing information about a drug (eg, as reflected in the literature and manufacturer's most current product information), and changing medical practices.

REFERENCES AND DATABASES

Micromedex

MICROMEDEX DRUG INTERACTIONS



REFERENCES AND DATABASES

Drug.com

The screenshot shows the Drug.com website interface. At the top left is the logo with the tagline "Know more. Be sure.". A search bar is present with a dropdown menu set to "All" and a search icon. Navigation links include "Register" and "Sign In". A secondary navigation bar lists "DRUGS A-Z", "PILL IDENTIFIER", "INTERACTIONS CHECKER", "NEWS & ALERTS", "PRO EDITION", and "MORE". Below this is an advertisement for "Speak Face to Face with Doctor - GP online available in UK" with an "OPEN" button. The main heading is "Drug Interactions Checker". Below the heading is a paragraph: "Start typing a drug name and select the best match from the list of suggestions. Repeat the process to add multiple drugs. Once your list is complete, you can check for interactions immediately or save your list for future reference." Below this is a form with a text input field containing the placeholder "Enter a drug name" and a blue "Add" button. A note below the input field says "Type a drug name in the box above to get started." To the right of the main content are two sidebars. The top sidebar is titled "How to Prevent Deadly Drug Interactions" and contains the text "Some mixtures of medications can lead to serious and even fatal consequences." with a link "Here are 9 ways to stay safe". The bottom sidebar is an advertisement for "Activate Windows" with the text "Go to Settings to activate Win" and "Ad closed by Google".

Drug Interactions Checker

Start typing a drug name and select the best match from the list of suggestions. Repeat the process to add multiple drugs. Once your list is complete, you can check for interactions immediately or save your list for future reference.

Enter a drug name

Type a drug name in the box above to get started.

How to Prevent Deadly Drug Interactions

Some mixtures of medications can lead to serious and even fatal consequences.

[Here are 9 ways to stay safe](#)

Activate Windows
Go to Settings to activate Win
Ad closed by Google

REFERENCES AND DATABASES


Medscape.com


Edition: **ENGLISH** DEUTSCH ESPAÑOL FRANÇAIS PORTUGUÉS

25 Medscape

NEWS & PERSPECTIVE **DRUGS & DISEASES** CME & EDUCATION ACADEMY VIDEO

Drug Interaction Checker

Enter a drug, OTC or herbal supplement:  Print



Drug Interaction Checker

- Use the search field above to look up prescription or OTC drugs, and herbal supplements
- Add a full drug regimen and view interactions

REFERENCES AND DATABASES

Webmd.com

The screenshot displays the WebMD website interface. At the top, there is a navigation bar with the WebMD logo on the left and several menu items: CORONAVIRUS UPDATE, CHECK YOUR SYMPTOMS, FIND A DOCTOR, FIND A DENTIST, CONNECT TO CARE, and FIND LOWEST DRUG PRICES. Below this, a secondary navigation bar features categories: HEALTH A-Z, DRUGS & SUPPLEMENTS, LIVING HEALTHY, FAMILY & PREGNANCY, and NEWS & EXPERTS. A large white advertisement box is positioned in the upper left. The main content area includes a link for 'Interaction Checker >' and another for 'Find a Drug Pill Identifier'. The central focus is the 'Drug Interaction Checker' tool, which prompts users to 'Enter two or more drugs, OTC's, or herbal supplements to check for interactions'. It features three input fields: 'Medication 1', 'Medication 2', and 'Add another' with a plus sign. To the right of the input fields is a stack of colorful pills (green, orange, blue, yellow, red, white).

REFERENCES AND DATABASES

MedlinePlus.gov

The screenshot shows the MedlinePlus.gov website interface. At the top, there is a blue header with the NIH logo and the text "U.S. National Library of Medicine". Below this is the MedlinePlus logo, which includes a green cross icon and the text "MedlinePlus Trusted Health Information for You". To the right of the logo is a search bar with the placeholder text "Search MedlinePlus" and a green "GO" button. Below the search bar are links for "About MedlinePlus", "What's New", "Site Map", and "Customer Support".

Below the header is a navigation bar with the following categories: "Health Topics", "Drugs & Supplements", "Genetics", "Medical Tests", "Videos & Tools", and "Español".

A red-bordered alert box is present, containing the text: "COVID-19 is an emerging, rapidly evolving situation." followed by two lines of text: "Get the latest public health information from CDC: <https://www.coronavirus.gov>" and "Get the latest research information from NIH: <https://www.nih.gov/coronavirus>".

Below the alert box is a breadcrumb trail: "Home → Drugs, Herbs and Supplements → Herbs and Supplements → American Ginseng".

The main heading is "American Ginseng". To the right of the heading are social media icons for email, RSS, Facebook, Twitter, and Pinterest.

Below the heading is a light blue box containing a list of questions and topics:

- What is it?
- How effective is it?
- How does it work?
- Are there safety concerns?
- Are there interactions with medications?
- Are there interactions with herbs and supplements?
- Are there interactions with foods?
- What dose is used?
- Other names
- Methodology
- References

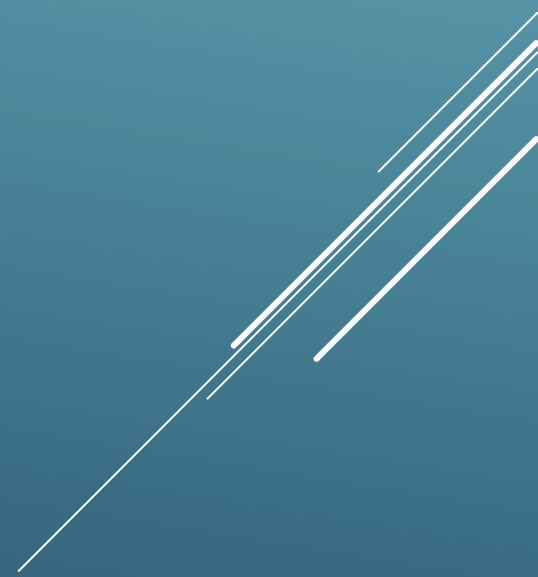
At the bottom right of the page, there is a partially visible link: "Activate W Go to Settings".

REFERENCES AND DATABASES

SPECIAL DRUG INTERACTIONS



CASE #1



- ▶ A 56 years old woman comes to your pharmacy
- ▶ PMH: HTN and Dyslipidemia
- ▶ DH: Losartan 50 mg BD and Atorvastatin 20 mg QD
- ▶ Her physician has diagnosed *Helicobacter pylori* infection and has prescribed following medications;

tab clarithromycin 500 mg BD

cap amoxicillin 500 mg 2* BD

tab pantoprazole 40 mg BD

CASE 1

You as a pharmacist checked her drug interactions

UpToDate®

Lexicomp® Drug Interactions

Add items to your list by searching below.

ITEM LIST

Clear List Analyze

- [Clarithromycin](#)
- [AtorvaSTATin](#)
- [Losartan](#)
- [Pantoprazole](#)

Display complete list of interactions for an individual item by clicking item name.

NOTE: This tool does not address chemical compatibility related to I.V. drug preparation or administration.

© 2020 UpToDate, Inc. and/or its affiliates. All Rights Reserved.

X Avoid combination	C Monitor therapy	A No known interaction
D Consider therapy modification	B No action needed	<i>More about Risk Ratings</i> ▼

1 Result Filter Results by Item ▼

D [AtorvaSTATin](#)
[Clarithromycin](#)

DISCLAIMER: Readers are advised that decisions regarding drug therapy must be based on the independent judgment of the clinician, changing information about a drug (eg, as reflected in the literature and manufacturer's most current product information), and changing medical practices.

What is your decision for this patient?

- ▶ Statins that depend on the cytochrome P-450 (CYP) 3A4 enzyme system to be metabolized are most vulnerable to this interaction (lovastatin, simvastatin, and to a lesser extent atorvastatin).
- ▶ Rosuvastatin and pravastatin have the lowest potential for interaction with medications that inhibit the CYP metabolic pathways.
- ▶ Gemfibrozil interferes with the glucuronidation of statins, thereby interfering with their renal clearance. This impact may be minimal or up to a three to fourfold increase in statin levels depending upon the specific agent.

STATIN INTERACTIONS

A decorative graphic consisting of several parallel white lines of varying lengths, slanted upwards from left to right, located in the bottom right corner of the slide.

	Do Not Use	Use with Caution
Lovastatin/ Simvastatin	Protease Inhibitors Azoles (except fluconazole) Macrolides (except azithromycin) Gemfibrozil Danazol Cyclosporine Emtricitabine Tenofovir Red yeast rice	Amiodarone Amlodipine Diltiazem, Verapamil Fluconazole Efavirenz Fenofibrate Imatinib Ticagrelor Grapefruit juice
Atorvastatin	Posaconazole Voriconazole Red yeast rice	Protease Inhibitors Macrolides (except azithromycin) Other Azoles Gemfibrozil Verapamil, Diltiazem Digoxin Imatinib Cyclosporine, Tacrolimus
Rosuvastatin	Red yeast rice	Protease Inhibitors Clarithromycin Gemfibrozil Cyclosporine, Tacrolimus Antacids

Atorvastatin + Clarithromycin

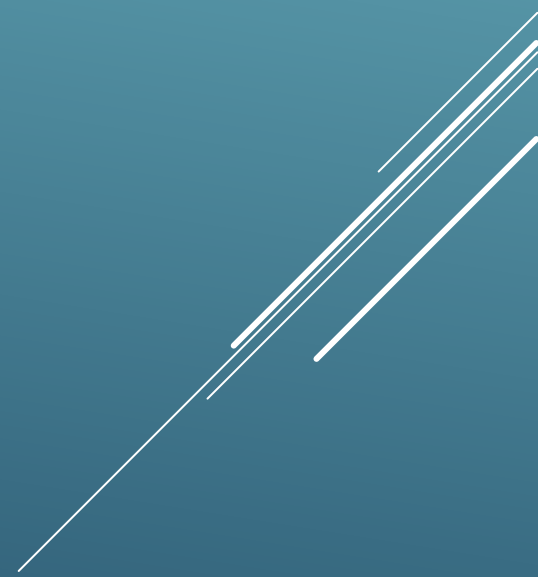
- ▶ **Risk Rating D:** Consider therapy modification
- ▶ **Summary** Clarithromycin may increase the serum concentration of Atorvastatin.
- ▶ **Patient Management:** Limit atorvastatin to a maximum dose of 20 mg/day when used with clarithromycin. If this combination is used, monitor patients more closely for evidence of atorvastatin toxicity (eg, muscle aches or pains, renal dysfunction)

CASE 1

- ▶ When statin-fibrate combination therapy is indicated, fenofibrate is preferred
- ▶ Under any circumstance, the use of gemfibrozil should be avoided in combination with lovastatin, pravastatin, and simvastatin.

STATIN INTERACTIONS

CASE #2



- ▶ A 33 years old man comes to emergency ward with tremor, akathisia and hyperthermia
- ▶ PMH: Depression, Insomnia
- ▶ HH: opium addiction
- ▶ DH: sertraline 100 mg QD zolpidem 10 since 2 years ago, Methadone 20 mg BD since last week
- ▶ What's your idea about possible diagnosis as a GP?

CASE 2

- ▶ Serotonin syndrome, also referred to as serotonin toxicity, is a potentially life-threatening condition associated with increased serotonergic activity in the central nervous system.
- ▶ It is seen with therapeutic medication use, inadvertent interactions between drugs, and intentional self-poisoning.
- ▶ Although classically described as the triad of mental status changes, autonomic hyperactivity, and neuromuscular abnormalities, serotonin syndrome is actually a spectrum of clinical findings ranging from benign to lethal

SEROTONIN SYNDROME

Table 3. Mechanisms of Serotonin Syndrome and the Drugs Associated with Each

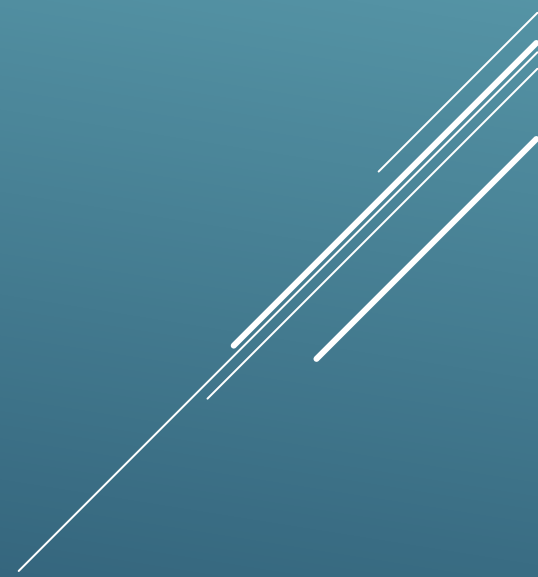
Mechanism	Associated Drugs
Inhibit Serotonin Uptake	<p>Amphetamines/weight loss drugs: phentermine</p> <p>Antidepressants: bupropion, nefazodone, trazodone</p> <p>Antiemetics: granisetron, ondansetron</p> <p>Antihistamines: chlorpheniramine</p> <p>Certain opiates: levomethorphan, levorphanol, meperidine, methadone, pentazocine, pethidine, tapentadol, tramadol</p> <p>Drugs of abuse: cocaine, MDMA (“Ecstasy”)</p> <p>Herbal supplements: St. John’s wort (<i>Hypericum perforatum</i>)</p> <p>Over-the-counter cold remedies: dextromethorphan</p> <p>SNRIs: desvenlafaxine, duloxetine, venlafaxine</p> <p>SSRIs: citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine, sertraline</p> <p>TCA: amitriptyline, amoxapine, clomipramine, desipramine, doxepin, imipramine, maprotiline, nortriptyline, protriptyline, trimipramine</p>
Inhibit Serotonin Metabolism	<p>Anxiolytics: buspirone</p> <p>Herbal supplements: St. John’s wort (<i>Hypericum perforatum</i>)</p> <p>MAOIs: furazolidone, isocarboxazid, linezolid, methylene blue, phenelzine, selegiline, Syrian rue, tranylcypromine</p> <p>Triptans: almotriptan, eletriptan, frovatriptan, naratriptan, rizatriptan, sumatriptan, zolmitriptan</p>
Increase Serotonin Synthesis	<p>Amphetamines/weight loss drugs: phentermine</p> <p>Dietary supplements: L-tryptophan</p> <p>Drugs of abuse: cocaine</p>

Table 3. Mechanisms of Serotonin Syndrome and the Drugs Associated with Each

Mechanism	Associated Drugs
Increase Serotonin Release	<p>Antidepressants: mirtazapine</p> <p>Amphetamines/weight loss drugs: phentermine</p> <p>Certain opiates: meperidine, oxycodone, tramadol</p> <p>Drugs of abuse: MDMA (“Ecstasy”)</p> <p>Over-the-counter cold remedies: dextromethorphan</p> <p>Parkinson disease treatment/amino acid: L-dopa</p>
Activate Serotonin Receptors	<p>Anxiolytics: buspirone</p> <p>Antidepressants: mirtazapine, trazodone</p> <p>Antimigraines: dihydroergotamine, triptans</p> <p>Certain opiates: fentanyl, meperidine</p> <p>Drugs of abuse: LSD</p> <p>Mood stabilizers: lithium</p> <p>Prokinetic agents: metoclopramide</p>
Inhibit CYP450 Microsomal Oxidases	<p>CYP2D6</p> <p>Inhibitors: fluoxetine, sertraline</p> <p>Substrates: dextromethorphan, oxycodone, phentermine, risperidone, tramadol</p> <p>CYP3A4</p> <p>Inhibitors: ciprofloxacin, ritonavir</p> <p>Substrates: methadone, oxycodone, venlafaxine</p> <p>CYP2C19</p> <p>Inhibitors: fluconazole</p> <p>Substrates: citalopram</p>

- ▶ Prevention of serotonin syndrome begins with awareness by physicians and patients of the potential for toxicity from serotonergic drugs.¹
- ▶ Avoiding the combined use of serotonin-augmenting drugs is essential. Physicians should modify prescribing practices to minimize coprescription of drugs known to have a high probability of inducing serotonin syndrome.

SEROTONIN SYNDROME

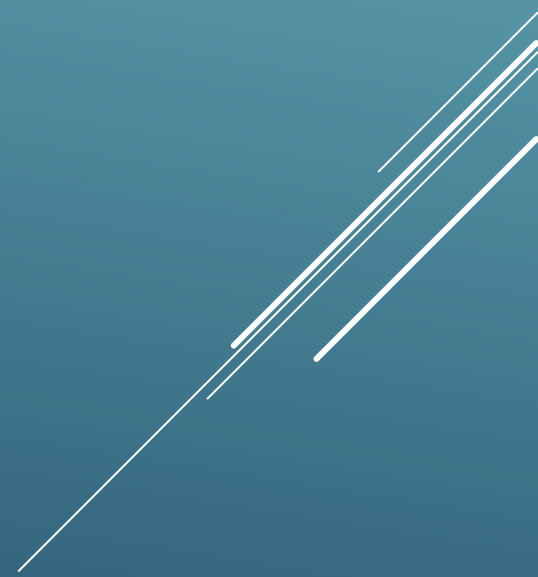


Serotonergic Agents (High Risk) + Methadone

- ▶ **Risk Rating C:** Monitor therapy
- ▶ **Summary** Methadone may enhance the serotonergic effect of Serotonergic Agents (High Risk). This could result in serotonin syndrome.
- ▶ **Patient Management** Monitor for signs and symptoms of serotonin syndrome/serotonin toxicity (eg, hyperreflexia, clonus, hyperthermia, diaphoresis, tremor, autonomic instability, mental status changes) when these drugs are combined.
- ▶ Patients with other risk factors (eg, higher drug concentrations/doses, greater numbers of serotonergic agents) are likely at greater risk for these potentially life-threatening toxicities.

CASE 2

CASE #3



- ▶ A 52 years old woman calls with you in drug and poison information center and asks about her drugs interaction.
- ▶ PMH: GAD, OCD
- ▶ DH: tab Sertraline 50 mg QD, tab Lorazepam 1 mg QHS, and tab Olanzapine 2.5 mg QD since 5 years ago.

CASE 3

You check Lexicomp Drug Interaction database and find following result:

UpToDate®

Lexicomp® Drug Interactions

Add items to your list by searching below.

ITEM LIST

Clear List Analyze

- [Sertraline](#)
- [LORazepam](#)
- [OLANzapine](#)

Display complete list of interactions for an individual item by clicking item name.

NOTE: This tool does not address chemical compatibility related to I.V. drug preparation or administration.

© 2020 UpToDate, Inc. and/or its affiliates. All Rights Reserved.

X Avoid combination	C Monitor therapy	A No known interaction
D Consider therapy modification	B No action needed	<i>More about Risk Ratings</i> ▼

3 Results Filter Results by Item ▼ [Print](#)

X	LORazepam (Benzodiazepines) OLANzapine
C	OLANzapine (Antipsychotic Agents) Sertraline (Serotonergic Agents (High Risk))
B	Sertraline (Selective Serotonin Reuptake Inhibitors) LORazepam (CNS Depressants)

DISCLAIMER: Readers are advised that decisions regarding drug therapy must be based on the independent judgment of the clinician, changing information about a drug (eg, as reflected in the literature and manufacturer's most current product information), and changing medical practices.

What's your advice to this woman about her medications?

Benzodiazepines + Olanzapine

- ▶ **Route:** Clinical significance and severity of this interaction may be lower with oral olanzapine and/or oral benzodiazepines.
- ▶ Olanzapine prescribing information specifically recommends avoiding the (route-specific) combination of IM olanzapine with a parenteral benzodiazepine.
- ▶ **Risk Rating X:** Avoid combination
- ▶ **Summary** Olanzapine may enhance the adverse/toxic effect of Benzodiazepines.

CASE 3

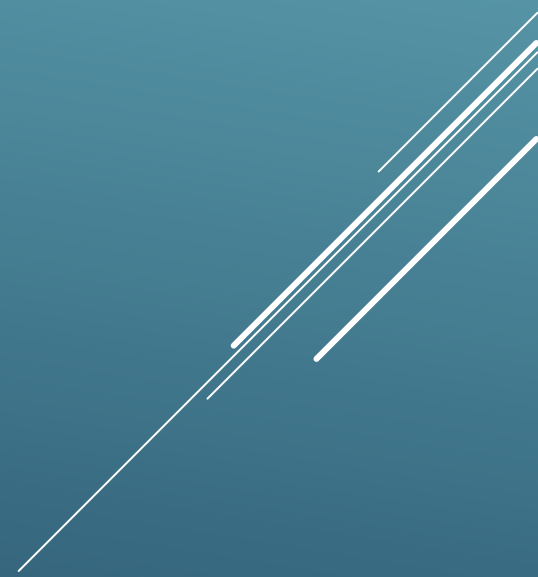
► Patient Management

Olanzapine prescribing information recommends to avoid concomitant use of parenteral benzodiazepines and intramuscular (IM) olanzapine due to risks of additive adverse effects (e.g., cardiorespiratory depression, excessive sedation). Additive pharmacologic effects might also be expected with oral use of these agents, but specific recommendations for management are lacking.

**OLANZAPINE +
BENZODIAZEPINE**

A decorative graphic consisting of several parallel white lines of varying lengths, slanted diagonally from the bottom right towards the top right, set against a dark teal background.

CASE #4



A 68 years old woman comes to your pharmacy with following prescription:

tab ciprofloxacin 250 mg BD

tab levothyroxine 0.1 mg QD

tab calcium-D QD

tab raloxifen 60 mg QD

tab ferfolic QD

What is your advice to this patient as a pharmacist?

CASE 4



Medication	Advice when coadministered with polyvalent cations
Ofloxacin	Administer 2 hours before or 2 hours after polyvalent cations
Moxifloxacin	Administer 4 hours before or 8 hours after polyvalent cations
Ciprofloxacin	Administer 2 hours before or 6 hours after polyvalent cations
Gemifloxacin	Administer 3 hours before or 2 hours after polyvalent cations
Nalidixic acid	Administer 2 hours before or 2 hours after polyvalent cations
Levofloxacin	Administer 2 hours before or 2 hours after polyvalent cations
Tetracycline	Administer 4 hours before or 2 hours after polyvalent cations
Doxycycline	Administer 4 hours before or 2 hours after polyvalent cations
Alendronate	Administer 30 mins before or 2 hours after polyvalent cations
Penicillamine	Administer 1 hours before or 1 hours after polyvalent cations
Levothyroxine	Administer 4 hours before or 4 hours after polyvalent cations
Mycophenolate	Administer 2 hours before polyvalent cations

- ▶ Levothyroxine 7 AM, at least 30 mins before breakfast
- ▶ Ciprofloxacin 11 AM, 4 hours after levothyroxine and 2 hours before Calcium-D
11 PM
- ▶ Calcium-D 1 PM, 2 hours after ciprofloxacin and at least 2 hours before ferfolic
- ▶ Ferfolic 3 PM, 2 hours after Calcium-D
- ▶ Raloxifen 7 PM, 12 hours interval with levothyroxine

CASE 4

The background is a dense collage of overlapping, colorful sticky notes in shades of orange, light blue, yellow, green, and red. Each sticky note features a large, bold, black question mark. The notes are scattered and tilted at various angles, creating a sense of movement and inquiry.

Thanks for your attention