

EMR Tutorial for Drug Interactions

The complexity of drug/drug interactions is growing so rapidly that it is virtually impossible for anyone to know all of the contraindications for the use of even the most common medications without considering those medications which are uncommonly used. This is such the case that the first “common clinical pitfall of monitoring drug interactions” listed below is, “Relying on memory as to which drugs interact.”

While NextGen EMR has a very complete drug/drug interaction check built into the medication module, the implications of the Cytochrome P450 system is such that special attention needs to be drawn to those drugs which are detoxified by this system.

SETMA’s **Drug Interactions Suite of Templates** has been built for the purpose of informing providers about this very important field which affects their daily prescriptive habits.

How to find the Drug Interactions Template

AAA Home

The screenshot displays the SETMA EMR interface for a patient named Jonny1. At the top, there is a patient information section with fields for Patient (Jonny1), ZTest, Sex (M), Age (69), and DOB (08/17/1940). Below this, there are fields for Home Phone ((409)833-9797) and Work Phone ((409)504-5566). A Patient's Code Status field is set to Full Code. A red alert banner states "Patient has one or more alerts!" with a link to "Click Here to View Alerts".

The main navigation area contains several links: SETMA's LESS Initiative, Preventing Diabetes, Preventing Hypertension, Medical Home Coordination, Charge Posting Tutorial, ICD-9 Code Tutorial, and E&M Coding Recommendations. Below these are links for various medical specialties: Master GP, Nursing Home, Ophthalmology, Pediatrics, Physical Therapy, Podiatry, Rheumatology, Daily Progress, Admission Orders, Discharge, Insulin Infusion, Colorectal Surgery, and Pain Management. A red box highlights the "Drug Interactions" link among other links like Exercise, CHF Exercise, Diabetic Exercise, Smoking Cessation, Hydration, Nutrition, Guidelines, Lab Future, and Lab Results.

Under the "Disease Management" section, there are links for Acute Coronary Syn, Angina, Asthma, CHF, Diabetes, Headaches, Hypertension, Lipids, Cardiometabolic Risk Syndrome, Weight Management, Renal Failure, and Diabetes Edu.

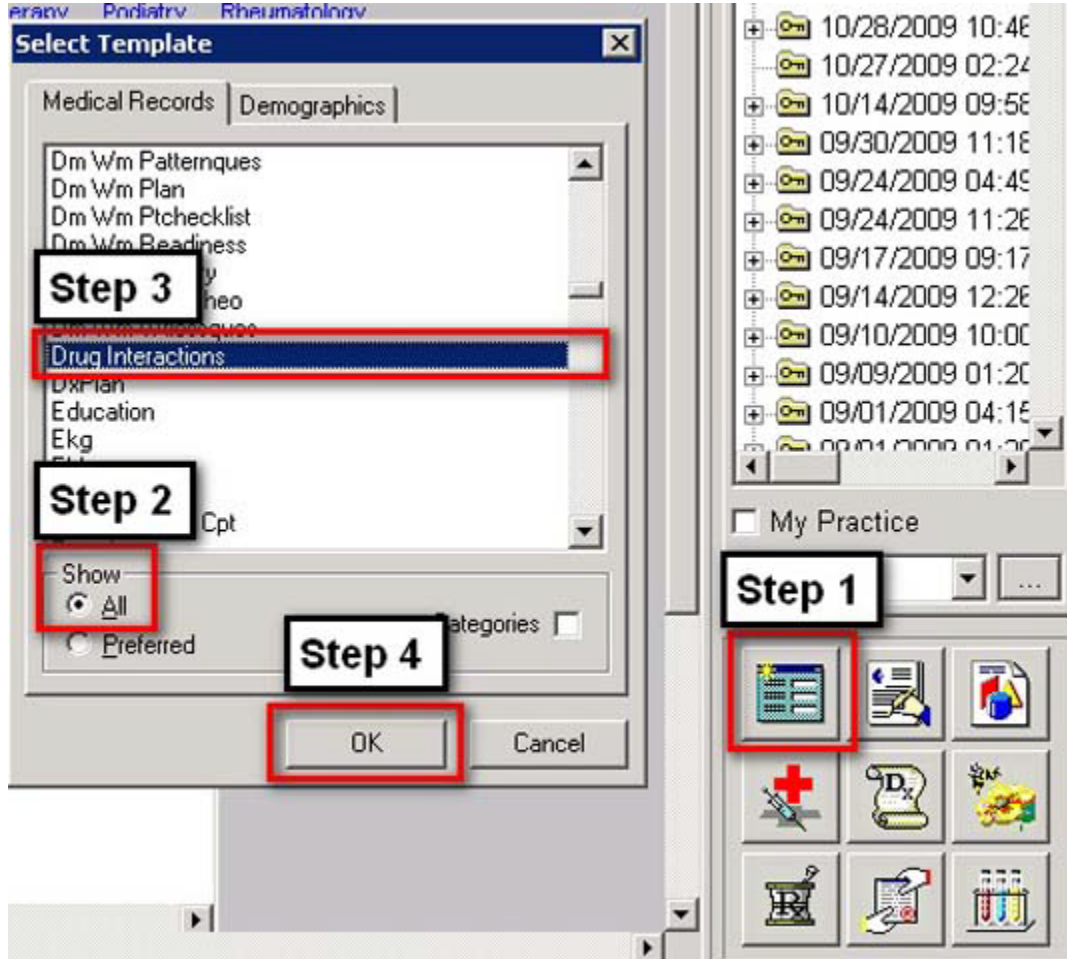
On the left, there is a "Patient's Pharmacy" section for Bruce's Pharmacy with phone and fax numbers. Below it are buttons for "Rx Sheet - Active", "Rx Sheet - New", "Rx Sheet - Complete", and "Home Health".

In the center, there is a "Pending Referrals" table with columns for Status, Priority, Referral, and Referring Provider. The table lists several completed referrals, including SETMA Infectious Disease, PFT, CPET, Adenosine Cardiolite, and Thyroid Scan.

On the right, there is a "Chart Note" section with buttons for "Return Info", "Return Doc", "Email", "Telephone", "Records Request", and "Transfer of Care Doc".

At the bottom, there is an "Archived Referrals - Do not use for new referrals" section with a table for Status, Priority, Referral, and Referring Provider.

Master Tool Bar Icon



- When the Template button is clicked you will be presented with the preference list.
- If the **Drug Interactions** Template is listed as one of your preferences, select it.
- If it is not one of your preferences, select the All radio button and scroll down until you find it in the list. Then you may select the template by either double-clicking on the name or single click on the name (so that it is highlighted in blue) and then click the OK button.

NOTE: For more on how to set up your preferences, [Click Here](#)

Drug Interactions Master Template

This template presents a brief introduction to the subject of the Cytochrome P-450 system.

At the bottom of the template, the following appears:

Cytochrome P450 Tutorial with the following parts:

- Definitions
- Highlights of Cytochrome P450
- Humans and Cytochrome P450
- Aging and Cytochrome P450
- Phase 1 Metabolism
- Factors Affecting P450 Metabolism
- CYP3A4

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
- 2C19 *
- 2D6
- 2E1
- 3A4 **

* Many antidepressants and antipsychotic medications are metabolized by either CYP2C19 or CYP2D6. This often results in clinically significant drug-drug interactions when treating an individual (e.g. psychotic depression) with both an antidepressant and an antipsychotic. Likewise, concerns about toxicity arise when co-prescribing both a TCA and an SSRI (an accepted practice for treatment resistant depression).

** CYP3A4 is involved in the metabolism of more than fifty (50) percent of ALL drugs. Furthermore, it often serves as the second isoenzyme system or "safety net" involved in drug metabolism.

Cytocrome P450 Tutorial

- [Definitions](#)
- [Phase 1 Metabolism](#)
- [Highlights of Cytochrome P450](#)
- [Factors Affecting P450 Metabolism](#)
- [Humans and Cytochrome P450](#)
- [CYP3A4](#)
- [Aging and Cytochrome P450](#)

Return

- Drug-Drug Interactions
- Supp-Drug Interactions
- Common Pitfalls
- P450 Interactions
- P450 and the Statins
- Managing Hepatic Enzyme
- Grapefruit Juice

Information

- [Cytochrome P450 Overview Medications and Grapefruit Juice](#)

To the right are seven navigation buttons to additional information about the system; they are:

- Drug-Drug Interactions
- Supplement-Drug Interactions
- Common Clinical Pitfalls
- Cytochrome P450 Interactions
- P450 and the Statins
- Managing Hepatic Enzyme
- Grapefruit Juice

Drug Interactions

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Cytochrome P450 Tutorial

Definitions	Phase 1 Metabolism
Highlights of Cytochrome P450	Factors Affecting P450 Metabolism
Humans and Cytochrome P450	CYP3A4
Aging and Cytochrome P450	

Return

[Drug-Drug Interactions](#)

[Supp-Drug Interactions](#)

[Common Pitfalls](#)

[P450 Interactions](#)

[P450 and the Statins](#)

[Managing Hepatic Enzyme](#)

[Grapefruit Juice](#)

Information
[Cytochrome P450 Overview](#)
[Medications and Grapefruit Juice](#)

Below the navigation buttons are two documents entitled:

- Cytochrome P450 Overview
- Medications and Grapefruit Juice

Drug Interactions

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Highlights of Cytochrome P450	Factors Affecting P450 Metabolism
Humans and Cytochrome P450	CYP3A4
Aging and Cytochrome P450	

Return

[Drug-Drug Interactions](#)

[Supp-Drug Interactions](#)

[Common Pitfalls](#)

[P450 Interactions](#)

[P450 and the Statins](#)

[Managing Hepatic Enzyme](#)

[Grapefruit Juice](#)

Information

[Cytochrome P450 Overview](#)

[Medications and Grapefruit Juice](#)

Drug-Drug Interactions Template

Drug Interactions

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Cytocrome P450 Tutorial

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- [Highlights of Cytochrome P450](#)
- [Factors Affecting P450 Metabolism](#)
- [Humans and Cytochrome P450](#)
- [CYP3A4](#)
- [Aging and Cytochrome P450](#)

Information

- [Cytochrome P450 Overview](#)
- [Medications and Grapefruit Juice](#)

Return

- Drug-Drug Interactions**
- Supp-Drug Interactions
- Common Pitfalls
- P450 Interactions
- P450 and the Statins
- Managing Hepatic Enzyme
- Grapefruit Juice

This template displays information on “**Some Classic Deadly Combinations**” of medications.

Drug - Drug Interactions

Some Classic Deadly Combinations

Aspirin or NSAIDs	+	Warfarin	=	Hemorrhage
Erythromycin	+	Seldene	=	Fatal Arrythmia (TdP)
Nizerol	+	Propulsid	=	Fatal Arrythmia (TdP)
Baycol	+	Lopid	=	Rhabdomyolysis
MAO's	+	Tyramine	=	Hypertensive Crisis
CNS Depressants	+	CNS Depressants	=	Respiratory Depression
Viagra	+	Nitroglycerin	=	Fatal Hypotension
ACE Inhibitors	+	Potassium-Sparing Diuretics	=	Hyperkalemia

Return

- [Combining Serotonin Enhancing Drugs](#)
- [Combining Vasodilators](#)
- [Combinations That Can Decrease Glycemic Control](#)
- [Combinations That Interact With Glucophage](#)
- [Combining Insulin-Enhancing Drugs](#)
- [Drug Combinations that Increase QT Interval](#)
- [Combining Drugs That Affect Dopamine](#)
- [Drug Combinations That Cause CNS Depression](#)

At the bottom of the template are 8 documents on the following subjects:

- Combining Serotonin Enhancing Drugs
- Combinations that can Decrease Glycemic control
- Combining Insulin-Enhancing Drugs
- Combining Drugs that Affect Dopamine
- Combining Vasodilators
- Combinations That Interact with Glucophage
- Drug Combinations that increase QT Interval
- Drug Combinations that Cause CNS Depression

Drug - Drug Interactions

Return

Some Classic Deadly Combinations

Aspirin or NSAIDs	+	Warfarin	=	Hemorrhage
Erythromycin	+	Seldane	=	Fatal Arrythmia (TdP)
Nizalol	+	Propulsid	=	Fatal Arrythmia (TdP)
Baycol	+	Lopid	=	Rhabdomyolysis
MAO's	+	Tyramine	=	Hypertensive Crisis
CNS Depressants	+	CNS Depressants	=	Respiratory Depression
Viagra	+	Nitroglycerin	=	Fatal Hypotension
ACE Inhibitors	+	Potassium-Sparing Diuretics	=	Hyperkalemia

Combining Serotonin Enhancing Drugs	Combining Vasodilators
Combinations That Can Decrease Glycemic Control	Combinations That Interact With Glucophage
Combining Insulin-Enhancing Drugs	Drug Combinations that Increase QT Interval
Combining Drugs That Affect Dopamine	Drug Combinations That Cause CNS Depression

Dietary Supplements & Drug Interactions

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
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- 2D6
- 2E1
- 3A4 **

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Return

Drug-Drug Interactions

Supp-Drug Interactions

Common Pitfalls

P450 Interactions

P450 and the Statins

Managing Hepatic Enzyme

Grapefruit Juice

Cytochrome P450 Tutorial

Definitions	Phase 1 Metabolism
Highlights of Cytochrome P450	Factors Affecting P450 Metabolism
Humans and Cytochrome P450	CYP3A4
Aging and Cytochrome P450	

Information

[Cytochrome P450 Overview](#)
[Medications and Grapefruit Juice](#)

This template identifies the drug/drug interactions of 28 commonly used supplements which are not FDA regulated. By clicking in the box, and selecting the supplement, a pop-up will appear which will give you information about potential problems with the selected supplement.

Dietary Supplements & Drug Interactions

[Return](#)

Some of the more common supplement-drug interactions effect...

- Blood Caogulation/Clotting
- Central Nervous System
- Blood Pressure
- Drug Metabolism

Select a supplement from the list below to view interaction information.

Information

[What Herbs Should I Avoid?](#)

[Warfarin and Supplements](#)

[Tricyclic Antidepressants and S](#)

[SSRIs and Supplements](#)

[Statins and Supplements](#)

Din Supplement

- 5 HTP
- ALA/GLA
- Black Cohosh
- CoQ10
- Dong Quai (Angelica)
- Echinacea
- Ephedra (Ma Huang)
- Feverfew
- Fish Oils (EPA, DHA)
- Garlic
- German Chamomile
- Ginger
- Ginkgo
- Ginseng
- Glucosamine/Chondroitin
- Goldenseal
- Green Tea
- Kava
- L-Arginine
- Licorice
- L-Tryptophan
- Melatonin
- SAMe
- St. John's Wort
- Stinging Nettle
- Valerian
- Vitamin E
- Yohimbe

[Close](#)

Dietary Supplements & Drug Interactions

[Return](#)

Some of the more common supplement-drug interactions effect...

- Blood Caogulation/Clotting
- Central Nervous System
- Blood Pressure
- Drug Metabolism

Select a supplement from the list below to view interaction information.

Information

[What Herbs Should I Avoid?](#)

[Warfarin and Supplements](#)

[Tricyclic Antidepressants and S](#)

[SSRIs and Supplements](#)

[Statins and Supplements](#)

Di Supp Fishoil

Fish Oils

Fish Oils may increase the risk of HYPotension in patients taking anihypertensive drugs.

Fish Oils (EPA, DHA) decrease platelet aggregation and may affect antithrombotic therapies such as Aspirin and Clopidogrel (Plavix) or anticoagulant therapies such as Enoxaparin (Lovenox), Heparin, and Warfarin (Coumadin).

[OK](#)
[Cancel](#)

At the bottom of the template there are the following information pieces:

- What Herbs Should I Avoid?
- Warfarin and Supplements
- Tricyclic Antidepressants and Supplements
- SSRIs and Supplements
- Statins and Supplements

The screenshot shows a web page with the following content:

- Dietary Supplements & Drug Interactions** (Title)
- Return** (Button)
- Some of the more common supplement-drug interactions effect...
 - Blood Caogulation/Clotting
 - Central Nervous System
 - Blood Pressure
 - Drug Metabolism
- Select a supplement from the list below to view interaction information.
-
- Information** (Section Header)
 - [What Herbs Should I Avoid?](#)
 - [Warfarin and Supplements](#)
 - [Tricyclic Antidepressants and Supplements](#)
 - [SSRIs and Supplements](#)
 - [Statins and Supplements](#)

Common Pitfalls Template

This template lists 12 common pitfalls which increase the probability of experiencing drug/drug interactions.

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
- 2C19 *
- 2D6
- 2E1

Return

Drug-Drug Interactions

Supp-Drug Interactions

Common Pitfalls

P450 Interactions

P450 and the Statins

Ageing Hepatic Enzyme

Grapefruit Juice

DI Drugpitfalls

Common Clinical Pitfalls of Monitoring Drug Interactions

1. Relying on memory as to which drugs interact
2. Relying heavily on personal clinical experience
3. Failure to understand the statistics of rare events
4. Failure to consider the effects of dose on the outcome of the interaction
5. Assuming that all members of a drug class will interact homogenously
6. Failure to appreciate the time-course of drug interactions
7. Failure to consider the effects of sequence of administration
8. Assuming that separating doses will circumvent absorption interactions
9. Assuming a similar magnitude of drug interactions among patients
10. Assuming that all routs of administration interact in the same way
11. Failure to consider the pharmacogenetics of the patient
12. Failure to consider herbal or dietary habits of patient or drug abuse potential

Ways to minimize the impact or frequency of interactions...

- Knowledge of mechanisms and time course
- Increased monitoring
- Use the lowest effective dose
- Discontinue ineffective therapies (clean out useless meds)
- Continually update drug history

Information

[chrome P450 Overview](#)

[Interactions and Grapefruit Juice](#)

Then the template displays 5 ways to minimize the impact or frequency of interactions.

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
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- 2D6
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Return
Drug-Drug Interactions
Supp-Drug Interactions
Common Pitfalls
P450 Interactions
P450 and the Statins
Inhibiting Hepatic Enzyme
Grapefruit Juice

DI Drugpitfalls

Common Clinical Pitfalls of Monitoring Drug Interactions

1. Relying on memory as to which drugs interact
2. Relying heavily on personal clinical experience
3. Failure to understand the statistics of rare events
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12. Failure to consider herbal or dietary habits of patient or drug abuse potential

Ways to minimize the impact or frequency of interactions...

- Knowledge of mechanisms and time course
- Increased monitoring
- Use the lowest effective dose
- Discontinue ineffective therapies (clean out useless meds)
- Continually update drug history

OK

Cancel

Information
[Chromome P450 Overview](#)
[Interactions and Grapefruit Juice](#)

P450 Interactions Template

This template presents a list of 32 classes of drugs. When a class is marked, the box below will present a pick list of all of the drugs in that class which interact with the P450 system.

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
- 2C19 *
- 2D6
- 2E1
- 3A4 **

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Cytocrome P450 Tutorial

- [Definitions](#)
- [Phase 1 Metabolism](#)
- [Highlights of Cytochrome P450](#)
- [Factors Affecting P450 Metabolism](#)
- [Humans and Cytochrome P450](#)
- [CYP3A4](#)
- [Aging and Cytochrome P450](#)

Information

- [Cytochrome P450 Overview](#)
- [Medications and Grapefruit Juice](#)

DI Pop

1. First select a category of medication.

- Acid Reflux
- Antipsychotics
- Cough Suppressant
- Nausea/Vomiting
- Alzheimers
- Arrhythmia
- Depression
- Nerves
- Antiacid
- Asthma
- Diabetic
- NSAIDs
- Antibiotics
- Benzodiazepines
- Diuretics
- Pain Relievers
- Anticoagulants
- Beta Blockers
- Fungal
- Steroids
- Angiotensin Receptor Blockers
- Calcium Blockers
- Hormones
- Unique
- Antiepileptics
- Cancer
- Muscle Relaxer
- Viral
- Antihistamines
- Cholesterol
- Narcotics
- Unusual Interactions**

2. Then select a drug from the box below to view the information.

the cytochrome(s)

Inhibitors (inhibit P450 metabolism of the substrate)

Inducers (increase P450 metabolism therefore decreasing the level of the substrate)

Atorvastatin

Cerivastatin

Fluvastatin

Lovastatin

Simvastatin

Close

OK Cancel

When a drug is selected, the following will be displayed:

- **Substrate** – the selected drug. The Cytochrome P450 enzyme which affects the substrate, will be displayed.
- **Inhibitors** – those drugs which will increase the concentration in the blood of the target.
- **Inducers** -- those drugs which will decrease the concentration in the blood of the target drug.

The screenshot shows a software window titled "Di Pop" with a close button in the top right corner. The window is divided into several sections:

- 1. First select a category of medication.** This section contains a grid of radio buttons for various medication categories. The categories are: Acid Reflux, Antipsychotics, Cough Suppressant, Nausea/Vomiting, Alzheimers, Arrhythmia, Depression, Nerves, Antacid, Asthma, Diabetic, NSAIDs, Antibiotics, Benzodiazepines, Diuretics, Pain Relievers, Anticoagulants, Beta Blockers, Fungal, Steroids, Angiotensin Receptor Blockers, Calcium Blockers, Hormones, Unique, Antiepileptics, Cancer, Muscle Relaxer, Viral, Antihistamines, Cholesterol (which is selected), and Narcotics. There is also a radio button for "Unusual Interactions".
- 2. Then select a drug from the box below to view the information.** Below this text, there are two text input fields. The first field contains "Perivastatin" and is followed by the text "is a substrate of the cytochrome(s)". The second field contains "CYP3A4".
- Inhibitors** (inhibit P450 metabolism therefore increasing the level of the substrate): A list of drugs including Ketoconazole; Itraconazole; Fluconazole; Erythromycin; Clarithromycin; Tricyclic Antidepressants; Nefazodone; Venlafaxine; Fluvoxamine; Fluoxetine; Sertraline; Cyclosporine; Tacrolimus; Omeprazole; Lansoprazole; Calcium Channel Blockers; Midazolam; Corticosteroids; Grapefruit Juice; Tamoxifen.
- Inducers** (increase P450 metabolism therefore decreasing the level of the substrate): A list of drugs including Phenytoin; Phenobarbital; Barbiturates; Rifampin; Erythromycin; Omeprazole; Lansoprazole; Dexamethasone; Sex Steroids; Cyclophosphamide; Carbamazepine.

At the bottom of the window, there are two buttons: "OK" and "Cancel".

Di Pop

1. First select a category of medication.

<input type="radio"/> Acid Reflux	<input type="radio"/> Antipsychotics	<input type="radio"/> Cough Suppressant	<input type="radio"/> Nausea/Vomiting
<input type="radio"/> Alzheimers	<input type="radio"/> Arrhythmia	<input type="radio"/> Depression	<input type="radio"/> Nerves
<input type="radio"/> Antiacid	<input type="radio"/> Asthma	<input type="radio"/> Diabetic	<input type="radio"/> NSAIDs
<input type="radio"/> Antibiotics	<input type="radio"/> Benzodiazepines	<input type="radio"/> Diuretics	<input type="radio"/> Pain Relievers
<input type="radio"/> Anticoagulants	<input type="radio"/> Beta Blockers	<input type="radio"/> Fungal	<input type="radio"/> Steroids
<input type="radio"/> Angiotensin Receptor Blockers	<input type="radio"/> Calcium Blockers	<input type="radio"/> Hormones	<input type="radio"/> Unique
<input type="radio"/> Antiepileptics	<input type="radio"/> Cancer	<input type="radio"/> Muscle Relaxer	<input type="radio"/> Viral
<input type="radio"/> Antihistamines	<input checked="" type="radio"/> Cholesterol	<input type="radio"/> Narcotics	<input type="radio"/> Unusual Interactions

2. Then select a drug from the box below to view the information.

Cerivastatin is a substrate of the cytochrome(s) CYP3A4

Inhibitors (slow P450 metabolism therefore increasing the level of the substrate) **Inducers** (increase P450 metabolism therefore decreasing the level of the substrate)

Di Inhibitors

Cytochrome P450 Inhibitors

An inhibitor is a compound that "slows down" the metabolism of a substrate by a given enzyme.

For example, fluoxetine slows down the metabolism of desipramine (substrate) by CYP2D6. In this case, fluoxetine now acts as an inhibitor. As a result, desipramine levels will rise. This can be very dangerous clinically resulting in tricyclic (desipramine) toxicity, prolonged QRS intervals (> 0.1), arrhythmia and even death.

DI Pop

1. First select a category of medication.

Acid Reflux
 Antipsychotics
 Cough Suppressant
 Nausea/Vomiting
 Alzheimers
 Arrhythmia
 Depression
 Nerves
 Antiacid
 Asthma
 Diabetic
 NSAIDs
 Antibiotics
 Benzodiazepines
 Diuretics
 Pain Relievers
 Anticoagulants
 Beta Blockers
 Fungal
 Steroids
 Angiotensin Receptor Blockers
 Calcium Blockers
 Hormones
 Unique
 Antiepileptics
 Cancer
 Muscle Relaxer
 Viral
 Antihistamines
 Cholesterol
 Narcotics
 Unusual Interactions

2. Then select a drug from the box below to view the information.

Cerivastatin is a substrate of the cytochrome(s) CYP3A4

Inhibitors (inhibit P450 metabolism therefore increasing the level of the substrate)

Inducers (increase P450 metabolism therefore decreasing the level of the substrate)

DI Inducers

Cytochrome P450 Inducers

An inducer is a compound that "speeds up" the metabolism of a substrate by a given enzyme.

For example, carbamazepine speeds up the metabolism of clozapine (substrate) by both CYP1A2 and CYP3A4. In this case carbamazepine acts as an inducer. As a result, clozapine plasma levels will fall. Conversely, if carbamazepine is discontinued, clozapine levels will rise. This can result in adverse effects such as an unanticipated seizure.

Cytochrome P450 and the Statins

This template lists the common statins in order from those which are most sensitive to the Cytochrome P450 System down to those which are the least sensitive.

Drug Interactions

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Return

Drug-Drug Interactions

Supp-Drug Interactions

Common Pitfalls

P450 Interactions

P450 and the Statins

Managing hepatic enzyme

Grapefruit Juice

Cytochrome P450 Tutorial

[Definitions](#) [Phase 1 Metabolism](#)
[Highlights of Cytochrome P450](#) [Factors Affecting P450 Metabolism](#)
[Humans and Cytochrome P450](#) [CYP3A4](#)
[Aging and Cytochrome P450](#)

Information

[Cytochrome P450 Overview Medications and Grapefruit Juice](#)

When you check the radial box next to the name of the statin, the P450 enzyme which detoxifies it, the inhibitors and the inducers will appear below. There is also a comment box.

Di P450statins

Cytochrome P450 and the Statins

Select a statin from the list below...

*** Organized in descending order of sensitivity to P450 metabolism. Those at the bottom of the list are the LEAST sensitive to P450 metabolism.*

- Simvastatin (Zocor)
- Lovastatin (Mevacor)
- Atorvastatin (Lipitor)
- Fluvastatin (Lescol)
- Rosuvastatin (Crestor)
- Pravastatin (Pravachol)

Substrate

Simvastatin (Zocor) is metabolized by CYP3A4.

Some Common Inhibitors (raise serum concentration levels) *** Scroll in box for more...*

Clarithromycin, Erythromycin, Diltiazem, Verapamil (max Zocor 20 mg qd), Itraconazole, Ritonavir, Nelfinavir, Cyclosporine (initially Zocor 5 mg qd, max 10 mg qd), Grapefruit Juice, Amiodorone (max Zocor 20 mg qd). If fibrates such as lopid or niacin greater than 1 gram per day, then avoid Zocor. If

Some Common Inducers (lowers serum concentration levels)

Carbamazepine, Rifampin, St. John's Wort, Phenobarbital, Phenytoin

Comments

Simvastatin (Zocor) and Lovastatin (Mevacor) are the most dependent upon the CYP3A4 enzyme and are therefore the most sensitive to inhibitors of this enzyme with resultant increase of toxicity of these statins.

OK Cancel

Managing Hepatic Enzyme Induction Template

This template provides information on 4 principles of how to avoid problems with drug toxicity.

Drug Interactions

More than 90% of human drug oxidation is due to six CYP isoenzymes

- 1A2
- 2C9 *
- 2C19 *
- 2D6
- 2E1
- 3A4 **

* Many antidepressants and antipsychotic medications are metabolized by either CYP2C19 or CYP2D6. This often results in clinically significant drug-drug interactions when treating an individual (e.g. psychotic depression) with both an antidepressant and an antipsychotic. Likewise, concerns about toxicity arise when co-prescribing both a TCA and an SSRI (an accepted practice for treatment resistant depression).

Return

- Drug-Drug Interactions
- Supp-Drug Interactions
- Common Pitfalls
- P450 Interactions
- P450 and the Statins
- Managing Hepatic Enzyme**

DI P450hepatic

Managing Hepatic Enzyme Induction

Prescription		Nonprescription Agents
1. Carbamazepine	7. Phenobarbital	1. Chronic cigarette smoking
2. Dexamethasone	8. Phenytoin	2. Chronic ethanol use
3. Isoniazid	9. Prednisone	3. Chronic marijuana smoking
4. Modafinil	10. Primidone	4. St. John's Wort
5. Omeprazole	11. Rifampin	
6. Oxcarbazepine		

- Inducing agents can lower plasma levels of co-administered medications that are also metabolized by the liver.
- Most psychotropics are metabolized by the liver, and their therapeutic effect requires a minimum plasma concentration.
- Hepatic enzyme induction can result in subtherapeutic plasma levels and inadequate drug trials of prescribed psychotropics.
- Assume that any inducing agent may lower plasma levels and alter the efficacy of co-administered drugs that are also metabolized by the liver. Observe carefully, monitor plasma levels, use incremental dosing to assess and compensate for induction effects

OK Cancel

[Overview](#)
[Grapefruit Juice](#)

Grapefruit Juice Template

This template displays 5 important facts about grapefruit juice and the Cytochrome P450 systems.

The screenshot shows a web application interface. At the top, the text "Drug Interactions" is displayed in blue. A modal window is open, titled "Di P450grapefruit" with a close button (X) in the top right corner. The modal window has a title "Cytochrome P450 and Grapefruit Juice" and contains five bullet points:

- Grapefruit juice is a "suicide" inhibitor of CYP3A4.
- It destroys some of the CYP3A4 in the small intestine, and the body must make new CYP3A4 to reestablish normal activity.
- The effect of grapefruit juice on CYP3A4 can last long after it passes through the small intestine and is eliminated from the body.
- Therefore, one cannot avoid the grapefruit juice-drug interactions by staggering juice consumption and drug administration.
- Frequent consumption of grapefruit juice (several times a day for several days) can lead to inhibition of CYP3A4 even for 2 or 3 days after the grapefruit juice is stopped.

At the bottom of the modal window are "OK" and "Cancel" buttons. To the right of the modal window is a sidebar menu with a "Return" section containing several buttons: "Drug-Drug Interactions", "Supp-Drug Interactions", "Common Pitfalls", "P450 Interactions", "P450 and the Statins", "Metoprolol Hepatic Enzyme", and "Grapefruit Juice". The "Grapefruit Juice" button is highlighted with a red border. Below the sidebar menu is an "Information" section with two blue hyperlinks: "Cytochrome P450 Overview" and "Medications and Grapefruit Juice".