1105, 11th Floor, SAS Tower-B, Medicity Sector-38, Gurgaon-122001. Haryana, India.

CliSeq med4me
Truly Personalized Medicine

PERSONAL DETAILS

PATIENT: xxx | GENDER : Female | DOB : 1985-01-01

Sample Information

ACCESSION NUMBER : xxxx | SPECIMEN TYPE : Blood | Hospital/Clinic:
COLLECTION DATE : 2025-xx-xx | RECEIVED DATE : | :

Clinical Information

ORDERING PHYSICIAN :
Disease indication:

Result Summary

Test Performed: GENES2ME

Current Patient Medications

Atorvastatin

The personalized pharmacogenomics profile of this patient reveals extensive CYP3A4-mediated metabolism, , andadequate response to Statin treatment (HMGCR-mediated).

Aspirin

The personalized pharmacogenomics profile of this patient reveals A labile ester, is rapidly hydrolyzed--primarily in the liver--to salicylic acid, which is conjugated with glycine (forming salicyluric acid) and glucuronic acid and excreted largely in the urine. These metabolic pathways have only a limited capacity, with kinetics that switch from first-order to zero-order. There is limited PGx information for hydrolysis, conjugation with glycine, and conjugation with glucuronic acid. In addition, this patient showsstandard renal functionAtomoxetineextensive CYP2C9-mediated metabolism, andextensive CYP3A5-mediated metabolism. For further details, please find supporting evidence in this report or on websites such as www.pharmgkb.org or www.fda.gov

- A medication has potentially reduced efficacy, increased toxicity or the patient has a risk for the indicated condition.
- Guidelines exist for adjusting dosage, increased vigilance or the patient has risk for the indicated condition.
- The medication can be prescribed according to standard regimens or the patient's risk for the indicated condition is not increased.

Examples of different levels of evidence for PGx SNPs

Gene	Marker	Level of Evidence	Drugs
DPYD	rs3918290	1A	Fluorouracil, Capecitabine, Tegafur, Pyrimidine analogues
CYP2D6	rs16947	1A	Amitriptyline, Codeine, Nortriptyline, Paroxetine
VKORC1	rs9923231	1A	Warfarin
SLCO1B1	rs4149056	1A	Simvastatin
CYP2D6	rs16947	1B	Tramadol
VKORC1	rs9923231	1B	Acenocoumarol
UGT1A1	rs8175347	2A	Irinotecan
NAT2	rs1801280	2A	Isoniazid
CYP2D6	rs16947	2A	Flecainide, Doxepin, Desipramine, Atomoxetine, Risperidone, Clomipramine, Imipramine, Venlafaxine
SLCO1B1	rs4149056	2A	Cerivastatin, Pravastatin, Rosuvastatin
UGT1A1	rs8175347	3	Raloxifene
ADH1B	rs1229984	3	Ethanol
CYP2D6	rs16947	3	Timolol, Carvedilol, Haloperidol, Aripiprazole, Metoprolol, Citalopram, Escitalopram, Tamoxifen
VKORC1	rs9923231	3	Phenprocoumon
SLCO1B1	rs4149056	3	Repaglinide, Irinotecan, Mycophenolate mofetil, Atorvastatin, Methotrexate, Olmesartan
CYP2D6	rs16947	4	Methylphenidate, Bufuralol
SLCO1B1	rs4149056	4	Lopinavir, Atrasentan

Level 1A Annotation for a variant-drug combination in a CPIC or medical society-endorsed PGx guideline, or implemented at a PGRN site or in another major health system.

Level 1B Annotation for a variant-drug combination where the preponderance of evidence shows an association. The association must be replicated in more than one cohort with significant p-values, and preferably will have a strong effect size.

Level 2A Annotation for a variant-drug combination that qualifies for level 2A where the variant is within a VIP (Very Important Pharmacogene) as defined by PharmGKB. The variants in level 2A are in known pharmacogenes, so functional significance is more likely.

Level 2B Annotation for a variant-drug combination with moderate evidence of an association. The association must be replicated but there may be some studies that do not show statistical significance, and/or the effect size may be small.

Level 3 Annotation for a variant-drug combination based on a single significant (not yet replicated) or annotation for a variant-drug combination evaluated in multiple studies but lacking clear evidence of an association.

Level 4 Annotation based on a case report, non-significant study or in vitro, molecular or functional assay evidence only.

GENOTYPE/HAPLOTYPE/PHENOTYPE DETAIL

Gene	Genotype-Haplotype	Phenotype
CYP1A1	*1/*1	Extensive metabolizer
CYP1A2	*1A/*1B	Extensive metabolizer
CYP2A6	*1.001/*1.001	Extensive metabolizer
CYP2B6	*1/*4	Ultrarapid metabolizer
CYP2C8	*1/*1	Extensive metabolizer
CYP2C9	*1/*1	Extensive metabolizer
CYP2C19	*38.001/*38.001	Extensive metabolizer
CYP2D6	*1/*29.001	Intermediate metabolizer
CYP2E1	*1/*1	Extensive metabolizer
CYP2J2	*1/*1	Extensive metabolizer
CYP3A4	*1.001/*1.001	Extensive metabolizer
CYP3A5	*1/*1	Extensive metabolizer
VKORC1	H1/H2	Sensitive to Warfarin
SLC22A1	*1/*408V	Intermediate function
SLCO1B1	*1/*14	
SLCO1B3	*112A/*112A	Intermediate function
SLCO2B1	*1/*1	Extensive function
ABCC2	*1/*1324I	Intermediate function
ABCG2	*1/*1	Extensive function
ADH1B	*2/*2	Ultrarapid metabolizer
SULT1A1	*1/*1	Extensive metabolizer
EPHX1	*1/*113His	Ultrarapid metabolizer
NAT2	*4.002/*5.001	Poor acetylator
TPMT	*1/*1	Extensive metabolizer
GSTP1	*1A/*1A	Extensive metabolizer
BCHE	*1/*1	Extensive function
UGT1A1	*1/*1	Extensive metabolizer
UGT1A4	*1/*3	Intermediate metabolizer
UGT1A6	*1/*1	Extensive metabolizer
UGT2B7	*1a/*1a	Extensive metabolizer
UGT2B15	*1/*1	Extensive metabolizer
DPYD	*9A/F632F	Extensive metabolizer
NUDT15	*1/*1	Thiopurines resistance
G6PD	0.01	

Disclaimer: No patient should evaluate or use the information contained herein without the advice, consultation and supervision of a licensed healthcare professional such as a pharmacist or physician. Laboratory-developed testing characteristics and protocols. Results have not been reviewed or approved by the U.S. Food & Drug Administration (FDA).

Methodology: Array based assays detect listed alleles, including all common and most rare variants with known clinical significance at analytical sensitivity and specificity >99%. Array based assays detect listed alleles, including all common and most rare variants with known clinical significance at analytical sensitivity and specificity >99%.

Limitations: Testing cannot detect all genetic mutations, inactive or altered genes. The absence of a finding of a detectable gene, polymorphism or mutation does not necessarily indicate patient possesses intermediate or high sensitivity phenotypes or that patient has an undetected polymorphism. Absence of finding may be due to drug-drug interaction.

PHARMACOGENOMICS

Genetic Markers Tested for Pharmacogenomics:
Results are arranged by drug response. Each individual report contains six sections, including: Patient's current medication (if any), Medication history, genotype/haplotype/phenotype detail, PGx report, Genomic Test Results, and Patient Information Card. Inclusion of the PGx Report indicates that the tested individual: displays decreased efficacy to the drug (light green dots), should use the drug as directed (green dots), or exhibits increased toxicity to the drug (red dots). Inclusion of Genomic Test Results indicates genotype, haplotype, phenotype, or presence of mutation.

Organization of Table:
1. Gene/Locus refers to gene or intergenic region of genetic marker location.
2. Marker refers to the tested marker's unique identifier.
3. Genotype/Haplotype refers to the particular marker's combination of nucleotides. The letter(s) on either side of the slash refer(s) to the two (2) copies of the patient DNA. Del and dashes denotes nucleotide indels in patient DNA. Empty cells indicate an absence of genotyping results.
4. Phenotype refers to the CYP specific drug metabolizing capabilities of an individual.

see risks and limitations on the last pages of this report

PGx Report - Pain Management

Type: Anti-inflammatory Agent, Analgesic, Antipyretic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
The Nonsteroidal Antiinflammatory Drugs (NSAIDs)						
Acetic acid derivatives	Diclofenac	UGT2B7	CYP2C9, UGT1A3, UGT1A9, CYP2E1, CYP3A4		●	
	Nabumetone	CYP1A2	CYP2C19, CYP3A4		●	
	Indomethacin	CYP2C9	CYP2C19		●	
Enolic acid (Oxicam) derivatives	Meloxicam	CYP2C9	CYP1A2, CYP3A4, CYP3A5		●	
	Piroxicam	CYP2C9	CYP3A4, CYP3A5		●	
	Tenoxicam	CYP2C9			●	
	Lornoxicam	CYP2C9			●	
Selective COX-2 inhibitors (Coxibs)	Etoricoxib	CYP3A4	CYP3A5, CYP2C9, CYP2D6, CYP1A2		●	
	Parecoxib	CYP2C9	CYP3A4, CYP3A5		●	
	Celecoxib	CYP2C9	CYP2C19		●	
Propionic acid derivatives	Ibuprofen	CYP2C9	CYP2C19, CYP2C8, UGT1A3, UGT1A9, UGT2B7		●	
	Flurbiprofen	CYP2C9			●	
	Ketoprofen	CYP3A4	CYP2C9, CYP3A5, UGT1A6, UGT1A9, UGT2B7		●	
	Fenoprofen	CYP2C9	UGT2B7		●	
	Vicoprofen	CYP2D6	CYP3A4		●	
	Naproxen	CYP2C9	CYP1A2, CYP2C8, UGT2B7, SULT1A1, UGT1A3, UGT1A6, UGT1A9		●	
Anthranilic acid derivatives (Fenamates)	Mefenamic acid	CYP2C9			●	
The Non-NSAIDs Analgesic	Acetaminophen	UGT1A1, UGT1A6, UGT1A9, SULT1A1, GSHs	CYP2E1, CYP3A4, CYP3A5, CYP2D6, CYP1A2, ABCG2		●	

PGx Report - Pain Management

Type: Opioid

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Opioid Analgesics						
Opium alkaloids	Morphine	UGT2B7	ABCB1, ABCC3, UGT1A1, UGT1A8, OPRM1, COMT			●
	Codeine	CYP2D6	CYP3A4, UGT2B7, UGT2B4, FMO3, CYP3A5, OPRM1	●		
Esters of morphine	Diacetylmorphine (Heroin)	CES1	CES2, BCHE, OPRM1		●	
Ethers of morphine	Dihydrocodeine	CYP3A4	CYP2D6, CYP3A5		●	
	Ethylmorphine	CYP2D6	CYP3A4, CYP3A5		●	
Semi-synthetic alkaloid derivatives	Hydrocodone	CYP2D6	CYP3A4, CYP3A5, OPRM1		●	
	Hydromorphone	UGT2B7			●	
	Oxycodone	CYP3A4	CYP3A5, CYP2D6, ABCB1, UGT2B7, COMT		●	
	Oxymorphone	UGT2B7			●	
Synthetic opioids						
Anilidopiperidine derivatives	Alfentanil	CYP3A4	CYP3A5, ABCB1, OPRM1		●	
	Fentanyl	CYP3A4	CYP3A5, ABCB1, OPRM1		●	
	Sufentanil	CYP3A4	CYP3A5, OPRM1		●	
Phenylpiperidine derivatives	Meperidine	CYP2B6	CYP3A4, CYP2C19, CYP3A5, UGT1A4		●	
	Ketobemidone	CYP2C9	CYP3A4, CYP3A5		●	
Diphenylpropylamine derivatives	Dextropropoxyphene	CYP3A4	CYP3A5, Renal Excretion		●	
	Levacetylmethadol	CYP3A4	CYP3A5		●	
	Loperamide	CYP3A4	CYP2C8, CYP3A5		●	
	Methadone	CYP3A4	CYP2B6, CYP2D6, CYP3A5, ABCB1, UGT2B7, COMT		●	
Oripavine derivatives	Buprenorphine	CYP3A4	CYP3A5, CYP2C8, UGT1A1, UGT1A3, UGT2B7		●	
Morphinan derivatives	Dextromethorphan	CYP2D6	CYP3A4, CYP3A5		●	
Biased opioid agonists (preferentially activate G-protein signaling over β-arrestin)	Oliceridine	CYP3A4	CYP2D6, CYP3A5, CYP2C9, CYP2C19		●	
Others	Tramadol	CYP2D6	CYP3A4, CYP2B6, CYP3A5, OPRM1, SLC22A1, COMT	●		
	Tapentadol	CYP2C9	CYP2C19, CYP2D6		●	
	Tilidine	CYP3A4	CYP2C19, CYP3A5		●	
Anti-opioid	Methylnaltrexone	CYP2D6	CYP3A4, CYP3A5		●	
	Naloxone	UGT2B7	UGT1A3		●	
	Naltrexone	UGT2B7	UGT1A1, UGT1A3, OPRM1		●	

PGx Report - Pain Management

Type: Drugs Prescribed for the Treatment of Gout, Antirheumatic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Drugs Prescribed for Gout						
Uricosurics	Sulfinpyrazone	CYP2C9	CYP3A4, CYP3A5		✓	
Mitotic inhibitors	Colchicine	CYP3A4	CYP3A5		✓	
Xanthine oxidase inhibitors	Febuxostat	CYP1A2, CYP2C8	CYP2C9, UGT1A1, UGT1A3, UGT1A9, UGT2B7		✓	
	Allopurinol	AOX1	Renal Excretion, HLA-B*5801		✓	
	Oxypurinol	Renal Excretion			✓	
Recombinant urate oxidase	Rasburicase		G6PD, CYB5R1, CYB5R2, CYB5R3, CYB5R4		✓	
Uric acid 1 transporter inhibitor	Lesinurad	CYP2C9			✓	
Drugs Prescribed for Rheumatic Conditions						
DMARDs	Leflunomide	CYP1A2			✓	
Complement 5a receptor (C5aR) antagonist	Avacopan	CYP3A4	CYP3A5		✓	
Janus kinase 1 (JAK1) inhibitor	Upadacitinib	CYP3A4	CYP2D6, CYP3A5		✓	
Anti-inflammatory	Tofacitinib	CYP3A4	CYP2C19, CYP3A5		✓	
Abbreviations: DMARDs, Disease-modifying antirheumatic drugs; RE, renal excretion (unchanged drug).						

Additional SNPs of Importance for Pain Management

Gene	Marker	Genotype	Drug	Level of Evidence	Results
COMT	rs4680	A/A	Paroxetine	3	Patients may require a lower dose

PGx Report - Modulation of Cardiovascular Function

Type: Antiarrhythmic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antiarrhythmic class Ia	Quinidine	CYP3A4, CYP2D6	CYP2E1, CYP3A5, CYP2C9, CYP2C8		✓	
	Procainamide	CYP2D6	NAT2			✓
	Sparteine	CYP2D6				✓
	Disopyramide	CYP3A4	CYP3A5, CYP1A2, CYP2C19		✓	
Antiarrhythmic class Ib	Phenytoin	CYP2C19	CYP2C9, CYP3A4, CYP3A5, CYP2D6, ABCB1, EPHX1, HLA-B*1502		✓	
	Tocainide	UGTs			✓	
	Lidocaine	CYP1A2	CYP3A4, CYP3A5		✓	
	Mexiletine	CYP2D6	CYP1A2		✓	
Antiarrhythmic class Ic	Propafenone	CYP2D6	CYP3A4, CYP1A2, CYP3A5		✓	
	Flecainide	CYP2D6				✓
	Encainide	CYP2D6				✓
Antiarrhythmic class II	Carvedilol	CYP2D6	UGT1A1, UGT2B4, CYP2C9		✓	
	Bisoprolol	CYP2D6	CYP3A4, CYP3A5		✓	
	Metoprolol	CYP2D6	CYP3A4, CYP3A5		✓	
	Propranolol	CYP2D6	CYP1A2, CYP2C19, CYP3A4, CYP3A5, UGT1A9		✓	
Antiarrhythmic class III	Amiodarone	CYP3A4	CYP2C8, CYP3A5		✓	
	Dronedarone	CYP3A4	CYP3A5		✓	
	Dofetilide	Renal Excretion	CYP3A4, CYP3A5		✓	
Antiarrhythmic class IV	Diltiazem	CYP3A4	CYP2C19, CYP3A5		✓	
	Verapamil	CYP3A4	CYP2C8, CYP3A5, ABCB1		✓	

PGx Report - Modulation of Cardiovascular Function

Type: Antihypertensive I

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antihypertensives						
Angiotensin II receptor antagonist	Losartan	CYP2C9	CYP3A4, CYP3A5, UGT1A1, UGT1A3		✓	
	Azilsartan	CYP2C9			✓	
	Irbesartan	CYP2C9			✓	
	Telmisartan	Biliary Excretion	UGT1A1		✓	
	Olmesartan	Hydrolysis	Renal Excretion, SLCO1B1		✓	
	Valsartan	CYP2C9			✓	
Angiotensin-Converting Enzyme Inhibitors	Captopril	Renal Excretion	CYP2D6		✓	
	Enalapril	CES1, Renal Excretion	CYP3A4, CYP3A5		✓	
	Trandolapril	CES1	CYP2D6, CYP2C9, Renal Excretion		✓	
Renin inhibitors	Aliskiren	CYP3A4	CYP3A5, ABCB1		✓	
Aldosterone Antagonists	Eplerenone	CYP3A4	CYP3A5		✓	
Loop diuretic	Torasemide	CYP2C9	CYP2C8, Renal Excretion		✓	
	Furosemide	Renal Excretion	UGT1A9, UGT1A10		✓	
Potassium-sparing diuretic	Triamterene	CYP1A2			✓	
Vasopressin receptor antagonists	Tolvaptan	CYP3A4	CYP3A5		✓	
Adrenergic release inhibitors	Debrisoquine	CYP2D6				✗
Peripheral Adrenergic Inhibitors	Reserpine	CYP2D6				✗
Beta-1 cardioselective beta-blockers	Metoprolol	CYP2D6	CYP3A4, CYP3A5		✓	
	Bisoprolol	CYP2D6	CYP3A4, CYP3A5		✓	
	Nebivolol	CYP2D6				✗

PGx Report - Modulation of Cardiovascular Function

Type: Antihypertensive II

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antihypertensives						
Nonselective beta-blockers	Timolol	CYP2D6				✗
	Propranolol	CYP2D6	CYP1A2, CYP2C19, CYP3A4, CYP3A5, UGT1A9		✓	
Beta-blockers with alpha activity	Carvedilol	CYP2D6	UGT1A1, UGT2B4, CYP2C9		✓	
	Labetalol	CYP2D6	CYP2C19, ABCB1, UGT1A1, UGT1A9, UGT2B7		✓	
Alpha blockers	Terazosin	CYP3A4	CYP3A5		✓	
	Doxazosin	CYP2D6	CYP2C19, CYP3A4, CYP3A5		✓	
α-2 adrenergic agonist	Clonidine	CYP2D6	CYP1A2, CYP3A4, CYP3A5		✓	
	Tizanidine	CYP1A2			✓	
Antihypertensives Calcium channel blockers						
Dihydropyridine	Amlodipine	CYP3A4	CYP3A5		✓	
	Nifedipine	CYP3A4	CYP1A2, CYP2A6, CYP3A5		✓	
	Nimodipine	CYP3A4	CYP3A5		✓	
	Nicardipine	CYP2C8	CYP2D6, CYP3A4, CYP3A5		✓	
Benzothiazepine	Diltiazem	CYP3A4	CYP2C19, CYP3A5		✓	
Phenylalkylamine	Verapamil	CYP3A4	CYP2C8, CYP3A5, ABCB1		✓	
Nonselective	Bepridil	CYP3A4	CYP3A5		✓	
Anti-pulmonary arterial hypertension						
ERA-Dual antagonists	Bosentan	CYP2C9	CYP3A4, CYP3A5, SLCO1B3		✓	
	Macitentan	CYP3A4	CYP2C19, CYP3A5		✓	
Phosphodiesterase inhibitors	Sildenafil	CYP3A4	CYP2C9, CYP3A5		✓	
	Tadalafil	CYP3A4	CYP3A5		✓	
Abbreviations: ERA, endothelin receptor antagonist.						

PGx Report - Modulation of Cardiovascular Function

Type: Cardiac stimulant, Vasodilator, Drugs Prescribed for the Treatment of Angina

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Cardiac stimulants						
Digitalis glycosides	Digoxin	Renal Excretion	ABCB1, SLCO1B3, ABCB4		✓	
Adrenergic and dopaminergic agents	Epinephrine	MAO	COMT		✓	
	Phenylephrine	MAO	SULTs, UGTs		✓	
	Dopamine	ALDH1A1, ALDH2	DBH, MAOA, MAOB, SULT1A3, SULT1A4, COMT		✓	
	Synephrine	MAO			✓	
Vasodilators used in cardiac diseases						
Organic nitrates	Isosorbide dinitrate	NAT2	NAT1			✓
Other Vasodilators	Hydralazine	NAT2	NAT1, CYP1A2, CYP3A4, CYP3A5			✓
Other Drugs Used in Angina						
Other cardiac preparations	Ranolazine	CYP3A4	CYP2D6, CYP3A5		✓	
	Ivabradine	CYP3A4	CYP3A5		✓	

PGx Report - Modulation of Cardiovascular Function

Type: Dyslipidemia

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Drug Therapy for Hypercholesterolemia and Dyslipidemia (Liver)						
HMG CoA reductase inhibitors Statins	Atorvastatin	CYP3A4, HMGCR	HMGCR, ABCG2, CYP3A5, ABCB1, ABCG8, UGT1A1, UGT1A3, UGT2B7, KIF6			✓
	Fluvastatin	CYP2C9, SLCO1B1	HMGCR, ABCG2, CYP3A4, CYP2C8, UGT1A1, UGT1A3, UGT2B7		✓	
	Lovastatin	CYP3A4, SLCO1B1	CYP3A5, HMGCR, UGT1A1, UGT1A3		✓	
	Cerivastatin	CYP3A4, SLCO1B1	HMGCR, CYP2C8, CYP3A5			✓
	Pitavastatin	UGT1A3, UGT2B7	CYP2C9, CYP2C8, ABCB1, HMGCR		✓	
	Pravastatin	SLCO1B1, HMGCR	KIF6, APOE, ABCA1		✓	
	Simvastatin	CYP3A4, SLCO1B1	ABCG2, HMGCR, CYP3A5, ABCB1, SLCO2B1, UGT1A1, UGT1A3, UGT2B7, KIF6			✓
	Rosuvastatin	UGT1A1	UGT1A3, ABCG2, HMGCR		✓	
MTTP inhibitors	Lomitapide	CYP3A4	CYP3A5, CYP1A2, LDLR		✓	
Drug Therapy for Hypercholesterolemia and Dyslipidemia (GI)						
Cholesterol absorption inhibitors	Ezetimibe	UGT1A1	UGT1A3, UGT2B15		✓	
Drug Therapy for Hypercholesterolemia and Dyslipidemia (Blood vessels)						
Fibrates	Gemfibrozil	CYP3A4	CYP3A5, UGT2B7, UGT1A1, UGT1A3, UGT1A9, UGT2B15		✓	
	Clofibrate	UGT2B7			✓	
Drug Therapy for familial hypercholesterolemia						
Cholesterol-reducing drug (antisense oligonucleotide)	Mipomersen	Nuclease, Renal Excretion	LDLR		✓	

Abbreviations: MTTP, microsomal triglyceride transfer protein; GI, gastrointestinal tract. Rosuvastatin and Pravastatin are considered alternative Statins since are not extensively metabolized by the CYPs.

Additional SNPs of Importance for Treatment Using Statins

Gene	Marker	Genotype	Drug	Level of Evidence	Results
HMGCR	rs17244841	A/A	Fluvastatin	2A	Adequate response to Statin treatment
HMGCR	rs17244841	A/A	Pravastatin	2A	Adequate response to Statin treatment
HMGCR	rs17244841	A/A	Simvastatin	2A	Adequate response to Statin treatment
HMGCR	rs17238540	T/T	Pravastatin	3	Adequate response to Statin treatment
HMGCR	rs17238540	T/T	Simvastatin	3	Adequate response to Statin treatment
HMGCR	rs17238540	T/T	Atorvastatin	3	Adequate response to Statin treatment
HMGCR	rs17238540	T/T	Fluvastatin	3	Adequate response to Statin treatment
HMGCR	rs17238540	T/T	Lovastatin	3	Adequate response to Statin treatment
HMGCR	rs3846662	A/A	Simvastatin	4	Adequate response to Statin treatment
ITGB3	rs5918	T/T	Clopidogrel	3	Clopidogrel

PGx Report - Modulation of Cardiovascular Function

Type: Anticoagulant, Antiplatelet

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Blood Coagulation and Anticoagulant, and Antiplatelet Drugs						
Vitamin K antagonist	Warfarin	CYP2C9, VKORC1	CYP4F2, CYP2C19, CYP1A2, CYP3A4, EPHX1, PROC, PROS1		✓	
	Acenocoumarol	CYP2C9, VKORC1	CYP4F2, CYP2C19, CYP1A2		✓	
	Phenprocoumon	CYP2C9, VKORC1	CYP4F2, CYP3A4, CYP2C8, EPHX1		✓	
Direct factor Xa inhibitors	Rivaroxaban	CYP3A4	CYP2J2, CYP3A5		✓	
	Apixaban	CYP3A4	CYP3A5		✓	
Antiplatelet Drugs						
ADP receptor (P2Y12) inhibitors Nucleotide/nucleo side analogs	Ticagrelor	CYP3A4	CYP3A5		✓	
ADP receptor (P2Y12) inhibitors Thienopyridines	Clopidogrel	CYP2C19	ABCB1, ABCC3		✓	
	Prasugrel	BCHE, CYP3A4	CYP2B6, CYP2C9, CYP2C19, CYP3A5, CYP2D6		✓	
Irreversible cyclooxygenase inhibitors	Aspirin	GLYAT, UGTs, Renal Excretion	CYP2C9, CYP3A4, CYP3A5		✓	
Phosphodiesterase inhibitors	Cilostazol	CYP3A4	CYP2C19, CYP3A5		✓	
Protease-activated receptor-1 (PAR-1) antagonists	Vorapaxar	CYP3A4	CYP2J2, CYP3A5		✓	

Abbreviations: P2Y12, purinergic receptor P2Y12.

SNPs of Importance for Venous Thromboembolism Risk

Gene	Protein change	Nucleotide change	Marker	Genotype	Results
F5	Arg534Gln	1601G>A	rs6025	G/G	Normal risk
F2		*97G>A	rs1799963	G/G	Normal risk
ADRB2	Gln27Glu	79C>G	rs1042714	G/C	1.4-fold lifetime increase risk
VKORC1		1173C>T	rs9923231	A/A	High warfarin sensitivity; low warfarin dosage
VKORC1		-1639G>A	rs9934438	T/T	High warfarin sensitivity; low warfarin dosage
MTHFR	Ala222Val	665C>T	rs1801133	C/C	Normal MTHFR enzyme function.
MTHFR	Glu429Ala	1286A>C	rs1801131	A/A	Normal MTHFR enzyme function.
MTHFR	Ala222Val	665C>T	rs1801133	C/C	Normal risk
MTHFR	Glu429Ala	1286A>C	rs1801131	A/A	

Additional SNPs of Importance for Cardiovascular Treatment I

Gene	Marker	Genotype	Drug	Level of Evidence	Results
ADRB1	rs1801252	A/G	Atenolol, Bisoprolol, Metoprolol, Verapamil	3	Patients may 1) experience more benefit from beta blocking agents (such as atenolol) than verapamil 2) not require additional heart failure medications (such as diuretics)
ADRB1	rs1801252	A/G	Timolol	3	Patients may have decreased systolic (SAP) and diastolic (DAP) arterial pressure responses
ADRB1	rs1801253	C/C	Metoprolol	3	Patients may have a stronger diastolic blood pressure (DBP) response with a significantly greater reduction in 24-hour and daytime DBP
ADRB1	rs1801253	C/C	Verapamil	3	Patients with Atrial Fibrillation may have a decreased response to treatment
ADRB1	rs1801253	C/C	Dobutamine	3	Healthy males may have a greater increase in fractional shortening and systolic blood pressure when given Dobutamine
ADRB2	rs1042713	G/A	Benazepril	3	Patients with hypertension may have a greater decrease in diastolic blood pressure
ADRB2	rs1042714	G/A	Isoproterenol	3	Patients may have increased isoproterenol-mediated desensitization in the vasculature

Additional SNPs of Importance for Cardiovascular Treatment II

Gene	Marker	Genotype	Drug	Level of Evidence	Results
GRK4	rs1024323	C/T	Metoprolol	3	In male patients with hypertensive nephrosclerosis may have a reduced response
GRK4	rs1024323	C/T	Atenolol or Verapamil	3	Patients with hypertension and coronory artery disease may have decreased, but not absent, risk for adverse cardiovascular outcomes when treated with Atenolol or Verapamil
ACE	rs1799752	-/ATAC	Captopril	2A	Patients with conditions such as heart failure, chronic obstructive pulmonary disease and Type 2 diabetes may have an increased response
ACE	rs1799752	-/ATAC	Hydrochlorothiazide	3	Patients with essential hypertension may have a decreased reduction in blood pressure
ACE	rs1799752	-/ATAC	Enalapril	3	Patients with conditions such as heart failure, chronic obstructive pulmonary disease and Type 2 diabetes may have an increased response
ACE	rs1799752	-/ATAC	Benazepril Perindopril	3	Patients with diabetes or hypertension may have a poorer response
ACE	rs1799752	-/ATAC	Irbesartan	3	Hypertensive patients may have a greater reduction in diastolic blood pressure
ACE	rs1799752	-/ATAC	Pravastatin	3	Patients may be less likely to benefit from treatment

PGx Report - Internal Medicine

Type: Drugs Prescribed for the Modulation of Respiratory Function

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Respiratory						
Anticholinergic	Umeclidinium	CYP2D6				●
	Aclidinium	CYP2D6	CYP3A4, CYP3A5		●	
Beta2-adrenergic agonist	Arformoterol	CYP2D6, UGT1A1	CYP2C19		●	
	Indacaterol	UGT1A1, CYP3A4	CYP3A5, CYP1A2, CYP2D6		●	
	Formoterol	CYP2D6	CYP2C19, CYP2C9, CYP2A6		●	
	Salmeterol	CYP3A4	CYP3A5		●	
	Vilanterol	CYP3A4	CYP3A5		●	
Corticosteroid	Budesonide	CYP3A4	CYP3A5		●	
	Fluticasone	CYP3A4	CYP3A5		●	
	Mometasone	CYP3A4	CYP3A5		●	
Phosphodiesterase inhibitor	Roflumilast	CYP3A4	CYP1A2, CYP3A5		●	
	Theophylline	CYP1A2	CYP2E1		●	
5-lipoxygenase inhibitor	Zileuton	CYP1A2	CYP2C9, CYP3A4, CYP3A5		●	
Leukotriene receptor-1 antagonist	Montelukast	CYP3A4	CYP2C9, CYP3A5, SLCO2B1, ABCC1		●	
	Pranlukast	CYP3A4	CYP3A5		●	
	Zafirlukast	CYP2C9	CYP3A4, CYP3A5		●	
Treatment of cystic fibrosis (specifics mutations in the CFTR gene)	Ivacaftor	CYP3A4	CYP3A5, CFTR		●	
	Elexacaftor	CYP3A4	CYP3A5, CFTR		●	
	Tezacaftor	CYP3A4	CYP3A5, CFTR		●	
Drugs Prescribed for Idiopathic pulmonary fibrosis & Hereditary angioedema						
Synthetic pyridone drug	Pirfenidone	CYP1A2	CYP2C9, CYP2C19, CYP2D6, CYP2E1		●	
Inhibitor of plasma kallikrein	Berotralstat	CYP2D6	CYP3A4, CYP3A5		●	
Abbreviations: CFTR, Cystic fibrosis transmembrane conductance regulator.						

PGx Report - Internal Medicine

Type: Antiemetic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antiemetic						
Antiemetic, 5-HT3 receptor antagonist Indole derivative	Dolasetron	CYP3A4	CYP2D6, CYP3A5		●	
	Tropisetron	CYP3A4	CYP2D6, CYP3A5		●	
Antiemetic, 5-HT3 receptor antagonist Isoquinoline derivative	Palonosetron	CYP1A2	CYP2D6, CYP3A4, CYP3A5		●	
Antiemetic, 5-HT3 receptor antagonist Indazole derivative	Granisetron	CYP3A4	CYP3A5		●	
Antiemetic, 5-HT3 receptor antagonist	Ondansetron	CYP2B6	CYP1A2, CYP2D6, CYP3A4, ABCB1		●	
Antiemetic, dopamine-receptor antagonist	Domperidone	CYP3A4	CYP3A5		●	
	Prochlorperazine	CYP2D6	CYP3A4, CYP3A5		●	
	Metoclopramide	CYP2D6	CYP1A2, CYB5R1, CYB5R2, CYB5R3, CYB5R4		●	
Antiemetic, NK1 receptor antagonist	Aprepitant	CYP3A4	CYP3A5, CYP1A2, CYP2C19		●	
	Fosnetupitant	CYP3A4	CYP3A5		●	
	Rolapitant	CYP3A4	CYP3A5		●	
Antiemetic, H1 histamine receptor antagonist	Diphenhydramine	CYP2D6	CYP3A4, CYP3A5, UGT1A3, UGT1A4		●	
	Hydroxyzine	ADHs	CYP3A4, CYP3A5		●	
	Promethazine	CYP2D6	UGT1A3, UGT1A4, SULTs			●
Cannabinoids	Dronabinol	CYP2C9	CYP2C19, CYP3A4, CYP3A5		●	
Benzodiazepines	Lorazepam	UGT2B15	UGT2B7		●	
	Midazolam	CYP3A4	CYP3A5		●	
Anticholinergics	Scopolamine	CYP3A4	CYP3A5		●	
Steroids	Dexamethasone	CYP3A4	CYP17A1, CYP3A5		●	
Abbreviations: 5-HT, Serotonin; NK1, neurokinin 1.						

PGx Report - Internal Medicine

Type: Drugs Prescribed for the Treatment of Peptic Ulcers and/or Gastro-Esophageal Reflux Disease

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Histamine H2-receptor antagonists	Ranitidine	Renal Excretion	CYP1A2, CYP2C19, FMO3, CYP3A4, CYP3A5		✓	
Proton-pump inhibitor	Omeprazole	CYP2C19	CYP3A4, CYP2C9, CYP3A5		✓	
	Dexlansoprazole	CYP2C19	CYP3A4, CYP3A5		✓	
	Esomeprazole	CYP2C19	CYP3A4, CYP3A5		✓	
	Lansoprazole	CYP3A4	CYP2C19, CYP3A5		✓	
	Rabeprazole	Non Enz	CYP2C19, CYP3A4, CYP3A5		✓	
	Ilaprazole	CYP3A4	CYP3A5		✓	
	Pantoprazole	CYP2C19	CYP3A4, CYP2D6, CYP2C9, CYP3A5		✓	
Rabeprazole						

PGx Report - Internal Medicine

Type: Drugs Prescribed for the Treatment of Functional Gastrointestinal Disorders, Obesity

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Drugs for functional gastrointestinal disorders						
Acting on serotonin receptors 5-HT3 antagonists	Alosetron	CYP2C9	CYP3A4, CYP1A2		✓	
	Cilansetron	CYP3A4	CYP2D6, CYP1A2, CYP2C19, CYP3A5		✓	
Acting on serotonin receptors 5-HT4 agonists	Mosapride	CYP3A4	CYP3A5		✓	
	Prucalopride	Renal Excretion	CYP3A4, CYP3A5		✓	
Gastroprokinetic						
Serotonin 5-HT$_4$ receptor agonist	Cisapride	CYP3A4	CYP3A5		✓	
	Cinitapride	CYP3A4	CYP2C8, CYP3A5		✓	
Parasympatho mimetic	Itropride	FMO3			✓	
Dopamine antagonists	Metoclopramide	CYP2D6	CYP1A2, CYB5R1, CYB5R2, CYB5R3, CYB5R4		✓	
	Clebopride	CYP3A4	CYP3A5		✓	
	Domperidone	CYP3A4	CYP3A5		✓	
Opioid-induced constipation						
Peripherally-selective opioid antagonist	Naloxegol	CYP3A4	CYP3A5		✓	
Antipropulsives						
Opioids	Loperamide	CYP3A4	CYP2C8, CYP3A5		✓	
	Morphine	UGT2B7	ABCB1, ABCC3, UGT1A1, UGT1A8, OPRM1, COMT			✗
Centrally acting anti-obesity drugs						
Stimulant/ Amphetamine/ Appetite suppressant agent	Sibutramine	CYP3A4	CYP3A5		✓	
	Phentermine	Renal Excretion	CYP3A4, CYP3A5		✓	
Opioid-system modulator (μ-opioid receptor antagonist)	Samidorphan	CYP3A4	CYP2C19, CYP3A5, CYP2C8		✓	
Anorectic	Lorcaserin	CYP2D6	CYP3A4, CYP3A5		✓	

PGx Report - Internal Medicine

Type: Diabetes

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antidiabetic Secretagogues						
Meglitinides	Repaglinide	CYP2C8	SLCO1B1, CYP3A4, CYP3A5, ABCC8			●
	Nateglinide	CYP2C9	CYP3A4, CYP3A5		●	
Sulfonylurea 1st generation	Chlorpropamide	Renal Excretion	CYP2D6, G6PD		●	
	Tolazamide	CYP2C9			●	
	Tolbutamide	CYP2C9	CYP2C19, CYP2C8		●	
Sulfonylurea 2nd generation	Glipizide	CYP2C9	G6PD		●	
	Glyburide	CYP3A4	CYP2C9, CYP2C19, CYP3A5, G6PD		●	
	Gliquidone	CYP2C9			●	
	Gliclazide	CYP2C9	CYP2C19		●	
	Glimepiride	CYP2C9	G6PD		●	
DPP-IV inhibitor	Saxagliptin	CYP3A4	CYP3A5		●	
	Alogliptin	Renal Excretion	CYP2D6, CYP3A4, CYP3A5		●	
	Linagliptin	Renal Excretion	CYP3A4, CYP3A5		●	
	Sitagliptin	CYP3A4	CYP2C8, CYP3A5		●	
Antidiabetic Sensitizers						
Thiazolidinediones	Pioglitazone	CYP2C8	CYP3A4, CYP3A5		●	
	Rosiglitazone	CYP2C8	CYP2C9		●	
Antidiabetic Other						
SGLT2 inhibitors	Canagliflozin	UGT1A9, UGT2B4	CYP3A4, CYP3A5		●	

Abbreviations: DPP-IV, Dipeptidyl peptidase-4; SGLT2, sodium/glucose cotransporter 2 or gliflozins.

PGx Report - Internal Medicine

Type: Migraine, Antihistamine, Abortifacient, Drugs Prescribed for the Treatment of Hyperparathyroidism, Dermatology

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Anti-migraine						
Selective serotonin (5-HT1) agonists	Almotriptan	CYP3A4	CYP2D6, CYP3A5		✓	
	Eletriptan	CYP3A4	CYP3A5		✓	
	Frovatriptan	CYP1A2			✓	
	Naratriptan	CYP1A2	CYP2C8, CYP2C9, CYP2D6		✓	
	Sumatriptan	MAO	UGTs, HTR2A		✓	
	Zolmitriptan	CYP1A2			✓	
CGRP receptor antagonist	Atogepant	CYP3A4	CYP3A5		✓	
	Rimegepant	CYP3A4	CYP2C9, CYP3A5		✓	
	Ubrogepant	CYP3A4	CYP3A5		✓	
Ergot alkaloids	Dihydroergotamine	CYP3A4	CYP3A5		✓	
	Ergotamine	CYP3A4	CYP3A5		✓	
Antihistamines						
Aminoalkyl ethers	Diphenhydramine	CYP2D6	CYP3A4, CYP3A5, UGT1A3, UGT1A4		✓	
Substituted alkylamines	Chlorpheniramine	CYP3A4	CYP3A5		✓	
Phenothiazine derivatives	Promethazine	CYP2D6	UGT1A3, UGT1A4, SULTs			✓
Piperazine derivatives	Hydroxyzine	ADHs	CYP3A4, CYP3A5		✓	
	Cyclizine	CYP2D6			✓	
	Cetirizine	Renal Excretion			✓	
Other antihistamines	Terfenadine	CYP3A4	CYP3A5		✓	
	Loratadine	CYP3A4, CYP2D6	CYP3A5, CYP2C8, CYP2C9		✓	
	Fexofenadine	Biliary Excretion	Renal Excretion, CYP3A4, CYP3A5, SLCO2B1		✓	
	Desloratadine	CYP2C8	UGT2B10		✓	
	Astemizole	CYP3A4	CYP3A5		✓	
Treatment of secondary hyperparathyroidism						
Calcimimetic	Cinacalcet	CYP3A4	CYP2D6, CYP3A5, CYP1A2		✓	
Abortifacient						
Progestin Antagonist	Mifepristone	CYP3A4	CYP3A5		✓	
Dermatology Antipsoriatics						
Retinoids	Etretinate	CYP26A1			✓	
	Acitretin	CYP26A1			✓	
Dermatology Anti-Atopic dermatitis						
Janus kinase 1 (JAK1) inhibitor	Abrocitinib	CYP2C19	CYP2C9, CYP3A4, CYP2B6, CYP3A5		✓	
Dermatology Anti-acne						
Retinoid	Isotretinoin	CYP2C8	CYP2C9, CYP3A4, CYP2B6, CYP3A5		✓	
Abbreviations: BE, biliary excretion.						

PGx Report - Psychiatry

Type: Antidepressant I

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antidepressants						
SSRIs	Citalopram	CYP2C19, CYP2D6	CYP3A4, CYP3A5, SLC6A4, HTR2A		✓	
	Escitalopram	CYP3A4, CYP2C19	CYP2D6, CYP3A5, SLC6A4, HTR2C		✓	
	Dapoxetine	CYP2D6	CYP3A4, CYP3A5, FMO1		✓	
	Fluoxetine	CYP2D6	CYP3A4, CYP2C9, CYP3A5, CYP2C19, SLC6A4, HTR2A		✓	
	Paroxetine	CYP2D6	CYP3A4, CYP1A2, CYP3A5, CYP2C9, SLC6A4, HTR2A, DRD3		✓	
	Sertraline	CYP2B6	CYP2C19, CYP2C9, CYP3A4, CYP2D6, SLC6A4		✓	
	Fluvoxamine	CYP2D6	CYP1A2, SLC6A4, HTR2A		✓	
SMSs	Vilazodone	CYP3A4	CYP3A5, CYP2C19, CYP2D6		✓	
SNRIs	Levomilnacipran	CYP3A4	CYP2C8, CYP3A5, CYP2C19, CYP2D6		✓	
	Milnacipran	UGTs	Renal Excretion		✓	
	Venlafaxine	CYP2D6	CYP2C19, CYP3A4, CYP2C9, CYP3A5, SLC6A3, SLC6A4, HTR2A		✓	
	Duloxetine	CYP2D6	CYP1A2, HTR2A		✓	
NRIs	Atomoxetine	CYP2D6	CYP2C19, CYP3A4, CYP3A5, SLC6A2		✓	
	Reboxetine	CYP3A4	CYP3A5		✓	
	Maprotiline	CYP2D6	CYP1A2		✓	
Venlafaxine	Clomipramine	CYP2D6	CYP3A4, CYP2C19, CYP1A2, CYP2C9, SLC6A4, HTR2A		✓	
	Imipramine	CYP1A2, CYP2D6	CYP2C19, CYP3A4, CYP3A5, UGT1A3, UGT1A4		✓	
Clomipramine	Desipramine	CYP2D6	CYP1A2, CYP2C19		✓	
	Nortriptyline	CYP2D6	CYP1A2, CYP2C19, ABCB1, SLC6A4		✓	
	Protriptyline	CYP2D6				✗

PGx Report - Psychiatry

Type: Antidepressant II

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antidepressants						
TCAs that fairly balanced serotonin-norepinephrine reuptake inhibitors	Amitriptyline	CYP2D6	CYP3A4, CYP2C19, CYP2C9, CYP1A2, CYP2B6, UGT1A3, UGT1A4		✓	
	Doxepin	CYP2D6, CYP2C19	CYP1A2, CYP3A4, CYP3A5, UGT1A3, UGT1A4		✓	
	Dosulepin	CYP2D6, CYP2C9	CYP3A4, CYP1A2, CYP3A5, CYP2C19		✓	
TeCAs	Mianserin	CYP2D6	CYP3A4, CYP1A2, CYP2B6, CYP3A5		✓	
	Amoxapine	CYP2D6	CYP3A4, CYP3A5		✓	
TCA with antipsychotic and sedative properties	Trimipramine	CYP2D6	CYP2C19, CYP2C9		✓	
MAOI	Tranylcypromine	MAO	CYP3A4, CYP2A6, CYP3A5, CYP2C19, CYP2D6		✓	
	Moclobemide	CYP2C19	CYP2D6, CYP1A2, HTR2A		✓	
Atypical antidepressants						
SMSs	Vortioxetine	CYP2D6	CYP2C9, CYP3A4, CYP3A5, UGTs, CYP2A6, CYP2C8, CYP2C19, CYP2B6		✓	
NaSSAs	Mirtazapine	CYP1A2	CYP2D6, CYP3A4, CYP3A5, SLC6A4, HTR2A		✓	
SARIs	Trazodone	CYP3A4	CYP2D6, CYP3A5		✓	
	Nefazodone	CYP2D6, CYP3A4	CYP3A5, UGT1A6		✓	
Mirtazapine	Bupropion	CYP2B6	CYP2E1, CYP3A4, CYP2C9, CYP2D6, CYP1A2, CYP3A5		✓	
Antidepressant and anti-generalized hypoactive sexual desire disorder (HSDD) in premenopausal women	Flibanserin	CYP3A4	CYP2C19, CYP3A5, CYP1A2, CYP2B6, CYP2C8, CYP2C9, CYP2D6		✓	
Bupropion	Buspirone	CYP3A4	CYP3A5		✓	

Abbreviations: SSRI, serotonin selective reuptake inhibitor; SMS, Serotonin modulator and stimulator; SNRI, serotonin-norepinephrine reuptake inhibitor; NRI, norepinephrine reuptake inhibitor; TCA, tricyclic antidepressant; TeCA, tetracyclic antidepressant; MAOI, monoamine oxidase inhibitor; NaSSA, noradrenergic and specific serotonergic antidepressant; SARI, serotonin antagonist and reuptake inhibitor.

Additional SNPs of Importance for Treatment Using Antidepressants

Gene	Marker	Genotype	Drug	Level of Evidence	Results
ADRA2A	rs1800544	G/G	SSRIs	3	Patients with major depressive disorder may have decreased response to selective serotonin reuptake inhibitors
GABRP	rs10036156	T/T	SSRIs	3	Patients with Depressive Disorder or Depression may be less likely to respond to antidepressant treatment
GABRP	rs10036156	T/T	Fluvoxamine	3	Patients with Depressive Disorder or Depression may be less likely to respond to antidepressant treatment
HTR2A	rs6313	G/A	Paroxetine	3	Patients with depression may have a reduced risk of adverse medication reactions

Additional SNPs of Importance for the Treatment of Depression and Psychosis, and the Treatment of Alcohol and Tobacco Use Disorders

Gene	Marker	Genotype	Drug	Level of Evidence	Results
HTR2A	rs6311	G/G	Citalopram	3	Patients with anxiety disorder may have a decreased risk of adverse cognitive effects
HTR2A	rs6311	G/G	Sertraline	3	Depressive patients may have an increased risk of gastrointestinal side effects and increased response
COMT	rs4680	A/A	Sertraline	3	Schizophrenia patients may have an increased risk for developing extrapyramidal symptoms
COMT	rs4680	A/A	Fluvoxamine	3	Patients with Depressive Disorder may have a decreased response but patients with Anxiety Disorders may have an increased response
COMT	rs4680	A/A	Paroxetine	3	Depressive patients may have an increased response or increased improvement
ANKK1/DRD2	rs1800497	G/G	Bupropion	1B	Patients may be more likely to quit smoking
ANKK1/DRD2	rs1800497	G/G	Risperidone	2A	Schizophrenia patients may have an increased risk for tardive dyskinesia
ANKK1/DRD2	rs1800497	G/G	Ethanol	2B	Patients may have a decreased, but not absent, risk for Alcoholism
ANKK1/DRD2	rs1800497	G/G	Clozapine Olanzapine Risperidone	2B	Patients may have decreased but not non-existent risk of side effects including hyperprolactinemia and weight gain
ANKK1/DRD2	rs1800497	G/G	Nicotine	3	Nicotine
ANKK1/DRD2	rs1800497	G/G	Risperidone	3	Risperidone
HTR2A	rs7997012	A/A	Antidepressants	3	Reduced risk of having no response to treatment (higher improvement) with antidepressants

PGx Report - Psychiatry

Type: Typical Antipsychotic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Typical antipsychotic						
Butyrophenones	Bromperidol	CYP3A4	CYP3A5		✓	
	Droperidol	CYP3A4	CYP3A5		✓	
	Haloperidol	UGTs, CYP3A4	CYP1A2, CYP2D6, CYP3A5, SLC6A4, HTR2C		✓	
Haloperidol	Chlorpromazine	CYP2D6	CYP1A2, UGT1A3, UGT1A4, CYP3A4, CYP3A5		✓	
	Levomepromazine	CYP3A4	CYP1A2, CYP3A5		✓	
	Promazine	CYP1A2	CYP3A4, CYP2C19, CYP2C9, CYP3A5		✓	
	Cyamemazine	CYP1A2	CYP3A4, CYP2C9, CYP2C8, CYP3A5		✓	
Phenothiazines with piperazine structure	Fluphenazine	CYP2D6				✗
	Perphenazine	CYP2D6				✗
	Prochlorperazine	CYP2D6	CYP3A4, CYP3A5		✓	
	Trifluoperazine	CYP1A2	UGT1A4		✓	
Phenothiazines with piperidine structure	Thioridazine	CYP2D6	CYP1A2, CYP3A4, CYP2C19, CYP3A5		✓	
Phenothiazines used as an anti-histamine, sedative, and antiemetic	Promethazine	CYP2D6	UGT1A3, UGT1A4, SULTs			✗
Diphenyl-butylpiperidine	Pimozide	CYP3A4, CYP2D6	CYP1A2, CYP3A5		✓	
Thioxanthene derivative	Thiothixene	CYP1A2	CYP3A4, CYP3A5		✓	
	Zuclopenthixol	CYP2D6	CYP3A4, CYP3A5		✓	
Tricyclics	Loxapine	CYP1A2	CYP3A4, CYP2D6, UGT1A3, UGT1A4, CYP3A5		✓	

PGx Report - Psychiatry

Type: Atypical antipsychotic

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Atypical antipsychotic						
Diazepines, Oxazepines, Thiazepines and Oxepines	Olanzapine	UGT1A4	CYP1A2, CYP2D6, FMO3, FMO1, SLC6A4, SLC1A1, HTR2A, HTR2C, DRD3		✓	
	Quetiapine	CYP3A4, CYP2D6	CYP3A5, CYP1A2, CYP2C9, CYP2C19, SLC6A4		✓	
	Asenapine	CYP1A2, UGT1A4	CYP2D6, CYP3A4, CYP3A5		✓	
	Clozapine	CYP1A2, CYP2D6	CYP3A4, FMO3, CYP2C9, CYP2C19, CYP3A5, CYP2A6, UGT1A3, UGT1A4, SLC6A3, SLC6A4, SLC1A1, HTR2C, DRD3		✓	
Clozapine	Sertindole	CYP2D6	CYP3A4, CYP3A5		✓	
	Ziprasidone	CYP3A4	AOX1, CYP3A5		✓	
	Lurasidone	CYP3A4	CYP3A5		✓	
Benzamides	Sulpiride	Renal Excretion			✓	
	Amisulpride	Renal Excretion			✓	
Piperazine derivative	Cariprazine	CYP3A4	CYP2D6, CYP3A5		✓	
Other antipsychotics	Aripiprazole	CYP2D6	CYP3A4, CYP3A5, DRD3		✓	
	Brexpiprazole	CYP3A4	CYP2D6, CYP3A5		✓	
	Lumateperone	CYP3A4	CYP3A5		✓	
	Risperidone	CYP2D6	CYP3A4, CYP3A5, ABCB1, SLC6A4, SLC1A1, HTR2A, HTR2C, DRD3		✓	
	Iloperidone	CYP2D6	CYP3A4, CYP3A5		✓	
	Paliperidone	CYP2D6	CYP3A4, CYP3A5		✓	
	Zotepine	CYP3A4	CYP1A2, CYP3A5, CYP2D6		✓	
Drugs Prescribed to treat tardive dyskinesia						
Vesicular monoamine transporter 2 inhibitor	Valbenazine	CYP2D6	CYP3A4, CYP3A5		✓	

Additional SNPs of Importance in Treatment that Includes the Use of Antipsychotics and for the Treatment of Autism

Gene	Marker	Genotype	Drug	Level of Evidence	Results
HTR2A	rs6311	G/G	Risperidone	3	Children with autism may have poorer response to treatment
COMT	rs4680	A/A	Haloperidol	3	Schizophrenia patients may have an increased risk for developing extrapyramidal symptoms
DRD1	rs4532	C/T	Methylphenidate or Dextroamphetamine	3	Patients with attention deficit hyperactivity disorder (ADHD) may have a decreased severity of social withdrawal or nausea

Other genetic and clinical factors may also influence a patient's response to medications.

PGx Report - Neurology

Type: Drugs Prescribed for the Treatment of ADHD, Related Drugs

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Anti ADHD Stimulants						
Amphetamine	Dextroamphetamine	Renal Excretion, CYP2D6	DBH, FMO3, GLYAT		✓	
	Levoamphetamine	Renal Excretion, CYP2D6	FMO3		✓	
NDRI	Dexmethylphenidate	CYP2D6	Renal Excretion		✓	
Psychostimulant	Lisdexamfetamine	Hydrolysis	CYP2D6, Renal Excretion		✓	
	Methylphenidate	CYP2D6	Renal Excretion, SLC6A2, SLC6A3, SLC6A4, DRD3			✗
Anti ADHD Non-stimulants						
NERI	Atomoxetine	CYP2D6	CYP2C19, CYP3A4, CYP3A5, SLC6A2		✓	
	Viloxazine	CYP2D6	UGT1A9, UGT2B15		✓	
Central alpha-2 Adrenergic Agonist	Clonidine	CYP2D6	CYP1A2, CYP3A4, CYP3A5		✓	
Antidepressants	Bupropion	CYP2B6	CYP2E1, CYP3A4, CYP2C9, CYP2D6, CYP1A2, CYP3A5		✓	
	Imipramine	CYP1A2, CYP2D6	CYP2C19, CYP3A4, CYP3A5, UGT1A3, UGT1A4		✓	
	Desipramine	CYP2D6	CYP1A2, CYP2C19		✓	
	Milnacipran	UGTs	Renal Excretion		✓	
	Reboxetine	CYP3A4	CYP3A5		✓	
Wakefulness-promoting agent	Modafinil	Hydrolysis, CYP2D6	CYP1A2, CYP3A4, CYP2B6, CYP3A5		✓	
	Armodafinil	CYP3A4	CYP3A5		✓	
Modafinil						
Modafinil	Ramelteon	CYP1A2	CYP2C19, CYP3A4, CYP3A5		✓	
	Tasimelteon	CYP1A2	CYP3A4, CYP3A5		✓	
Dual orexin receptor antagonist	Lemborexant	CYP3A4	CYP3A5		✓	
Histamine (H3) receptor antagonist/inverse agonist	Pitolisant	CYP2D6	CYP3A4, CYP3A5		✓	
Orexin receptor antagonist	Suvorexant	CYP3A4	CYP2C19, CYP3A5		✓	

Abbreviations: ADHD, Attention deficit hyperactivity disorder; NERI; norepinephrine reuptake inhibitor, NDRI, norepinephrine-dopamine reuptake inhibitor.

PGx Report - Neurology

Type: Drugs Prescribed for the Treatment of Epilepsy

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antiepileptic						
Barbiturates	Phenobarbital	CYP2C19	ABCB1		✓	
Carbamates	Felbamate	CYP3A4	CYP2E1, CYP3A5		✓	
	Cenobamate	UGT2B7	UGT2B4		✓	
Carboxamides	Carbamazepine	CYP3A4, EPHX1	CYP2C8, CYP2B6, UGT2B7, CYP1A2, CYP3A5, ABCB1, HLA-B*1502, HLA-A*3101, ABCC2		✓	
Fatty acids	Tiagabine	CYP3A4	CYP3A5, CYP1A2, CYP2D6, CYP2C19		✓	
Fructose derivatives	Topiramate	Renal Excretion	CYPs, UGTs		✓	
GABA analogs	Gabapentin	Renal Excretion			✓	
	Pregabalin	Renal Excretion			✓	
Hydantoin	Phenytoin	CYP2C19	CYP2C9, CYP3A4, CYP3A5, CYP2D6, ABCB1, EPHX1, HLA-B*1502		✓	
	Mephenytoin	CYP2C19	CYP2C8, CYP2C9, CYP2B6, CYP1A2, CYP2D6		✓	
Oxazolidinediones	Trimethadione	CYP2C9	CYP2E1, CYP3A4, CYP3A5		✓	
	Paramethadione	CYP2C9			✓	
Pyrimidinedione	Primidone	CYP2C9	CYP2C19		✓	
Pyrrolidines	Brivaracetam	CYP2C19, CYP2C9	CYP3A4, CYP3A5, CYP2C8, CYP2B6		✓	
	Levetiracetam	Renal Excretion			✓	
	Seletracetam	Renal Excretion			✓	
Succinimides	Ethosuximide	CYP3A4	CYP3A5, CYP2E1		✓	
Sulfonamides	Zonisamide	CYP3A4	CYP2C19, CYP3A5		✓	
Triazines	Lamotrigine	UGT1A4	UGT2B7, HLA-B*1502		✓	
Benzodioxoles	Stiripentol	CYP1A2	CYP2C19, CYP3A4, CYP3A5		✓	
Other	Lacosamide	CYP2C9	CY2C19, CYP3A4		✓	
	Perampanel	CYP3A4	CYP3A5		✓	
	Retigabine	UGT1A4	NAT2			✗

Abbreviations: GABA, gamma-aminobutyric acid.

PGx Report - Neurology

Type: Anxiolytic, Hypnotic, Sedative, Anticonvulsant, Muscle Relaxants

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Anxiolytic, Hypnotic, Sedative, Anticonvulsant, and Muscle Relaxant						
Benzodiazepine Short-acting	Midazolam	CYP3A4	CYP3A5		✓	
	Triazolam	CYP3A4	CYP3A5		✓	
	Brotizolam	CYP3A4	CYP3A5		✓	
Benzodiazepine Intermediate-acting	Alprazolam	CYP3A4	CYP3A5		✓	
	Bromazepam	CYP1A2	CYP2D6		✓	
	Clobazam	CYP2C19	CYP3A4, CYP3A5, CYP2B6		✓	
	Flunitrazepam	CYP2C19	CYP2C9, CYP3A4, CYP3A5, NAT2		✓	
	Estazolam	CYP3A4	CYP3A5		✓	
	Clonazepam	CYP3A4	CYP2C19, CYP3A5, NAT2		✓	
	Oxazepam-r	UGT2B7	UGT1A9		✓	
	Oxazepam-s	UGT2B15			✓	
	Quazepam	CYP3A4	CYP2C19, CYP3A5		✓	
	Lormetazepam	CYP3A4	CYP3A5		✓	
	Lorazepam-r	UGT2B7			✓	
	Lorazepam-s	UGT2B15			✓	
	Nitrazepam	CYP3A4	CYP3A5, NAT2		✓	
	Temazepam	CYP2C19	CYP3A4, CYP3A5, UGT2B7		✓	
Benzodiazepine Long-acting	Diazepam	CYP2C19, CYP3A4	CYP3A5, CYP2B6, CYP1A2		✓	
	Clorazepate	CYP3A4	CYP3A5		✓	
	Chlordiazepoxide	CYP3A4	CYP3A5		✓	
	Flurazepam	CYP3A4	CYP3A5		✓	
	Nordazepam	CYP3A4	CYP3A5		✓	
Nonbenzodiazepine hypnotic	Zolpidem	CYP3A4	CYP3A5, CYP1A2, CYP2D6		✓	
	Zaleplon	AOX1, CYP3A4	CYP3A5		✓	
	Zopiclone	CYP3A4	CYP2C8, CYP2C9, CYP3A5		✓	
	Eszopiclone	CYP3A4	CYP2E1, CYP3A5		✓	

PGx Report - Neurology

Type: Drugs Prescribed for the Treatment of Alzheimer's and Parkinson's, Related Drugs

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Anti-Alzheimer disease						
Acetylcholinesterase inhibitor	Tacrine	CYP1A2	CYP2D6		✓	
	Donepezil	CYP2D6	CYP3A4, CYP3A5		✓	
	Rivastigmine	ACHE	BCHE, CHAT		✓	
	Galantamine	CYP2D6	CYP3A4, CYP3A5		✓	
NMDA receptor antagonist	Memantine	Renal Excretion	UGTs		✓	
Anti-Parkinson disease						
Inhibitor of MAO-B	Selegiline	CYP2B6	CYP2C9, CYP3A4, CYP3A5, CYP2A6, FMO3		✓	
	Rasagiline	CYP1A2			✓	
	Safinamide	Amidases	CYP3A4, CYP3A5		✓	
COMT inhibitors	Entacapone	UGT1A9, CYP3A4	CYP2A6, CYP3A5, UGT1A6, UGT2B7, UGT2B15		✓	
Dopamine receptor agonists	Bromocriptine	CYP3A4	CYP3A5		✓	
	Pramipexole	Renal Excretion	DRD3		✓	
	Ropinirole	CYP1A2	UGTs, Renal Excretion		✓	
Adenoside A2A receptor antagonist	Istradefylline	CYP1A1	CYP3A4, CYP3A5, CYP1A2, CYP2B6, CYP2C8, CYP2C9, CYP2C18, CYP2D6		✓	
Anticholinergics - Antimuscarinics	Diphenhydramine	CYP2D6	CYP3A4, CYP3A5, UGT1A3, UGT1A4		✓	
Anti-hallucinations and delusions	Pimavanserin	CYP3A4	CYP3A5, CYP2J2, CYP2D6		✓	
Anti-hyperkinetic movement	Tetrabenazine	CYP2D6	CYP1A2		✓	
Anti-amyotrophic lateral sclerosis drug	Riluzole	CYP1A2			✓	
Anti-multiple sclerosis						
Sphingosine 1-phosphate Receptor Modulator	Ponesimod	CYP2J2	CYP3A4, CYP3A5, CYP4F3A, CYP4F12		✓	
Anthracenedione	Mitoxantrone	CYP2E1			✓	
Dihydroorotate dehydrogenase inhibitor	Teriflunomide	Hydrolysis	NATs , SULTs		✓	
Selective blocker of members of voltage-activated K+ channels	Dalfampridine	Renal Excretion	CYP2E1		✓	
Anti-Huntington's disease						
Carbonyl reductase	Deutetrabenazine	Carbonyl reductase	CYP2D6, CYP1A2, CYP3A4, CYP3A5		✓	

Abbreviations: NMDA, N-methyl-D-aspartate; COMT, Catechol-O-methyltransferase.

Additional SNP of Importance for different Medical Condition and personality

Gene	Marker	Genotype	Results
ABCG2	rs2231142	C/C	Increased risk for Gout
BDNF	rs6265	C/T	Slightly increased risk for ADHD or depression; somewhat quicker mental decline in Alzheimer patients
DRD2	rs6277	G/A	Higher risk for schizophrenia

Additional SNP of Importance for hypersensitivity

Gene	Marker	Genotype	HLA	Drug	Results
data	data	data	data	data	data

The variant allele for rs1061235(T) serves as a proxy for the HLA-A*3101 allele, the variant allele for rs3909184(C) serves as a proxy for the HLA-B*1502 allele, the variant allele for rs2395029(G) serves as a proxy for the HLA-B*5701 allele.

PGx Report - Infectology

Type: Antibiotics

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antibacterials: protein synthesis inhibitors 50S						
Amphenicols	Chloramphenicol	CYP2C9	UGT2B7		●	
Lincosamides	Clindamycin	CYP3A4	CYP3A5		●	
Pleuromotilin	Lefamulin	CYP3A4	CYP3A5		●	
Antibiotic						
Macrolides	Clarithromycin	CYP3A4	CYP3A5		●	
	Erythromycin	CYP3A4			●	
	Telithromycin	CYP3A4	CYP3A5		●	
Antibacterials: nucleic acid inhibitors						
DHPS inhibitor Short-acting sulfonamides	Sulfadimidine	NAT2	Renal Excretion			●
	Sulfapyridine	NAT2	Renal Excretion			●
DHPS inhibitor Intermediate-acting sulfonamides	Sulfamethoxazole	Renal Excretion	NAT2, CYP2C9		●	
Anaerobic DNA inhibitors/ Nitroimidazole	Tinidazole	CYP3A4	CYP3A5		●	
	Ornidazole	CYP3A4	CYP3A5		●	
DNA-dependent RNA polymerase inhibitors	Rifampicin	CYP3A4	CYP2C8, CYP3A5, CYP2C19, CYP2A6, RE		●	
	Rifabutin	CYP3A4	CYP1A2.CYP3A5		●	
Other drugs against mycobacteria	Dapsone	CYP2E1	NAT2, CYP3A4, CYP2C9, CYP3A5, CYP2D6, UGT1A9, G6PD		●	
	Bedaquiline	CYP3A4	CYP2C8, CYP2C19, CYP3A5		●	
	Isoniazid	NAT2	CYP2E1, Renal Excretion			●
	Pyrazinamide	AOX1, XDH	CYP1A2, CYP3A4, CYP3A5, RE		●	
Abbreviations: DHPS, Dihydropteroate synthase.						

PGx Report - Infectology

Type: Antimalarial, Anthelmintic, Antifungal

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Antimalarial						
Aminoquinolines	Chloroquine	CYP2C8	CYP3A4, CYP3A5, G6PD		●	
	Hydroxychloroquine	CYP2D6	CYP2C8, CYP3A4, CYP3A5		●	
	Amodiaquine	CYP2C8			●	
	Primaquine	CYP2D6	G6PD			●
Methanolquinolines	Quinine	CYP3A4, CYP2D6	CYP2C19, CYP3A5, G6PD		●	
	Mefloquine	CYP3A4	CYP3A5		●	
Artemisinin and derivatives	Artemisinin	CYP3A4	CYP2B6, CYP3A5		●	
	Artemether	CYP3A4	CYP3A5		●	
	Artesunate	CYP2A6			●	
	Arteether	CYP3A4	CYP2B6, CYP3A5		●	
Biguanides	Proguanil	CYP2C19			●	
Other antimalarials	Halofantrine	CYP3A4	CYP3A5		●	
	Tafenoquine	CYP2D6		◐		
	Pentamidine	CYP2C19	CYP1A2, CYP2D6		●	
Anti-African trypanosomiasis						
2-substituted 5-nitroimidazole	Fexinidazole	CYP1A2	CYP2B6, CYP2C19, CYP2D6, CYP3A4, CYP3A5, FMO-3		●	
Anthelmintic						
Benzimidazoles	Albendazole	CYP3A4	CYP1A2, CYP3A5		●	
	Triclabendazole	CYP1A2	CYP2C9, CYP2C19, CYP2D6, CYP3A4, CYP3A5, FMO3		●	
Antifungals						
Imidazoles	Ketoconazole	CYP3A4	UGT1A1, FMO3, CYP26A1		●	
Triazoles	Itraconazole	CYP3A4			●	
	Voriconazole	CYP2C19	CYP2C9, CYP3A4, CYP3A5		●	
	Fluconazole	Renal Excretion			●	
Triterpene	Ibrexafungerp	CYP3A4	CYP3A5		●	
Allylamines	Terbinafine	CYP2C9	CYP1A2, CYP3A4, CYP2C8, CYP2C19		●	

PGx Report - Infectology

Type: Antiretroviral, Antiviral

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Protease inhibitor 1st generation	Lopinavir	CYP3A4	SLCO1B1, CYP3A5, ABCC1, ABCC2		✓	
	Ritonavir	CYP3A4	CYP2D6, CYP3A5, ABCC1		✓	
	Saquinavir	CYP3A4	CYP3A5		✓	
	Indinavir	CYP3A4	CYP2D6, CYP3A5, ABCC4		✓	
	Nelfinavir	CYP2C19	CYP3A4, CYP3A5		✓	
	Fosamprenavir	CYP3A4	CYP3A5		✓	
Protease inhibitor 2nd generation	Atazanavir	CYP3A4	CYP3A5, ABCB1		✓	
	Darunavir	CYP3A4	CYP3A5, SLCO3A1		✓	
	Tipranavir	CYP3A4	CYP3A5		✓	
NNRTI 1st generation	Delavirdine	CYP3A4	CYP2D6, CYP3A5		✓	
	Efavirenz	CYP2B6	CYP2A6, ABCB1, SLCO3A1, ABCG2		✓	
NNRTI 2nd generation	Nevirapine	CYP3A4	CYP2B6, CYP3A5, ABCB1, SLCO3A1		✓	
	Etravirine	CYP3A4	CYP2C9, CYP2C19, CYP3A5		✓	
	Rilpivirine	CYP3A4	CYP3A5		✓	
Nucleoside reverse transcriptase inhibitor (NRTI)	Zidovudine	UGT2B7	Renal Excretion, UGT1A9, SLCO3A1, ABCC1, ABCC4		✓	
	Abacavir	ADH6	UGT1A1, ADK, HLA-B*5701		✓	
Integrase and Reverse transcriptase/RNaseH inhibitor	Bictegravir	CYP3A4	UGT1A1, CYP3A5		✓	
HIV-1 attachment inhibitor	Fostemsavir	Esterases	CYP3A4, CYP3A5		✓	
Abacavir	Zanamivir	Renal Excretion			✓	
	Peramivir	Renal Excretion			✓	
	Oseltamivir	BCHE, ACHE	Renal Excretion		✓	
CCR5 Co-receptor Antagonist	Maraviroc	CYP3A4	CYP3A5		✓	
Hepatitis C Virus NS3/4A Protease Inhibitor	Boceprevir	CYP3A4	IFNL3, CYP3A5		✓	
	Telaprevir	CYP3A4	CYP3A5, IFNL3		✓	
	Paritaprevir	CYP3A4	CYP3A5		✓	
	Simeprevir	CYP3A4	CYP2C8, CYP2C19, CYP3A5, IFNL3		✓	
NS5A inhibitor	Ombitasvir	Hydrolysis	CYP2C8		✓	
	Daclatasvir	CYP3A4	CYP3A5		✓	
NS5B inhibitor	Dasabuvir	CYP2C8	CYP3A4, CYP3A5		✓	
Nonstructural protein 3 and 4a protease inhibitor	Voxilaprevir	CYP3A4	CYP2C8, CYP3A5, CYP1A2		✓	
Other antivirals	Enfuvirtide	CYP2C19	CYP2E1, CYP1A2		✓	
	Letermovir	UGT1A1	UGT1A3		✓	
	Raltegravir	UGT1A1	SLCO1A2		✓	
	Elvitegravir	CYP3A4	CYP3A5		✓	
	Dolutegravir	UGT1A1, CYP3A4	CYP3A5		✓	

Abbreviations: NNRTI, Non-Nucleoside Reverse Transcriptase Inhibitors; CCR5, C-C chemokine receptor type 5.

PGx Report - Oncology, Hematology

Type: Antineoplastic I

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Alkylating agents						
Nitrogen mustard analogues	Cyclophosphamide	CYP2B6	CYP2C19, CYP3A4, CYP2C9, CYP3A5, EPHX1, ALDH1A1, ABCC3		✓	
	Ifosfamide	CYP2B6	CYP3A4, CYP3A5		✓	
Nitrosoureas	Carmustine	CYP1A2	Renal Excretion		✓	
Antimetabolites						
Folic acid analogues	Methotrexate	Renal Excretion	AOX1, SLCO1B1, SLC19A1, ABCC1, ABCC2, ABCC3, ABCG2		✓	
	Pemetrexed	Renal Excretion	SLC19A1		✓	
Purine analogues	Mercaptopurine	XO	TPMT, NUDT15, AOX1, SLC19A1		✓	
	Tioguanine	HPRT1	TPMT, NUDT15		✓	
	Cladribine	DCK	Renal Excretion		✓	
	Clofarabine	DCK	Renal Excretion		✓	
	Nelarabine	ADA	DCK, Renal Excretion, XO		✓	
Pyrimidine analogues	Fluorouracil	DPYD, TYMS, MTHFR	NQO1, GSTP1, UMPS, TYMP, SLC19A1, ABCG2		✓	
	Cytarabine	CES1, CES2, CDA	TYMP, DPYD, TYMS, SLCO1B1, SLC29A1		✓	
	Tegafur	CYP2A6	DPYD, TYMS		✓	

PGx Report - Oncology, Hematology

Type: Antineoplastic II

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Plant alkaloids and other natural products						
Vinca alkaloids and analogues	Vincristine	CYP3A4	CYP3A5, ABCC3		✓	
	Vinblastine	CYP3A4	CYP3A5		✓	
Podophyllotoxin derivatives	Etoposide	CYP3A4	CYP3A5, CYP1A2, CYP2E1, ABCB1, UGT1A1		✓	
	Teniposide	CYP2C19	CYP3A4, CYP3A5, ABCB1		✓	
Taxanes	Paclitaxel	CYP2C8	CYP3A4, CYP3A5, ABCB1, SLC29A1		✓	
	Docetaxel	CYP3A4	CYP3A5, EPHX1, SLCO1B3, ABCC6		✓	
Cytotoxic antibiotics and related substances						
Anthracyclines and related substances	Doxorubicin	ALDH1A1, ABCB1, GSTP1, NQO1	CYP3A4, CYP2B6, CYP3A5, CYP2C8, CYP2D6, ABCC2, ABCC3		✓	
	Mitoxantrone	CYP2E1			✓	
Other antineoplastic agents						
Platinum compounds	Cisplatin	Renal Excretion, NQO1, GSTP1	EPHX1, GSTM1, ABCB1, XPC, LRP2, SLC19A1, ABCC2, ABCC3		✓	
Derivative of camptothecin	Irinotecan	UGT1A1, CYP3A4, CES1, CES2	CYP3A5, CYP2B6, UGT1A4, SLCO1B1, BCHE, UGT1A9, UGT1A10, SLC19A1, SLCO1B3, ABCG2		✓	

PGx Report - Oncology, Hematology

Type: Antineoplastic Targeted Therapy I

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Protein kinase inhibitor (receptor)						
Epidermal growth factor receptor (EGFR)	Erlotinib	CYP3A4	CYP1A2, CYP3A5		✓	
	Gefitinib	CYP3A4	CYP2D6, CYP3A5, ABCG2		✓	
	Vandetanib	CYP3A4	FMO3, FMO1, CYP3A5		✓	
EGFR (exon 19 deletion or exon 21 L858R substitution mutations)	Dacomitinib	CYP2D6	CYP2C9, CYP3A4, CYP3A5		✓	
EGFR (exon 20 insertion mutations)	Mobocertinib	CYP3A4	CYP3A5		✓	
EGFR and epidermal growth factor receptor (HER2)	Lapatinib	CYP3A4.CYP2C19	CYP2C8, CYP3A5, HLA-DQA1*0201, HLA-DRB1*0701		✓	
	Neratinib	CYP3A4	CYP3A5		✓	
Dual inhibitor of anaplastic lymphoma kinase (ALK) and epidermal growth factor receptor (EGFR)	Brigatinib	CYP2C8	CYP3A4, CYP3A5		✓	
C-KIT and PDGFR	Masitinib	CYP3A4	CYP3A5		✓	
	Ripretinib	CYP3A4	CYP2D6, CYP3A5, CYP2E1		✓	
KIT and PDGFRA (PDGFRA exon 18 mutation, including PDGFRA D842V mutations)	Avapritinib	CYP3A4	CYP2C9, CYP3A5		✓	
FLT3	Lestaurtinib	CYP3A4	CYP3A5		✓	
RET, VEGFR and EGFR	Vandetanib	CYP3A4	FMO3, FMO1, CYP3A5		✓	
Tyrosine kinase inhibitor (MET exon 14 skipping mutation)	Tepotinib	CYP3A4	CYP2C8, CYP3A5		✓	
Tyrosine kinase inhibitor (RET)	Pralsetinib	CYP3A4	CYP2D6, CYP3A5, CYP1A2		✓	
	Selpercatinib	CYP3A4	CYP3A5		✓	
c-MET and VEGFR2	Cabozantinib	CYP3A4	CYP2C8, CYP3A5		✓	
Tyrosine kinase inhibitor (Fibroblast growth factor receptor)	Erdafitinib	CYP2C9	CYP3A4, CYP1A2, CYP3A5		✓	
	Infigratinib	CYP3A4	CYP3A5, FMO3		✓	
	Pemigatinib	CYP3A4	CYP3A5		✓	
Multiple targets (c-KIT, FGFR, PDGFR and VEGFR)	Axitinib	CYP3A4	CYP1A2, CYP2C19, CYP3A5, UGT1A1		✓	
	Nintedanib	CYP1A2	CYP2C9, CYP2C19, CYP2D6, CYP2E1		✓	
	Pazopanib	CYP3A4, UGT1A1	CYP1A2, CYP2C8, CYP3A5		✓	
	Ponatinib	CYP3A4	CYP2C8, CYP2D6, CYP3A5		✓	
	Regorafenib	CYP3A4	UGT1A9, CYP3A5		✓	
	Sorafenib	CYP3A4	UGT1A9, CYP3A5		✓	
	Sunitinib	CYP3A4	CYP3A5, ABCG2		✓	
	Toceranib	CYP3A4	CYP3A5		✓	
Protein kinase inhibitor (non-receptor)						
BCR-ABL	Imatinib	CYP3A4	CYP3A5, ABCB1, SLCO1A2, SLC22A4, ABCG2		✓	
	Nilotinib	CYP3A4, UGT1A1	CYP1A2, CYP2C9, CYP2C19, CYP2D6, CYP3A5, ABCG2		✓	
	Dasatinib	CYP3A4	CYP3A5, ABCG2		✓	
	Ponatinib	CYP3A4	CYP2C8, CYP2D6, CYP3A5		✓	
Src	Bosutinib	CYP3A4	CYP3A5		✓	
Tyrosine kinase inhibitor (Janus Activated Kinase 2 (JAK2) and FMS-like tyrosine kinase 3)	Fedratinib	CYP3A4	CYP2C19, CYP3A5, FMO3		✓	
Janus kinase	Lestaurtinib	CYP3A4	CYP3A5		✓	
	Ruxolitinib	CYP3A4	CYP3A5		✓	
	Pacritinib	CYP3A4	CYP3A5		✓	
	Tofacitinib	CYP3A4	CYP2C19, CYP3A5		✓	

PGx Report - Oncology, Hematology

Type: Antineoplastic Targeted Therapy II

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
EML4-ALK	Ceritinib	CYP3A4	CYP2C9, CYP3A5		✓	
	Crizotinib	CYP3A4	CYP3A5		✓	
	Lorlatinib	CYP3A4	UGT1A4, CYP2C8, CYP2C19, CYP3A5, UGT1A3		✓	
Bruton tyrosine kinase	Ibrutinib	CYP3A4	CYP2D6, CYP3A5		✓	
	Acalabrutinib	CYP3A4	CYP3A5		✓	
	Zanubrutinib	CYP3A4	CYP3A5		✓	
BRAF inhibitor (V600E mutation-positive)	Dabrafenib	CYP2C8	CYP3A4, CYP3A5, G6PD		✓	
	Vemurafenib	CYP3A4	CYP3A5		✓	
	Encorafenib	CYP3A4	CYP2C19, CYP3A5, CYP2D6		✓	
Type: Antineoplastic I						

PGx Report - Organ Transplantation

Type: Immunosuppressive, Immunomodulation

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Immunosuppressive						
Antimetabolite	Mycophenolate mofetil	CYP3A4	CYP3A5, CYP2C8, UGT2B7, UGT1A8, UGT1A9, SLCO1B1, SLCO1B3, ABCC2, HPRT1		✓	
	Azathioprine	XO	TPMT, NUDT15, AOX1		✓	
Calcineurin Inhibitors	Pimecrolimus	CYP3A4	CYP3A5	✓		
	Tacrolimus	CYP3A4	CYP3A5, ABCB1, UGT2B7	✓		
	Voclosporin	CYP3A4	CYP3A5	✓		
	Cyclosporine	CYP3A4	CYP3A5, ABCB1, UGT2B7, ABCC2	✓		
mTOR Inhibitors	Temsirolimus	CYP3A4	CYP3A5	✓		
	Everolimus	CYP3A4	CYP2C8, CYP3A5	✓		
Rho-associated coiled-coil-containing protein kinases (ROCK) inhibitor	Belumosudil	CYP3A4	CYP2C8, CYP3A5, CYP2D6, UGT1A9		✓	
Immunomodulation						
Immunomodulator and anti-angiogenic	Pomalidomide	CYP1A2	CYP3A4, CYP2C19, CYP2D6, CYP3A5		✓	

PGx Report - Anesthesiology

Type: Anesthetic, Muscle Relaxant

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Inhaled Anesthetics						
Inhaled Agents	Enflurane	CYP2E1			✓	
	Halothane	CYP2E1	CYP3A4, CYP2A6, CYP3A5		✓	
	Isoflurane	CYP2E1	CYP2B6		✓	
	Methoxyflurane	CYP2E1	CYP1A2, CYP2C9, CYP2D6		✓	
	Sevoflurane	CYP2E1			✓	
Intravenous agents (non-opioid)						
Barbiturates	Hexobarbital	CYP2C19	CYP2C9, CYP2E1, CYP1A2		✓	
	Thiamylal	CYP2C9			✓	
Benzodiazepines	Diazepam	CYP2C19, CYP3A4	CYP3A5, CYP2B6, CYP1A2		✓	
	Lorazepam	UGT2B15	UGT2B7		✓	
	Midazolam	CYP3A4	CYP3A5		✓	
Other Anesthetics	Ketamine	CYP3A4	CYP2B6, CYP2C9, CYP3A5		✓	
Skeletal muscle relaxants						
Muscle Relaxants	Succinylcholine	BCHE			✓	
	Carisoprodol	CYP2C19			✓	
	Cyclobenzaprine	CYP1A2	CYP2D6, CYP3A4, CYP3A5, UGT1A4		✓	
	Tizanidine	CYP1A2			✓	

PGx Report - Urology

Type: Drugs Prescribed for the Treatment of Incontinence, Erectile Dysfunction, Benign Prostatic Hypertrophy

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Drugs for urinary frequency and incontinence						
Anticholinergic	Oxybutynin	CYP3A4	CYP3A5		✓	
	Tolterodine	CYP2D6, CYP3A4	CYP2C9, CYP3A5, CYP2C19		✓	
	Solifenacin	CYP3A4	CYP3A5		✓	
	Darifenacin	CYP2D6	CYP3A4, CYP3A5		✓	
Beta-3 adrenergic receptor (β3) agonist	Mirabegron	RE, CYP3A4	CYP3A5, CYP2D6, UGT2B7, UGT1A3, UGT1A8		✓	
	Vibegron	RE, CYP3A4	CYP3A5, UGTs		✓	
Drugs used in erectile dysfunction						
Phosphodiesterase inhibitors	Sildenafil	CYP3A4	CYP2C9, CYP3A5		✓	
	Tadalafil	CYP3A4	CYP3A5		✓	
	Vardenafil	CYP3A4	CYP2C9, CYP3A5		✓	
	Avanafil	CYP3A4	CYP3A5		✓	
	Udenafil	CYP3A4	CYP3A5		✓	
Drugs used in benign prostatic hypertrophy						
Alpha-adrenoreceptor antagonists	Alfuzosin	CYP3A4	CYP3A5, Renal Excretion		✓	
	Tamsulosin	CYP3A4	CYP2D6, CYP3A5, Renal Excretion		✓	
	Silodosin	CYP3A4	UGT2B7, CYP3A5		✓	
Testosterone-5-alpha reductase inhibitors	Finasteride	CYP3A4	CYP3A5		✓	
	Dutasteride	CYP3A4	CYP3A5		✓	

PGx Report - Endocrinology

Type: Contraceptives, Androgens, Antiandrogens, Glucocorticoid, Thyroid

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Hormonal contraceptives						
Estrogens	Ethinylestradiol	CYP3A4, CYP2C9	CYP3A5, CYP2C19, CYP1A2, UGT1A1		✓	
	Estradiol	CYP1A2	CYP3A4, CYP3A5, CYP2C8, UGT1A1, UGT1A9		✓	
Progestogens	Desogestrel	CYP3A4, HSD3B1	CYP3A5, CYP2C9, CYP2C19, UGT1A1		✓	
	Dienogest	CYP3A4	CYP3A5		✓	
	Drospirenone	CYP3A4	CYP3A5		✓	
	Mestranol	CYP2C9			✓	
Emergency contraceptives	Levonorgestrel	CYP3A4	CYP3A5		✓	
	Ulipristal	CYP3A4	CYP1A2, CYP2D6, CYP3A5		✓	
Androgens						
3-oxoandrosten-(4) derivatives	Testosterone	CYP3A4, CYP19A1	HSD3B2, CYP3A5, UGT2B15, SULTs		✓	
Antiandrogens						
Antiandrogens	Cyproterone	CYP3A4	CYP3A5		✓	
Other sex hormones and modulators of the genital system						
Selective estrogen receptor modulators (SERMs)	Raloxifene	UGT1A1	UGT1A8, UGT1A10		✓	
	Bazedoxifene	UGT1A1	UGT1A8, UGT1A10		✓	
	Ospemifene	CYP3A4	CYP2C9, CYP3A5, CYP2C19, CYP2B6		✓	
Steroid hormone						
Glucocorticoids	Dexamethasone	CYP3A4	CYP17A1, CYP3A5		✓	
	Cortisol (hydrocortisone)	CYP3A4	CYP3A5		✓	
	Prednisone	HSD11B2	CYP3A4, CYP3A5, SLC19A1, SULTs, UGTs		✓	
Thyroid hormone						
Thyroid hormones	Levothyroxine	DIO2	UGT1A1, SULTs		✓	
	Liothyronine	DIO2	UGT1A1, UGT1A9, SULTs		✓	
There are additional SERMs (Tamoxifen and Toremifene) described under antineoplastics)						

PGx Report - Recreational Drugs

Type: Alcohol, Barbiturates, Benzodiazepines, Cannabinoids, Synthetic Cannabis, Dissociative Drugs, Tobacco

Drug Class	Generic	Primary Mechanism Involved	Other Mechanisms Involved	May Have Decreased Efficacy	Used As Directed	May Have Increased Toxicity
Alcohol	Ethanol	ADH1B	ALDH2, ADH1A, CYP2E1	◔		
Amphetamines	3,4-methylenedioxy-methamphetamine (MDMA)	Renal Excretion, CYP2D6	CYP1A2, CYP3A4, CYP3A5, FMO3		◔	
	Methamphetamine	CYP2D6, Renal Excretion	DBH, FMO3, ACSM1, GLYAT, DRD3		◔	
Barbiturates	Amobarbital	CYP3A4	CYP3A5, CYP2B6, CYP2C9, CYP2A6		◔	
	Phenobarbital	CYP2C19	ABCB1		◔	
Benzodiazepines	Alprazolam	CYP3A4	CYP3A5		◔	
	Clonazepam	CYP3A4	CYP2C19, CYP3A5, NAT2		◔	
	Lorazepam	UGT2B15	UGT2B7		◔	
	Diazepam	CYP2C19.CYP3A4	CYP3A5, CYP2B6, CYP1A2		◔	
Cannabinoids & Related Drugs	Cannabidiol (CBD)	CYP3A4	CYP2C19, CYP3A5		◔	
	Delta 9-tetra hydrocannabinol (∆9_THC)	CYP2C9	CYP2C19, CYP3A4, CYP3A5		◔	
	Cannabinol (CBN)	CYP2C9	CYP2C19, CYP3A4, CYP3A5		◔	
Synthetic Cannabis	JWH-018	CYP1A2	CYP2C9		◔	
	AM2201	CYP1A2	CYP2C9		◔	
Dissociative Drugs	Ketamine	CYP3A4	CYP2B6, CYP2C9, CYP3A5		◔	
	Phencyclidine (PCP)	CYP3A4	CYP3A5, CYP2A6, CYP1A2		◔	
Ecgonine derivative	Cocaine	BCHE, CES2	CYP3A4, CYP3A5, SLC6A3		◔	
Ergoline derivatives	Lysergic acid diethylamide (LSD)	CYP3A4	CYP3A5		◔	
Tobacco	Nicotine	CYP2A6, FMO3	UGT1A9, UGT1A4, UGT2B7, CYP2B6, SLC6A3		◔	

Additional SNPs of Importance for Recreational Drugs

Gene	Marker	Genotype	Drug	Level of Evidence	Results
OPRD1	rs2236857	T/T	Heroin		Patients may have a lower tendency for heroin addiction
OPRK1	rs702764	A/A	Opioids		Neonates may display reduced abstinence syndrome due to in-utero opioid exposure
OPRK1	rs1051660	G/G	Opioids		Patients may have a lower tendency for Opioids addiction
DBH	rs1611115	T/T	Analgesics	3	Patients with substance withdrawal syndrome may have a decreased likelihood of headache when discontinuing the use of analgesics (such as opioids, NSAIDs, triptans, ergot)

Genomic Test Results

Genotype/Haplotype Details
CYP1A1
***1,*2,.**
Genetic results: CYP1A1 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP1A1	Ile462Val	1384A>G	*2	rs1048943	A/A

CYP1A1 contribute in the metabolism of several drugs including: Amodiaquine, Estrogens, Erlotinib, Gefitinib, Warfarin.

Genotype/Haplotype Details
CYP2A6
***1.001,*1.003,*2,*7,*8,*9,*17,*24,*37,*41,*44,*49,*50.**
Genetic results: CYP2A6 *1.001/*1.001
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2A6		-1013A>G	*1.003	rs4803381	A/A
CYP2A6	Leu160His	479T>A	*2	rs1801272	T/T
CYP2A6	Ile471Thr	1412T>C	*7	rs5031016	T/T
CYP2A6	Arg485Leu	1454G>T	*8	rs28399468	G/G
CYP2A6		-48T>G	*9	rs28399433	T/T
CYP2A6	Val365Met	1093G>A	*17	rs28399454	G/G
CYP2A6	Val110Leu	328G>C	*24	rs72549435	G/G
CYP2A6	Arg265Gln	794G>A	*41	rs140471703	G/G
CYP2A6	Glu390Lys	1168G>A	*44	rs376817657	G/G
CYP2A6	Ile300Thr	899T>C	*50	rs148693084	T/T

CYP2A6 is the most important gene in the metabolism of: Artesunate, Nicotine, Tegafur.
Drugs and substances known to induce CYP2A6 activity include: Pentobarbital, Phenobarbital, Rifampicin.
Drugs and substances known to inhibit CYP2A6 activity include: Grapefruit juice flavonoids, Ketoconazole, Methoxsalen, Pilocarpine, Tranylcypromine.

Genotype/Haplotype Details
CYP1A2
***1A,*1B,*1C,*1D,*1E,*1F,*1G,*1J,*1K,*1L,*4,*7,*8,*17,.**
Genetic results: CYP1A2 *1A/*1B
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP1A2	Asn516Asn	1548T>C	*1B	rs2470890	T/C
CYP1A2		-3860G>A	*1C	rs2069514	G/G
CYP1A2		-2467delT	*1D	rs35694136	T/T
CYP1A2		-739T>G	*1E	rs2069526	T/T
CYP1A2		-729C>T	*1K	rs12720461	C/C
CYP1A2		-163C>A	*1F	rs762551	C/C
CYP1A2	Ile386Phe	1156A>T	*4	rs72547516	A/A
CYP1A2	Splicing defect	1253+1G>A	*7	rs56107638	G/G
CYP1A2	Arg456His	1367G>A	*8	rs72547517	G/G

CYP1A2 is the most important gene in the metabolism of: Asenapine, Bromazepam, Carmustine, Clozapine, Cyamemazine, Cyclobenzaprine, Eltrombopag, Estradiol, Febuxostat, Flutamide, Frovatriptan, Imipramine, Leflunomide, Lidocaine, Loxapine, Mirtazapine, Nabumetone, Naratriptan, Nintedanib, Palonosetron, Pomalidomide, Promazine, Pyrazinamide, Ramelteon, Rasagiline, Riluzole, Ropinirole, Tacrine, Theophylline, Thiothixene, Tizanidine, Triamterene, Trifluoperazine, Zileuton, Zolmitriptan.
Drugs and substances known to induce CYP1A2 activity include: beta-naphthoflavone, char-grilled meat, Marijuana, Modafinil, Omeprazole, Tobacco.
Drugs and substances known to inhibit CYP1A2 activity include: Amiodarone, Efavirenz, Fluoroquinolones, Fluvoxamine, Ticlopidine, Verapamil.
CYP1A2 activity is dependent upon hepatic and renal function status as well as age.

Genotype/Haplotype Details
CYP2B6
***1,*4,*5,*6,*7,*8,*9,*10,*11,*13,*15,*18,*18.002,*28,*33,.**
Genetic results: CYP2B6 *1/*4
Phenotype: Ultrarapid metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2B6	Lys262Arg	785A>G	*4	rs2279343	A/G
CYP2B6	Arg487Cys/Ser	1459C>T/A	*5/*7/*33	rs3211371	C/C
CYP2B6	Gln172His	516G>T	*6/*9	rs3745274	G/G
CYP2B6	Lys139Glu	415A>G	*8/*13	rs12721655	A/A
CYP2B6	Arg22Cys	64C>T	*10	rs8192709	C/C
CYP2B6	Met46Leu	136A>G	*11	rs35303484	A/A
CYP2B6	Ile391Asn	1172T>A	*15	rs35979566	T/T
CYP2B6	Ile328Thr	983T>C	*18	rs28399499	T/T
CYP2B6	Arg378Ter	1132C>T	*28	rs34097093	C/C

CYP2B6 is the most important gene in the metabolism of: Bupropion, Cyclophosphamide, Efavirenz, Iphosphamide, Meperidine, Ondansetron, Selegiline, Sertraline.
Drugs and substances known to induce CYP2B6 activity include: Artemisinin, Carbamazepine, Efavirenz, Nevirapine, Phenobarbital, Phenytoin, Rifampicin.
Drugs and substances known to inhibit CYP2B6 activity include: Clopidogrel, Orphenadrine, Thiotepa, Ticlopidine, Voriconazole.

Genotype/Haplotype Details
CYP2C8
***1,*2,*3,*4,.**
Genetic results: CYP2C8 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2C8	Ile269Phe	805A>T	*2	rs11572103	A/A
CYP2C8	Arg139Lys	416G>A	*3	rs11572080	G/G
CYP2C8	Lys399Arg	1196A>G	*3	rs10509681	A/A
CYP2C8	Ile264Met	792C>G	*4	rs1058930	C/C

CYP2C8 is the most important gene in the metabolism of: Amodiaquine, Chloroquine, Dabrafenib, Desloratadine, Enzalutamide, Isotretinoin, Nicardipine, Paclitaxel, Pioglitazone, Repaglinide, Rosiglitazone.
Drugs and substances known to induce CYP2C8 activity include: Rifampicin.
Drugs and substances known to inhibit CYP2C8 activity include: Gemfibrozil, Montelukast, Trimethoprim.

Genotype/Haplotype Details
CYP2C9
***1,*2,*3,*4,*5,*6,*8,*9,*11,*12,*13,*14,*27,*35,*61,.**
Genetic results: CYP2C9 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2C9	Arg144Cys	430C>T	*2	rs1799853	C/C
CYP2C9	Ile359Leu	1075A>C	*3	rs1057910	A/A
CYP2C9	Ile359Asn	1076T>C	*4	rs56165452	T/T
CYP2C9	Asp360Glu	1080C>G	*5	rs28371686	C/C
CYP2C9	Lys273Argfs	817delA	*6	rs9332131	A/A
CYP2C9	Arg150His/Leu	449G>A/T	*8/*27	rs7900194	G/G
CYP2C9	His251Arg	752A>G	*9	rs2256871	A/A
CYP2C9	Arg335Trp	1003C>T	*11	rs28371685	C/C
CYP2C9	Pro489Ser	1465C>T	*12	rs9332239	C/C
CYP2C9	Leu90Pro	269T>C	*13	rs72558187	T/T
CYP2C9	Arg125His/Leu	374G>A/T	*14/*35	rs72558189	G/G
CYP2C9	Asn457Ser	1370A>G	*61	rs202201137	A/A

CYP2C9 is the most important gene in the metabolism of: Acenocoumarol, Alosetron , Azilsartan, Bosentan, Cannabinol (CBN), Celecoxib, Chloramphenicol, Delta 9-tetra hydrocannabinol (▵9_THC), Dronabinol, Fenoprofen, Flurbiprofen, Fluvastatin, Gliclazide, Glimepiride, Glipizide, Gliquidone, Ibuprofen, Indomethacin, Irbesartan, Ketobemidone, Lacosamide, Lornoxicam, Losartan, Mefenamic acid, Meloxicam, Mestranol, Naproxen, Nateglinide, Paramethadione, Parecoxib, Phenprocoumon, Piroxicam, Primidone, Sulfinpyrazone, Tapentadol, Tenoxicam, Terbinafine, Thiamylal, Tolazamide, Tolbutamide, Torasemide, Trimethadione, Valsartan, Vismodegib, Warfarin, Zafirlukast.
Drugs and substances known to induce CYP2C9 activity include: Carbamazepine, Nevirapine, Phenobarbital, Rifampicin, Secobarbital.
Drugs and substances known to inhibit CYP2C9 activity include: Amentoflavone, Amiodarone, Apigenin, Isoniazid, Fluconazole, Miconazole, Sulfaphenazole, Valproic acid.

Genotype/Haplotype Details
CYP2C19
***38.001,*2.001,*3.001,*4.001,*4.002,*17,*22,*35,.**
Genetic results: CYP2C19 *38.001/*38.001
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2C19	Splicing defect	681G>A	*2.001	rs4244285	G/G
CYP2C19	Splicing defect	332-23A>G	*2.001	rs12769205	A/A
CYP2C19	Trp212Ter	636G>A	*3.001	rs4986893	G/G
CYP2C19	Met1Val	1A>G	*4	rs28399504	A/A
CYP2C19		-806C>T	*17	rs12248560	C/C
CYP2C19	Arg186Pro	557G>C	*22	rs140278421	G/G

CYP2C19 is the most important gene in the metabolism of: Brivaracetam, Carisoprodol, Citalopram, Clobazam, Clopidogrel, Dexlansoprazole, Diazepam, Enfuvirtide, Esomeprazole, Flunitrazepam, Hexobarbital, Mephenytoin, Moclobemide, Nelfinavir, Nilutamide, Omeprazole, Pantoprazole, Pentamidine, Phenobarbital, Phenytoin, Proguanil, Rabeprazole, Temazepam, Teniposide, Voriconazole.
Drugs and substances known to induce CYP2C19 activity include: Artemisinin, Carbamazepine, Efavirenz, Norethisterone, Rifampicin, Ritonavir, St. John's Wort.
Drugs and substances known to inhibit CYP2C19 activity include: Chloramphenicol, Esomeprazole, Felbamate, Fluvoxamine, Isoniazid, Lansoprazole, Moclobemide, Omeprazole.

Genotype/Haplotype Details
CYP2D6
***1,*2.001,*3.001,*4.001,*4.003,*4.010,*4.012,*4.013,*4.027,*5,*6.001,*6.003,*8.001,*10.001,*13,*17.001,*29.001,*34.001,*36.001,*39.001,*61.001,*63.001,*64.001,*65.001,*68.001,*70.001,*74.001,*83.001,*114.001,*134.001,*141.001,*153.001,*160.001,.**
Genetic results: CYP2D6 *1/*29.001
Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2D6	Arg296Cys	886C>T	*2	rs16947	G/A
CYP2D6	Ser486Thr	1457G>C	*2	rs1135840	C/G
CYP2D6	Arg259fs	775delA	*3.001	rs35742686	A/A
CYP2D6	Splicing defect	506-1G>A	*4.001	rs3892097	G/G
CYP2D6	Leu91Met	271C>A	*4.001	rs28371703	C/C
CYP2D6	CNV assay		*5/XN	CYP2D6_CNVs	2
CYP2D6	Trp152fs	454delT	*6.001	rs5030655	T/T
CYP2D6	Gly169Ter/Arg	505G>T/A	*8/*14	rs5030865	G/G
CYP2D6	Pro34Ser	100C>T	*10	rs1065852	C/C
CYP2D6	Thr107Ile/Tyr	320C>T/A	*17/*82	rs28371706	C/C
CYP2D6	Val136Val	408G>C	*29	rs1058164	C/G
CYP2D6	Arg344Gln	1031G>A	*134	rs76088846	G/G
CYP2D6	Glu215Lys	643G>A	*153	rs567606867	G/G

CYP2D6 is the most important gene in the metabolism of: Aclidinium, Amitriptyline, Amoxapine, Arformoterol, Aripiprazole, Atomoxetine, Bisoprolol, Carvedilol, Chlorpromazine, Clomipramine, Clonidine, Codeine, Cyclizine, Dapoxetine, Darifenacin, Debrisoquine, Desipramine, Dexmethylphenidate, Dextromethorphan, Diphenhydramine, Donepezil, Dosulepin, Doxazosin, Doxepin, Duloxetine, Encainide, Ethylmorphine, Flecainide, Fluoxetine, Fluphenazine, Fluvoxamine, Formoterol , Galantamine, Hydrocodone, Hydroxychloroquine, Iloperidone, Labetalol, Lisdexamfetamine, Lorcaserin, Maprotiline, Methamphetamine, Methylnaltrexone, Methylphenidate, Metoclopramide, Metoprolol, Mexiletine, Mianserin, Modafinil, Nebivolol, Nefazodone, Nortriptyline, Paliperidone, Paroxetine, Perphenazine, Primaquine, Procainamide, Prochlorperazine, Promethazine, Propafenone, Propranolol, Protriptyline, Reserpine, Risperidone, Sertindole, Sparteine, Tetrabenazine, Thioridazine, Timolol, Tolterodine, Tramadol, Trimipramine, Umeclidinium, Venlafaxine, Vicoprofen, Vortioxetine, Zuclopenthixol.
In Caucasians, approximately 6 -10% are CYP2D6 poor metabolizers and up to 7% are ultrarapid drug metabolizers.
Drugs and substances known to induce CYP2D6 activity include: Dexamethasone, Glutethimide, Rifampicin.
Drugs and substances known to inhibit CYP2D6 activity include: Bupropion, Fluoxetine, Paroxetine, Quinidine, Ritonavir.

Genotype/Haplotype Details
CYP2E1
***1,*7.**
Genetic results: CYP2E1 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2E1		-333T>A	*7	rs2070673	T/T

CYP2E1 is the most important gene in the metabolism of: Dalfampridine, Dapsone, Enflurane, Halothane, Isoflurane, Methoxyflurane, Mitoxantrone, Sevoflurane.
Drugs and substances known to induce CYP2E1 activity include: Ethanol, Isoniazid.
Drugs and substances known to inhibit CYP2E1 activity include: Disulfiram

Genotype/Haplotype Details
CYP2J2
***1,*7.**
Genetic results: CYP2J2 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP2J2		-76G>T	*7	rs890293	G/G

Genotype/Haplotype Details
CYP3A4
***1.001,*1.002,*3,*7,*10,*15,*16,*18,*19,*20,*22,*37,.**
Genetic results: CYP3A4 *1.001/*1.001
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP3A4		-392G>A	*1.002	rs2740574	G/G
CYP3A4	Met445Thr	1334T>C	*3	rs4986910	T/T
CYP3A4	Gly56Asp	167G>A	*7	rs56324128	G/G
CYP3A4	Asp174His	520G>C	*10	rs4986908	G/G
CYP3A4	Arg162Gln	485G>A	*15	rs4986907	G/G
CYP3A4	Thr185Ser	554C>G	*16	rs12721627	C/C
CYP3A4	Leu293Pro	878T>C	*18	rs28371759	T/T
CYP3A4	Pro467Ser	1399C>T	*19	rs4986913	C/C
CYP3A4	Pro488fs	1461_1462insA	*20	rs67666821	-/-
CYP3A4		522-191C>T	*22	rs35599367	C/C

Genotype/Haplotype Details
CYP3A5
***1,*1.002,*3,*3A,*6,*6.001,*7,*7.001,.**
Genetic results: CYP3A5 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
CYP3A5		*14C>T	*1.002	rs15524	C/C
CYP3A5	Patients with two copies of the CFTR G178R variant and cystic fibrosis may respond to ivacaftor treatment. FDA-approved drug labeling information and CPIC guidelines indicate use of ivacaftor in cystic fibrosis patients with at least one copy of a list of 10 CFTR genetic variants including G178R.	689-1A>G	*3	rs776746	A/A
CYP3A5	Patients with two copies of the CFTR G178R variant and cystic fibrosis may respond to ivacaftor treatment. FDA-approved drug labeling information and CPIC guidelines indicate use of ivacaftor in cystic fibrosis patients with at least one copy of a list of 10 CFTR genetic variants including G178R.	624G>A	*6	rs10264272	G/G
CYP3A5	Thr346Tyrfs	1035_1036insT	*7	rs41303343	-/-

CYP3A4/5 are the most important genes in the metabolism of: Abiraterone, Albendazole, Alfentanyl, Alfuzosin, Aliskiren, Almotriptan, Alprazolam, Amiodarone, Amlodipine, Amobarbital, Anastrozole, Apixaban, Aprepitant, Armodafinil, Arteether, Artemether, Artemisinin, Astemizole, Atazanavir, Atorvastatin, Avanafil, Axitinib, Bedaquiline, Bepridil, Bicalutamide, Boceprevir, Bosutinib, Bromocriptine, Bromperidol, Brotizolam, Budesonide, Buprenorphine, Buspirone, Cabozantinib, Cannabidiol (CBD), Carbamazepine, Ceritinib, Cerivastatin, Chlordiazepoxide, Chlorpheniramine, Cilansetron, Cilostazol, Cinacalcet, Cinitapride, Cisapride, Clarithromycin, Clebopride , Clindamycin, Clonazepam, Clorazepate, Colchicine, Cortisol (hydrocortisone), Crizotinib, Cyclosporine, Cyproterone, Darunavir, Dasatinib, Delavirdine, Desogestrel, Dexamethasone, Dextropropoxyphene, Dienogest, Dihydrocodeine, Dihydroergotamine, Diltiazem, Disopyramide, Docetaxel, Dolasetron, Domperidone, Dronedarone, Droperidol, Dutasteride, Eletriptan, Elvitegravir, Eplerenone, Ergotamine, Erlotinib, Erythromycin, Escitalopram, Estazolam, Eszopiclone, Ethinylestradiol, Ethosuximide, Etoposide, Etoricoxib, Etravirine, Everolimus, Exemestane, Felbamate, Fentanyl, Finasteride, Flurazepam, Fluticasone, Fosamprenavir, Fulvestrant, Gefitinib, Gemfibrozil, Glyburide, Granisetron, Halofantrine, Haloperidol, Hydroxyzine, Ibrutinib, Ilaprazole, Imatinib, Indinavir, Itraconazole, Ivabradine, Ivacaftor, Ketamine, Ketoconazole, Ketoprofen, Lansoprazole, Lapatinib, Lestaurtinib, Letrozole, Levacetylmethadol, Levomepromazine, Levomilnacipran, Levonorgestrel, Loperamide, Lopinavir, Loratadine, Lormetazepam, Lovastatin, Lurasidone, Lysergic acid diethylamide (LSD), Macitentan, Maraviroc, Masitinib, Mefloquine, Methadone, Midazolam, Mifepristone, Mometasone, Montelukast, Mosapride, Mycophenolate mofetil, Neratinib, Nevirapine, Nifedipine, Nilotinib, Nimodipine, Nitrazepam, Nordazepam, Ornidazole, Ospemifene, Oxybutynin, Oxycodone, Pacritinib, Paritaprevir, Pazopanib, Perampanel , Phencyclidine (PCP), Pimecrolimus, Pimozide, Ponatinib, Pranlukast, Prednisone, Quazepam, Quetiapine, Quinidine, Quinine, Ranolazine, Reboxetine, Regorafenib, Rifabutin, Rifampicin, Rilpivirine, Ritonavir, Rivaroxaban, Roflumilast, Ruxolitinib, Salmeterol, Saquinavir, Saxagliptin, Scopolamine, Sibutramine, Sildenafil, Silodosin, Simeprevir, Simvastatin, Sirolimus, Sitagliptin, Solifenacin, Sorafenib, Sufentanil, Sunitinib, Tacrolimus, Tadalafil, Tamoxifen, Tamsulosin, Telaprevir, Telithromycin, Temsirolimus, Terazosin, Terfenadine, Testosterone, Tiagabine, Ticagrelor, Tilidine, Tinidazole, Tipranavir, Toceranib, Tofacitinib, Tolvaptan, Toremifene, Trazodone, Triazolam, Tropisetron, Udenafil, Ulipristal, Vandetanib, Vardenafil, Verapamil, Vilanterol, Vilazodone, Vinblastine, Vincristine, Vorapaxar, Zaleplon, Ziprasidone, Zolpidem, Zonisamide, Zopiclone, Zotepine.
Drugs and substances known to induce CYP3A4/5 activity include: Carbamazepine, Efavirenz, Nevirapine, Phenobarbital, Phenytoin, Pioglitazone, Rifabutin, Rifampicin, St. John's Wort, Troglitazone.
Drugs and substances known to inhibit CYP3A4/5 activity include: Chloramphenicol, Clarithromycin, Grapefruit juice flavonoids, Indinavir, Itraconazole, Ketoconazole, Nefazodone, Nelfinavir, Ritonavir.

Genotype/Haplotype Details
VKORC1
H1,H2,H3,H4,H5,H6,H7,H8,H9.
Genetic results: VKORC1 H1/H2
Phenotype: Sensitive to Warfarin

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
VKORC1		497T>G	H2	rs2884737	T/T
VKORC1		2255T>C	H3	rs2359612	T/T
VKORC1		1542C>G	H3	rs8050894	C/C
VKORC1		1173T>C	H4	rs9934438	T/T
VKORC1		-1639A>G	H4	rs9923231	A/A
VKORC1		296C>T	H5	rs7196161	C/C
VKORC1		3730G>A	H7	rs7294	C/T
VKORC1		776C>A	H8	rs17880887	C/C
VKORC1		173+525C>T	H9	rs17708472	C/C

The VKORC1 gene encodes the vitamin K epoxide reductase enzyme, the drug target of Warfarin.

Genotype/Haplotype Details
SLC22A1
***1,*61C,*88R,*341L,*401S,*408V,*465R.**
Genetic results: SLC22A1 *1/*408V
Phenotype: Intermediate function

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
SLC22A1	Arg61Cys	181C>T	*61C	rs12208357	C/C
SLC22A1	Cys88Arg	262T>C	*88R	rs55918055	T/T
SLC22A1	Pro341Leu	1022C>T	*341L	rs2282143	C/C
SLC22A1	Gly401Ser	1201G>A	*401S	rs34130495	G/G
SLC22A1	Met408Val	1222A>G	*408V	rs628031	A/G
SLC22A1	Met420del	1260_1262delGAT	*420Del	rs72552763	GAT/GAT
SLC22A1	Met420Terfs	1258delA	*420Del	rs35167514	A/A
SLC22A1	Gly465Arg	1393G>A	*465R	rs34059508	G/G

SLC22A1 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Anthracyclines, Cisplatin, Dalfampridine, Lamivudine, Metformin, Pazopanib.

Genotype/Haplotype Details
SLCO1B1
***10*4,*5,*14,*15,*19,*20,*37,*40,.**
Genetic results: SLCO1B1 *1/*14
Phenotype:

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
SLCO1B1	Pro155Thr	463C>A	*4/*14	rs11045819	C/A
SLCO1B1	Val174Ala	521T>C	*5	rs4149056	T/T
SLCO1B1	Leu643Phe	1929A>C	*19	rs34671512	A/A
SLCO1B1	Asn130Asp	388A>G	*37	rs2306283	A/G

SLCO1B1 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Atorvastatin, Cerivastatin, Cytarabine, Fluvastatin, Irinotecan, Lopinavir, Lovastatin, Methotrexate, Mycophenolate mofetil, Olmesartan, Pravastatin, Repaglinide, Simvastatin.

Genotype/Haplotype Details
SLCO1B3
***10*4,*5,*14,*15,*19,*20,*37,*40,.**
Genetic results: SLCO1B3 *112A/*112A
Phenotype:

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
SLCO1B3	Ser112Ala	334T>G	*112A	rs4149117	G/G
SLCO1B3	Met233Ile	699G>A	*233I	rs7311358	A/A

SLCO1B3 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Carboplatin, Docetaxel, Mycophenolate mofetil, Paclitaxel.

Genotype/Haplotype Details
SLCO2B1
***1,*3.**
Genetic results: SLCO2B1 *1/*1
Phenotype: Extensive function

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
SLCO2B1	Ser486Phe	1457C>T	*3	rs2306168	C/C

SLCO1B3 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: SLCO2B1 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Fexofenadine, Montelukast.

Genotype/Haplotype Details
ABCC2
***1,*417I,*1324I,.**
Genetic results: ABCC2 *1/*1324I
Phenotype: Intermediate function

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
ABCC2	Val417Ile	1249G>A	*417I	rs2273697	G/G
ABCC2	Ile1324=	3972C>T	*1324I	rs3740066	C/T

ABCC2 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Acetaminophen, Atorvastatin, Carbamazepine, Codeine, Docetaxel, Doxorubicin, Gemtuzumab ozogamicin, Ibuprofen, Irinotecan, Lovastatin, Lamivudine, Methotrexate, Morphine, Mycophenolic acid, Paclitaxel, Pravastatin, Simvastatin, Tramadol, Vincristine.

Genotype/Haplotype Details
ABCG2
***1,*141K,*126Ter.**
Genetic results: ABCG2 *1/*1
Phenotype: Extensive function

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
ABCG2	Gln141Lys	421C>A	*141K	rs2231142	C/C
ABCG2	Gln126Ter	376C>T	*126Ter	rs72552713	C/C

ABCG2 is an important pharmacokinetic gene affecting drug disposition. Pharmaceutical agents affected include: Acetaminophen, Atorvastatin, Docetaxel, Doxorubicin, Erlotinib, Fluoropyrimidines, Gefitinib, Imatinib, Irinotecan, Lovastatin, Lamivudine, Methotrexate, Pazopanib, Paclitaxel, Pravastatin, Simvastatin, Uricosurics, Zidovudine.

Genotype/Haplotype Details
ADH1B
***1,*2,*3.**
Genetic results: ADH1B *2/*2
Phenotype: Ultrarapid metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
ADH1B	His48Arg	143A>G	*2	rs1229984	C/C
ADH1B	Arg370Cys	1108C>T	*3	rs2066702	C/C

ADH1B, also frequently known as ADH2 or ADH beta, is a Class I alcohol dehydrogenase gene. Alcohol dehydrogenases metabolize ethanol to acetaldehyde, which is successively metabolized by aldehyde dehydrogenases (ALDH1A, ALDH2 genes) to acetate.

Genotype/Haplotype Details
SULT1A1
***1,*4.**
Genetic results: SULT1A1 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
SULT1A1	Arg37Gln	110G>A	*4	rs72547527	G/G

SULT1A1 contribute in the metabolism of several drugs including: Acetaminophen, Naproxen, Propofol, Tamoxifen.

Genotype/Haplotype Details
EPHX1
***1,*113His,*139Arg.**
Genetic results: EPHX1 *1/*113His
Phenotype: Ultrarapid metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
EPHX1	Tyr113His	337T>C	*113His	rs1051740	T/C
EPHX1	His139Arg	416A>G	*139Arg	rs2234922	A/A

EPHX1 contribute in the metabolism of several drugs including: Carbamazepine, Cisplatin, Cyclophosphamide, Docetaxel, Phenprocoumon, Phenytoin, Warfarin.

Genotype/Haplotype Details
NAT2
Allele Tested: *1.001,*1.002,*1.003,*4.001,*4.002,*4.003,*5.001,*5.002,*6.001,*6.002,*6.004,*7.001,*7.002,*16.001,*16.002,*30.001,*34.001,*40.001,.
Genetic results: NAT2 *4.002/*5.001
Phenotype: Poor acetylator

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
NAT2	Tyr94Tyr	282C>T	*1.002	rs1041983	C/C
NAT2	Leu161Leu	481C>T	*1.003	rs1799929	C/T
NAT2	Arg268Lys	803G>A	*4.001	rs1208	G/A
NAT2	Ile114Thr	341T>C	*5.001	rs1801280	T/C
NAT2	Arg197Gln	590G>A	*6.001	rs1799930	G/G
NAT2	Gly286Glu	857G>A	*7.001	rs1799931	G/G

NAT2 is the most important gene in the metabolism of: Hydralazine, Isoniazid, Isosorbide dinitrate, and certain sulfonamides such as Sulfadimidine, Sulfapyridine.
NAT2 contribute in the metabolism of several drugs including: Caffeine, Dapsone, Flunitrazepam, Procainamide, Nitrazepam.

Genotype/Haplotype Details
GSTP1
***1A,*1B,*1D,*1C.**
Genetic results: GSTP1 *1A/*1A
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
GSTP1	Ile105Val	313A>G	*1B or *1C	rs1695	A/A
GSTP1	Ala114Val	341C>T	*1C or *1D	rs1138272	C/C

GSTP1 contribute in the metabolism of several drugs including: Cisplatin, Doxorubicin, Fluorouracil.

Genotype/Haplotype Details
BCHE
***1,*70G,*539T,*70G*539T,*418V,*271M.**
Genetic results: BCHE *1/*1
Phenotype: Extensive function

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
BCHE	Asp98Gly	293A>G	*98G	rs1799807	A/A
BCHE	Ala567Thr	1699G>A	*567T	rs1803274	G/G
BCHE	Gly418Val	1253G>T	*418V	rs28933390	G/G
BCHE	Thr271Met	812C>T	*271M	rs28933389	C/C

BCHE is the most important gene in the metabolism of: Succinylcholine.
BCHE contribute in the metabolism of several drugs including: Cocaine, Oseltamivir, Prasugrel, Rivastigmine.

Genotype/Haplotype Details
UGT1A1
***1,*6,*28,*36,*37,*60,*80.**
Genetic results: UGT1A1 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
UGT1A1		A(TA)(7,5,8)TAA	*28, *36, *37	rs8175347	45814
UGT1A1	Gly71Arg	211G>A	*6	rs4148323	G/G
UGT1A1		-364C>T	*80	rs887829	C/C
UGT1A1		862-10021T>G	*60	rs4124874	T/T

UGT1A1 is the most important gene in the metabolism of: Bazedoxifene, Ezetimibe, Irinotecan, Raloxifene, Raltegravir, Rosuvastatin.
UGT1A1 contribute in the metabolism of several drugs including: Abacavir, Acetaminophen, Arformoterol, Atorvastatin, Axitinib, Buprenorphine, Carvedilol, Desogestrel, Dolutegravir, Ethinylestradiol, Estradiol, Etoposide, Febuxostat, Fluvastatin, Gemfibrozil, Indacaterol, Ketoconazole, Labetalol, Levothyroxine, Liothyronine, Losartan, Lovastatin, Morphine, Naltrexone, Nilotinib, Pazopanib, Simvastatin, Telmisartan.

Genotype/Haplotype Details
UGT1A4
***1,*2,*3.**
Genetic results: UGT1A4 *1/*3
Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
UGT1A4	Pro24Thr	70C>A	*2	rs1799807	C/C
UGT1A4	Leu48Val	142T>G	*3	rs2011425	T/G

UGT1A4 is the most important gene in the metabolism of: Lamotrigine, Olanzapine, Retigabine.

Genotype/Haplotype Details
UGT1A6
***1,*2.**
Genetic results: UGT1A6 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
UGT1A6	Ser7Ala	19T>G	*2	rs6759892	T/T
UGT1A6	Thr181Ala	541A>G	*2	rs2070959	A/A
UGT1A6	Arg184Ser	552A>C	*2	rs1105879	A/A

UGT1A6 contribute in the metabolism of several drugs including: Acetaminophen, Entacapone, Ketoprofen, Naproxen, Nefazodone, Valproic acid.

Genotype/Haplotype Details
UGT2B7
***1a,*1d,*2a,*2b.**
Genetic results: UGT2B7 *1a/*1a
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
UGT2B7	Arg124Arg	372A>G	*1d	rs28365063	A/A
UGT2B7	Tyr268His	802C>T	*2a	rs7439366	C/C
UGT2B7		-327G>A	*2b	rs7662029	G/G
UGT2B7		-161C>T	*2b	rs7668258	C/C

UGT2B7 is the most important gene in the metabolism of: Clofibrate, Diclofenac, Hydromorphone, Morphine, Lorazepam-r, Naloxone, Naltrexone, Oxazepam-r, Oxymorphone, Zidovudine.

Genotype/Haplotype Details
UGT2B15
***1,*2.**
Genetic results: UGT2B15 *1/*1
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
UGT2B15	Tyr85Asp	253G>T	*2	rs1902023	C/C

UGT2B15 is the most important gene in the metabolism of: Lorazepam-s, Oxazepam-s.

Genotype/Haplotype Details
DPYD
***1,*2A,*2B,*3,*4,*5,*6,*7,*9A,*10,*11,*12,*13,I560N,D949V,V335M,M166V,HapB3,F632F,R592W,T768K,Y186C,.**
Genetic results: DPYD *9A/F632F
Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
DPYD		1905+1G>A	*2A	rs3918290	G/G
DPYD	Pro633Glnfs	1898delC	*3	rs72549303	C/C
DPYD	Ser534Asn	1601G>A	*4	rs1801158	G/G
DPYD	Ile543Val	1627A>G	*5	rs1801159	A/A
DPYD	Val732Ile	2194G>A	*6	rs1801160	G/G
DPYD	Phe100Serfs	295_298delTCAT	*7	rs72549309	TCAT/TCAT
DPYD	Arg235Trp	703C>T	*8	rs1801266	C/C
DPYD	Cys29Arg	85T>C	*9A	rs1801265	A/G
DPYD	Val995Phe	2983G>T	*10	rs1801268	G/G
DPYD	Val335Leu/Met	1003G>T/A	*11/V335M	rs72549306	G/G
DPYD	Glu386X	1156G>T	*12	rs78060119	G/G
DPYD	Ile560Ser/Asn	1679T>G/A	*13/I560N	rs55886062	T/T
DPYD		1129-5923C>G	HapB3	rs75017182	C/C
DPYD		1236G>A	HapB3	rs56038477	G/G
DPYD	Asp949Val	2846A>T	D949V	rs67376798	A/A
DPYD	Met166Val	496A>G	M166V	rs2297595	A/A
DPYD	Phe632Phe	1896T>C	F632F	rs17376848	A/G
DPYD	Arg592Trp	1774C>T	R592W	rs59086055	C/C
DPYD	Thr768Lys	2303C>A	T768K	rs56005131	C/C
DPYD	Tyr186Cys	557A>G	Y186C	rs115232898	A/A

DPYD is the most important gene in the metabolism of: Cytarabine, Fluorouracil, Tegafur.

Genotype/Haplotype Details
NUDT15
***1,*2,*3,*5,*6,*7,*9,.**
Genetic results: NUDT15 *1/*1
Phenotype: Thiopurines resistance

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
NUDT15	Arg139Cys	415C>T	*2/*3	rs116855232	C/C
NUDT15	del17_18GlyVal; V18_V19insGlyVal	50delGAGTCG; 55_56insGAGTCG	*2/*6/*9	rs746071566	45691
NUDT15	Val18Ile	52G>A	*5	rs186364861	G/G
NUDT15	Arg34Thr	101G>C	*7	rs766023281	G/G

NUDT15 contribute in the metabolism of several drugs including: Azathioprine, Mercaptopurine, Thioguanine.

Genotype/Haplotype Details
G6PD
A-,B,M,.
Genetic results: G6PD 0.01

Gene	Protein change	Nucleotide change	Allele	Marker	Genotype
G6PD	Ser218Phe	653C>T	M	rs5030868	G/G
G6PD	Arg489Leu	1376G>T	Canton	rs72554665	C/C

Background

COMT: COMT is an enzyme that degrades dopamine and norepinephrine, primarily in the prefrontal cortex of the brain. A common single nucleotide polymorphism (SNP) 472G>A, also referred to by the amino acid change 158 Val>Met, is associated with altered COMT enzymatic activity. The 158 Met allele has lower enzymatic activity resulting in less dopamine degradation and higher dopamine concentrations as compared to those carrying the Val allele. Conversely, the 158 Val allele has higher activity and results in lower dopamine levels in the prefrontal cortex. Low dopamine concentrations are associated with cognitive impairments including working memory deficits. Val/Val homozygotes with depression are less likely to achieve remission when treated with SSRI antidepressants, and Val/Val homozygotes with schizophrenia are less likely to demonstrate improved cognitive effects when treated with antipsychotics. In contrast, the Met/Met homozygotes are more likely to achieve remission and demonstrate cognitive improvement when treated with SSRIs and antipsychotics, respectively. The frequency of the 158 Met variant varies from 25-43% depending on the population studied.

CYP1A2: CYP1A2 is a liver enzyme that metabolizes many medications, including theophylline, diazepam, caffeine, many antidepressants, and antipsychotics. CYP1A2 enzymatic activity can be induced by several medications, substrates, and constituents of tobacco smoke. CYP1A2 can also be inhibited by several medications. Detecting inherited variants of the CYP1A2 gene that lead to altered enzymatic activity, particularly in the presence of an inducer, can identify patients who may be at increased risk of having adverse drug reactions or therapeutic failure to standard dosages of CYP1A2 medications. CYP1A2 is responsible for more than 95% of the primary metabolism of caffeine In several studies, “slow” caffeine metabolizers, had increased risk of myocardial infarction.

CYP2B6: Drugs metabolized mainly by CYP2B6 include artemisinin, bupropion, cyclophosphamide, efavirenz, ketamine, and methadone. CYP2B6 is one of the most polymorphic CYP genes in humans and variants have been shown to affect transcriptional regulation, splicing, mRNA and protein expression, and catalytic activity. Some variants appear to affect several functional levels simultaneously, thus, combined in haplotypes, leading to complex interactions between substrate-dependent and –independent mechanisms. The most common functionally deficient allele is CYP2B6*6 [Q172H, K262R], which occurs at frequencies of 15 to over 60% in different populations. The allele leads to lower expression in liver due to erroneous splicing.

CYP2C19: CYP2C19 metabolizes approximately 10-15% of all drugs, including clopidogrel, citalopram, diazepam, and many of the proton pump inhibitors. Detecting variants of the CYP2C19 gene that cause altered enzymatic activity can identify patients who may be at increased risk of having adverse drug reactions or therapeutic failure to standard dosages of CYP2C19 substrates.

CYP2C9: CYP2C9 metabolizes approximately 10% of all drugs, including warfarin, phenytoin, non-steroidal anti-inflammatory drugs (NSAIDs), and antihyperglycemicsulphonylureas. Detecting variants of the CYP2C9 gene that cause altered enzymatic activity can identify patients who may be at increased risk of having adverse drug reactions or therapeutic failure to standard dosages of CYP2C9 substrates.

CYP2D6: CYP2D6 metabolizes more than 25% of all drugs, including tamoxifen, many antidepressants, antipsychotics, beta-blockers, and opioids. Detecting variants of the CYP2D6 gene that cause altered enzymatic activity can identify patients who may be at increased risk of having adverse drug reactions or therapeutic failure to standard dosages of CYP2D6 substrates. Medications which require activation or inactivation by CYP2D6 should be used with caution in patients with CYP2D6 variants.

CYP3A4: CYP3A4 is a liver enzyme that, in concert with CYP3A5, metabolizes approximately 50% of medications, including many of the statins, benzodiazepines, antibiotics, and antipsychotics.
Detecting variants of the CYP3A4 gene that cause altered enzymatic activity can identify patients who may be at increased risk of having adverse drug reactions while taking standard dosages of 3A4 substrates.3A4 has higher activity than 3A5xon CYP3A drugs. Roughly 4-10% of the general population possesses inherited differences in 3A4 that cause decreased metabolism. Poor metabolizers may be at increased risk for dose-dependent side effects to drugs normally inactivated by 3A4.

CYP3A5: CYP3A5 is a liver enzyme that, in concert with CYP3A4, metabolizes approximately 50% of medications, including many of the statins, benzodiazepines, antibiotics, and antipsychotics. Detecting variants of the CYP3A5 gene that cause altered enzymatic activity can identify patients who may be at increased risk of having adverse drug reactions while taking standard dosages of 3A5 substrates. More than half of the general population (60-80%) possesses inherited differences in 3A5 that cause decreased metabolism. Poor metabolizers may be at increased risk for dose-dependent side effects to drugs normally inactivated by 3A5.

GLP1R: Not only does GLP1R signaling have a tremendous impact on weight gain (one of the key limiting side-effects of atypical antipsychotics) but it also influences the hypothalamic-pituitary-adrenal axis (HPA) activation, stress and anxiety-related behaviours. GLP1R also has a significant effect on dopaminergic neurotransmission, a key target of antipsychotic drug action. Drugs that target GLP1R can lead to decreased appetite and weight loss.

MTHFR: MTHFR gene variants (c.665C>T and c.1286A>C) correlate with reduced MTHFR enzyme activity. MTHFR enzyme is involved in folate metabolism. The gene catalyzes 5,10-methylenetetrahydrofolate to 5-methyltetrahydrofolate and is a necessary cofactor for the remethylation of homocysteine. Reduced MTHFR enzyme function increases plasma homocysteine. MTHFR gene variants may be associated with methotrexate toxicity, especially in individuals with family history of intolerance, prolonged administration of methotrexate therapy (eg, ALL, CML, rheumatoid arthritis). Dose adjustment or discontinuation of therapy may be advised for individuals with high-risk MTHFR genotypes. The MTHFR gene status is essential to determine genetic cause for hyperhomocysteinemia, predict sensitivity to antifolate drugs (eg, methotrexate).

OPRM1: Opioid agonists, such as morphine, hydromorphone, and oxymorphone, exert their analgesic properties via stimulation of the mu-1 opioid receptor. Analgesic efficacy of mu-acting drugs has been linked to the 118A>G single nucleotide polymorphism (SNP) of OPRM1, the gene encoding the mu-1 receptor. The frequency of the variant G allele varies from 10% to 48% depending on the population studied. Studies show that patients carrying the GG (homozygous variant) genotype require much higher opioid doses to achieve pain relief. Additionally, patients with the AA genotype display higher relapse rates with respect to naltrexone treatment for alcohol dependence.

SLCO1B1: The SLCO1B1 gene encodes the liver enzyme OATP1B1, which assists in transport of statins medications into the liver. Roughly 15% of the population possesses the C variant, an inherited form of SLOC1B1 which increases risk of statin-induced myopathy 3 to 5 fold. Risk of myopathy with the C variant is most closely associated with simvastatin and to a lesser extent, atorvastatin. Patients with the C variant may need the lowest doses of simvastatin or an alternative statin to reduce risk of myopathy. The C variant has reduced activity, leading to higher drug concentrations and worse outcomes with statins.

SULT4A1: Sulfotransferase family 4A, member 1 is a brain sulfotransferase with many interesting properties. However, its exact activities and mechanisms remain unknown. It binds numerous classes of molecules that might impact psychosis like catecholamines – norepinephrine, epinephrine, isoprenoline (but not dopamine); neurosteroids and thyroid hormones. It is known to affect the action of antipsychotics like risperidone, olanzapine etc.

VKORC1: The vitamin K oxidoreductase (VKORC1) recycles vitamin K to support the activation of vitamin K-dependent (VKD) proteins, which have diverse functions that include hemostasis and calcification. Warfarin – an anticoagulant widely used throughout the world. Primary mechanism of action is to inhibit vitamin K epoxide reductase (VKOR).VROR recycles vitamin K and activates clotting factors II, VII, IX, and X and exerts anticoagulant effects by reducing the concentration of these activated clotting factors VKOR is the site of action for warfarin. The VKORC1 (c.-1639G>A) variant reduces gene expression and lowers the amount of VKOR protein, leading to warfarin sensitivity. Hence VKORC1 mutational analysis is warranted for Warfarin (Coumadin)-naïve individuals who are being considered for Warfarin therapy, for individuals with personal or family history of difficulty with warfarin, for individuals who are adherent to warfarin therapy, but are difficult to treat (eg, those requiring 49 mg per week to maintain therapeutic international normalized ratio [INR]) and for those individuals who expect to be taken off of warfarin, such as prior to an invasive procedure or surgery, to estimate time required to eliminate the drug.

References

- Burton, M. E. (Ed.). (2006). Applied pharmacokinetics & pharmacodynamics: principles of therapeutic drug monitoring. Lippincott Williams & Wilkins.
- Gregers, Jannie, Henrik Green, IbJarle Christensen, K. Dalhoff, H. Schroeder, N. Carlsen, S. Rosthoej, B. Lausen, K. Schmiegelow, and Curt eterson. "Polymorphisms in the ABCB1 gene and effect on outcome and toxicity in childhood acute lymphoblastic leukemia." The pharmacogenomics journal 15, no. 4 (2015): 372-379.
- Hajj, Aline, LucineHalepian, Nada El Osta, Georges Chahine, Joseph Kattan, and Lydia RabbaaKhabbaz. "OPRM1 c. 118A> G Polymorphism and Duration of Morphine Treatment Associated with Morphine Doses and Quality-of-Life in Palliative Cancer Pain Settings."International journal of molecular sciences 18, no. 4 (2017): 669.
- Kieling, Christian, Júlia P. Genro, Mara H. Hutz, and Luis Augusto Rohde. "A current update on ADHD pharmacogenomics." Pharmacogenomics11, no. 3 (2010): 407-419.
- Lepper, Erin R., Sharyn D. Baker, Matt Permenter, Nicole Ries, Ron HN van Schaik, Paul W. Schenk, Douglas K. Price et al. "Effect of common CYP3A4 and CYP3A5 variants on the pharmacokinetics of the cytochrome P450 3A phenotyping probe midazolam in cancer patients." Clinical cancer research 11, no. 20 (2005): 7398-7404.
- Padmanabhan, Sandosh. Handbook of Pharmacogenomics and Stratified Medicine. Academic Press, 2014.
- Relling, M. V., and T. E. Klein. "CPIC: clinical pharmacogenetics implementation consortium of the pharmacogenomics research network." Clinical Pharmacology & Therapeutics 89, no. 3 (2011): 464-467.
- Sangkuhl, Katrin, Teri E. Klein, and Russ B. Altman. "Clopidogrel pathway." Pharmacogenetics and genomics 20, no. 7 (2010): 463-465.
- Sim, Sarah C., and Magnus Ingelman-Sundberg. "The Human Cytochrome P450 (CYP) Allele Nomenclature website: a peer-reviewed database of CYP variants and their associated effects." Human genomics 4, no. 4 (2010): 278.
- Swen, J. J., M. Nijenhuis, A. de Boer, L. Grandia, Anke-Hilse Maitland-van der Zee, H. Mulder, G. A. P. J. M. Rongen et al. "Pharmacogenetics: from bench to byte—an update of guidelines." Clinical Pharmacology & Therapeutics 89, no. 5 (2011): 662-673.
- Tan-kam, Teerarat, ChutamaneeSuthisisang, ChositaPavasuthipaisit, PenkhaeLimsila, ApichayaPuangpetch, and ChonlaphatSukasem. "Importance of pharmacogenetics in the treatment of children with attention deficit hyperactive disorder: a case report." Pharmacogenomics and personalized medicine 6 (2013): 3.
- Taubert, Dirk, Nicolas Beckerath, GundulaGrimberg, Andreas Lazar, Norma Jung, Tobias Goeser, Adnan Kastrati, Albert Schömig, and Edgar Schömig. "Impact of P-glycoprotein on clopidogrel absorption." Clinical pharmacology & therapeutics 80, no. 5 (2006): 486-501.
- The, Lay Kek, and Leif Bertilsson. "Pharmacogenomics of CYP2D6: molecular genetics, interethnic differences and clinical importance." Drug metabolism and pharmacokinetics 27, no. 1 (2012):
- 55-67.
- Thorn, Caroline F., EleniAklillu, Teri E. Klein, and Russ B. Altman. "PharmGKB summary: very important pharmacogene information for CYP1A2."Pharmacogenetics and genomics 22, no. 1 (2012): 73.
- Wessler, Jeffrey D., Laura T. Grip, Jeanne Mendell, and Robert P. Giugliano. "The P-glycoprotein transport system and cardiovascular drugs." Journal of the American College of Cardiology 61, no. 25 (2013): 2495-2502.
- Zanger, Ulrich M., and Matthias Schwab. "Cytochrome P450 enzymes in drug metabolism: regulation of gene expression, enzyme activities, and impact of genetic variation." Pharmacology & therapeutics 138, no. 1 (2013): 103-141.

Disclaimer

Disclaimer: *This is not a diagnostic test and so not to be considered as a purpose of diagnosis of any diseases. This test is meant for only understanding SNPs/ mutations in genes and its clinical relevance. Clinician should use their own clinical judgment and not base clinical decisions solely on this document. Any test or medication mentioned in the report should be taken under doctor's supervision. This report must be given only in the presence of medical professional to explain the findings and implications. Company will not be liable for any direct, indirect, consequential, special, exemplary, or any other damages.*

Note: This report is solely based on genetic makeup of the individuals and mutation detected at the time of sample collection. Individuals can show new mutations based on environmental changes that can alter the risk for different diseases.

Patient Information Card

An easily portable summary of the report patients can share with their medical professionals. (Please cut along dotted line.)

Pharmacogenomic Test Summary

CYP1A1	*1/*1	Extensive metabolizer
CYP1A2	*1A/*1B	Extensive metabolizer
CYP2A6	*1.001/*1.001	Extensive metabolizer
CYP2B6	*1/*4	Ultrarapid metabolizer
CYP2C8	*1/*1	Extensive metabolizer
CYP2C9	*1/*1	Extensive metabolizer
CYP2C19	*38.001/*38.001	Extensive metabolizer
CYP2D6	*1/*29.001	Intermediate metabolizer
CYP2E1	*1/*1	Extensive metabolizer
CYP2J2	*1/*1	Extensive metabolizer
CYP3A4	*1.001/*1.001	Extensive metabolizer
CYP3A5	*1/*1	Extensive metabolizer
VKORC1	H1/H2	Sensitive to Warfarin
SLC22A1	*1/*408V	Intermediate function
SLCO1B1	*1/*14	
SLCO1B3	*112A/*112A	Intermediate function
SLCO2B1	*1/*1	Extensive function
ABCC2	*1/*1324I	Intermediate function
ABCG2	*1/*1	Extensive function
ADH1B	*2/*2	Ultrarapid metabolizer
SULT1A1	*1/*1	Extensive metabolizer
EPHX1	*1/*113His	Ultrarapid metabolizer
NAT2	*4.002/*5.001	Poor acetylator
TPMT	*1/*1	Extensive metabolizer
GSTP1	*1A/*1A	Extensive metabolizer
BCHE	*1/*1	Extensive function
UGT1A1	*1/*1	Extensive metabolizer
UGT1A4	*1/*3	Intermediate metabolizer
UGT1A6	*1/*1	Extensive metabolizer
UGT2B7	*1a/*1a	Extensive metabolizer
UGT2B15	*1/*1	Extensive metabolizer
DPYD	*9A/F632F	Extensive metabolizer
NUDT15	*1/*1	Thiopurines resistance
G6PD	0.01	

For a complete report contact PGxSoftware.com

This report is automatically generated by CliSeq Interpreter