Drug Sensitivity Genetic Profile

Pharmacogenomics (PGx)

Name: Sample Report US Version
Report Number: PGX-AGS00000
Report Date: 2018-08-14

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AGS
ADVANCED GENOMICS MADE PERSONAL

PERSONAL DETAILS	
PATIENT	Sample Report US Version
DOB	2018-08-14
GENDER	N/A
COLLECTION DATE	Buccal Swab
ORDERING PHYSICIAN	Dr. Chan, Hoi Chung Samuel

LABORATORY INFORMATION	
ACCESSION NUMBER	AGS00000
REPORT NUMBER	PGX-AGS00000
REPORT GENERATED	2018-08-14
LABORATORY DIRECTOR	Dr. Lai, Chun Wan Jeffrey

Current Patient Medication

Clopidogrel (Plavix): Used As Directed

The personalized pharmacogenomics profile of this patient reveals extensive CYP2C19-mediated metabolism. For further details, please find supporting evidence in this report or on websites such as www.pharmgkb.org or www.fda.gov.

Nortriptyline (Pamelor): May Have Increased Toxicity

The personalized pharmacogenomics profile of this patient reveals intermediate CYP2D6-mediated metabolism, extensive CYP1A2-mediated metabolism with higher inducibility, and extensive CYP2C19-mediated metabolism. For further details, please find supporting evidence in this report or on websites such as www.pharmgkb.org or www.fda.gov.

Warfarin (Coumadin, Jantoven): Used As Directed

The personalized pharmacogenomics profile of this patient reveals intermediate CYP2C9-mediated metabolism, intermediate sensitivity to Warfarin (VKORC1-mediated). The drug's labeling notes that deficiencies in protein C (PROC) or protein S (PROS1) have been associated with tissue necrosis following the administration of Warfarin. For further details, please find supporting evidence in this report or on government/public websites such as www.pharmgkb.org or www.fda.gov or www.warfarindosing.org.

Atorvastatin (Lipitor): May Have Increased Toxicity

The personalized pharmacogenomics profile of this patient reveals intermediate CYP3A4-mediated metabolism, and intermediate SLCO1B1-mediated function

Simvastatin (Zocor, FloLipid): May Have Increased Toxicity

The personalized pharmacogenomics profile of this patient reveals intermediate CYP3A4-mediated metabolism, and intermediate SLCO1B1-mediated function

GENOTYPE/HAPLOTYPE/PHENOTYPE DETAIL

Gene	Genotype-Haplotype	Phenotype
CYP1A2	***1F/*1F**	**Extensive metabolizer with higher inducibility**
CYP2B6	*1/*1	Extensive metabolizer
CYP2C9	*1/*2	Intermediate metabolizer
CYP2C19	*1/*1	Extensive metabolizer
CYP2D6	*2/*3	Intermediate metabolizer
CYP3A4	*1A/*22	Intermediate metabolizer
CYP3A5	***3A/*3A**	**Poor metabolizer**
VKORC1	*1/*2	Intermediate sensitivity to Warfarin
SLCO1B1	*1A/*5	Intermediate function
UGT2B7	*1a/*2b	Intermediate metabolizer

Disclaimer: The graphic representations of the medication dosages are not drawn to actual scale. 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 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%.

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.

Examples of different levels of evidence for PGx SNPs

Gene	Marker	Level of Evidence	Drugs
CYP2D6	rs16947	1A	Amitriptyline, Codeine, Nortriptyline, Paroxetine
VKORC1	rs9923231	1A	Warfarin
SLCO1B1	rs4149056	1A	Simvastatin
CYP2D6	rs16947	1B	Tramadol
VKORC1	rs9923231	1B	Acenocoumarol
CYP2D6	rs16947	2A	Flecainide, Doxepin, Desipramine, Atomoxetine, Risperidone, Clomipramine, Imipramine, Venlafaxine
SLCO1B1	rs4149056	2A	Cerivastatin, Pravastatin, Rosuvastatin
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.

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 (Voltaren, Cambia)	UGT2B7	CYP2C9,CYP3A4			●
	Nabumetone (Relafen)	**CYP1A2**	CYP2C19,CYP3A4		●	
	Indomethacin (Tivorbex)	CYP2C9	CYP2C19		●	
Enolic acid (Oxicam) derivatives	Meloxicam (Mobic, Vivlodex)	CYP2C9	CYP1A2,CYP3A4,CYP3A5		●	
	Piroxicam (Feldene)	CYP2C9	CYP3A4,CYP3A5			●
	Tenoxicam (Mobiflex)	CYP2C9				●
	Lornoxicam (FLEXILOR)	CYP2C9				●
Selective COX-2 inhibitors (Coxibs)	Etoricoxib (Arcoxia)	CYP3A4	CYP3A5,CYP2C9,CYP2D6,CYP1A2			●
	Parecoxib (Dynastat)	CYP2C9	CYP3A4,CYP3A5			●
	Celecoxib (Celebrex)	CYP2C9	CYP2C19		●	
Propionic acid derivatives	Ibuprofen (Motrin, Advil)	CYP2C9	CYP2C19,UGT2B7		●	
	Flurbiprofen (Ocufen)	CYP2C9				●
	Ketoprofen (Frotek)	CYP3A4	CYP2C9,CYP3A5,UGT2B7			●
	Fenoprofen (Nalfon, Fenortho)	CYP2C9	UGT2B7			●
	Vicoprofen (Reprexain, Ibudone)	CYP2D6	CYP3A4			●
	Naproxen (Aleve, Naprosyn)	CYP2C9	CYP1A2,UGT2B7		●	
Anthranilic acid derivatives (Fenamates)	Mefenamic acid (Ponstel)	CYP2C9				●

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 (Duramorph, Infumorph P/F)	UGT2B7	ABCC3,OPRM1,COMT		●	
	Codeine*	CYP2D6	CYP3A4,UGT2B7,UGT2B4,FMO3,CYP3A5,OPRM1		●	
Ethers of morphine	Dihydrocodeine (DHC Plus, Panlor)	CYP3A4	CYP2D6,CYP3A5			●
	Ethylmorphine (Codethyline)	CYP2D6	CYP3A4,CYP3A5			●
Semi-synthetic alkaloid derivatives	Hydrocodone (Hysingla, Vicodin)*	CYP2D6	CYP3A4,CYP3A5,OPRM1	◔		
	Hydromorphone (Exalgo)	UGT2B7			●	
	Oxycodone (Oxycontin, Roxicodone)*	CYP3A4	CYP3A5,CYP2D6,UGT2B7,COMT	◔		
	Oxymorphone (Opana)	UGT2B7			●	
Synthetic opioids						
Anilidopiperidine derivatives	Alfentanyl	CYP3A4,CYP3A5	OPRM1			●
	Fentanyl (Duragesic, Subsys)	CYP3A4	CYP3A5,OPRM1			●
	Sufentanil (Sufenta)	CYP3A4	CYP3A5,OPRM1			●
Phenylpiperidine derivatives	Meperidine (Demerol)	CYP2B6	CYP3A4,CYP2C19,CYP3A5		●	
	Ketobemidone (Ketogan)	CYP2C9	CYP3A4,CYP3A5			●
Diphenylpropylamine derivatives	Dextropropoxyphene (Darvon)	CYP3A4	CYP3A5,Renal Excretion			●
	Levacetylmethadol (Orlaam)	CYP3A4	CYP3A5			●
	Loperamide (Anti-diarrhea, Diamode)	CYP3A4	CYP3A5			●
	Methadone (Methadose, Diskets)	CYP3A4	CYP2B6,CYP2D6,CYP2C19,CYP3A5,UGT2B7,COMT			●
Oripavine derivatives	Buprenorphine (Buprenex, Butrans)	CYP3A4	CYP3A5,UGT2B7			●
Morphinan derivatives	Dextromethorphan (Robitussin, Dayquil)	CYP2D6	CYP3A4,CYP3A5			●
Others	Tramadol*	CYP2D6	CYP3A4,CYP2B6,CYP3A5,OPRM1,COMT	◔		
	Tapentadol (Nucynta, Nucynta ER)	CYP2C9	CYP2C19,CYP2D6			●
	Bupivacaine (Exparel, Sensorcaine)	CYP3A4	CYP3A5,CYP2D6,CYP2C19			●
	Ropivacaine (Naropin)	**CYP1A2**	CYP3A4,CYP3A5		●	
	Tilidine (Valoron)	CYP3A4	CYP2C19,CYP3A5			●
Anti-opioid	Methylnaltrexone (Relistor)	CYP2D6	CYP3A4,CYP3A5			●
	Naloxone (Narcan, Evzio)	UGT2B7			●	
	Naltrexone (Revia, Vivitrol)	UGT2B7	OPRM1		●	
* - Indicates a prodrug.						

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 (Anturane)	CYP2C9	CYP3A4,CYP3A5			
Mitotic inhibitors	Colchicine (Colcrys, Mitigare)	CYP3A4	CYP3A5			
Xanthine oxidase inhibitors	**Febuxostat (Uloric)**	**CYP1A2**	CYP2C9,UGT2B7			
DMARDs	**Leflunomide (Arava)**	**CYP1A2**				
Anti-inflammatory	Tofacitinib (Xeljanz, Jakvinus)	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
OPRM1	rs1799971	A/A	Naloxone (Narcan, Evzio)	2B	Patients may have lower cortisol response
OPRM1	rs1799971	A/A	Morphine (Duramorph, Infumorph P/F)	2B	Pain patients may experience increased efficacy of opioids and may be less susceptible to opioid addiction, and may require a decreased dose of opioids
OPRM1	rs1799971	A/A	Alfentanil	2B	Pain patients may experience increased efficacy of opioids and may be less susceptible to opioid addiction, and may require a decreased dose of opioids
OPRM1	rs1799971	A/A	Fentanyl (Duragesic, Subsys)	2B	Pain patients may experience increased efficacy of opioids and may be less susceptible to opioid addiction, and may require a decreased dose of opioids
OPRM1	rs1799971	A/A	Tramadol	2B	Pain patients may experience increased efficacy of opioids and may be less susceptible to opioid addiction, and may require a decreased dose of opioids
OPRM1	rs1799971	A/A	Hydrocodone (Hysingla, Vicodin)	3	Patients may have a decreased risk for experiencing side effects, including constipation, dry mouth or respiratory depression
COMT	rs4680	A/G	Paroxetine (Paxil, Seroxat)	3	Patients may require an intermediate 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 (Cardioquine, Cin-Quin)	CYP3A4,CYP2D6	CYP3A5,CYP2C9			●
	Procainamide (Pronestyl, Procan-SR)	CYP2D6				●
	Sparteine	CYP2D6				●
	Disopyramide (Norpace, Norpace CR)	CYP3A4	CYP3A5,CYP1A2,CYP2C19			●
Antiarrhythmic class Ib	Phenytoin (Dilantin Phenytek)	CYP2C19	CYP2C9,CYP3A4,CYP3A5,CYP2D6,HLA-B*1502		●	
	Lidocaine (Lidoderm, Xylocaine)	**CYP1A2**	CYP3A4,CYP3A5	●		
	Mexiletine (Mexitil)	CYP2D6	CYP1A2			●
Antiarrhythmic class Ic	Propafenone (Rythmol SR)	CYP2D6	CYP3A4,CYP1A2,CYP3A5			●
	Flecainide (Tambocor)	CYP2D6				●
	Encainide (Enkaid)	CYP2D6				●
Antiarrhythmic class II	Carvedilol (Coreg, Coreg CR)	CYP2D6	CYP2C9,CYP3A4,CYP1A2			●
	Bisoprolol (Zebeta)	CYP2D6	CYP3A4,CYP3A5			●
	Metoprolol (Lopressor, Toprol XL)	CYP2D6	CYP3A4,CYP3A5			●
	Propranolol (Hemangeol, Inderal XL)	CYP2D6	CYP1A2,CYP2C19,CYP3A4,CYP3A5			●
Antiarrhythmic class III	Amiodarone (Nexterone, Pacerone)	CYP3A4	CYP3A5			●
	Dronedarone (Multaq)	CYP3A4	CYP3A5			●
	Dofetilide (Tikosyn)	Renal Excretion	CYP3A4,CYP3A5		●	
Antiarrhythmic class IV	Diltiazem (Cardizem, Tiazac)	CYP3A4	CYP2C19,CYP3A5			●
	Verapamil (Verelan, Calan)	CYP3A4	CYP3A5			●

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 (Cozaar)*	CYP2C9	CYP3A4,CYP3A5			
	Azilsartan (Edarbi)	CYP2C9,CYP2C19				
	Irbesartan (Avapro)	CYP2C9				
	Valsartan (Diovan)	CYP2C9				
Angiotensin-Converting Enzyme Inhibitors	Captopril (Capoten)	Renal Excretion	CYP2D6			
Renin inhibitors	Aliskiren (Tekturna)	CYP3A4	CYP3A5			
Aldosterone Antagonists	Eplerenone (Inspra)	CYP3A4	CYP3A5			
Loop diuretic	Torasemide (Demadex)	CYP2C9	Renal Excretion			
Potassium-sparing diuretic	**Triamterene (Dyrenium)**	**CYP1A2**				
Vasopressin receptor antagonists	Tolvaptan (Samsca)	CYP3A4	CYP3A5			
Adrenergic release inhibitors	Debrisoquine (Bonipress)	CYP2D6				
Peripheral Adrenergic Inhibitors	Reserpine (Raudixin, Serpalan)	CYP2D6				
Beta-1 cardioselective beta-blockers	Metoprolol (Lopressor, Toprol XL)	CYP2D6	CYP3A4,CYP3A5			
	Bisoprolol (Zebeta)	CYP2D6	CYP3A4,CYP3A5			
	Nebivolol (Bystolic)	CYP2D6				
* - Indicates a prodrug.						

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 (Timoptic, Betimol)	CYP2D6	CYP2C19			●
	Propranolol (Hemangeol, Inderal XL)	CYP2D6	CYP1A2,CYP2C19,CYP3A4,CYP3A5			●
Beta-blockers with alpha activity	Carvedilol (Coreg, Coreg CR)	CYP2D6	CYP2C9			●
	Labetalol (Normodyne, Trandate)	CYP2D6	CYP2C19,UGT2B7			●
Alpha blockers	Terazosin (Hytrin)	CYP3A4	CYP3A5			●
	Doxazosin (Cardura, Cardura XL)	CYP2D6	CYP2C19,CYP3A4,CYP3A5			●
α-2 adrenergic agonist	Clonidine (Catapres, Kapvay)	CYP2D6	CYP1A2,CYP3A4,CYP3A5		●	
	Guanabenz (Wytensin)	**CYP1A2**		●		
	Tizanidine (Zanaflex)	**CYP1A2**		●		
Antihypertensives Calcium channel blockers						
Dihydropyridine	Amlodipine (Norvasc)	CYP3A4	CYP3A5			●
	Nifedipine (Procardia, Adalat CC)	CYP3A4	CYP1A2,CYP3A5		●	
	Felodipine (Plendil)	CYP3A4	CYP3A5			●
	Nimodipine (Nymalize)	CYP3A4	CYP3A5			●
	Lercanidipine (Zanidip)	CYP3A4	CYP3A5			●
	Nisoldipine (Sular)	CYP3A4	CYP3A5			●
	Nitrendipine (Baypress)	CYP3A4	CYP3A5			●
Benzothiazepine	Diltiazem (Cardizem, Tiazac)	CYP3A4	CYP2C19,CYP3A5			●
Phenylalkylamine	Verapamil (Verelan, Calan)	CYP3A4	CYP3A5			●
Nonselective	Bepridil (Vascor)	CYP3A4	CYP3A5			●
Anti-pulmonary arterial hypertension						
ERA-Dual antagonists	Bosentan (Tracleer)	CYP2C9	CYP3A4,CYP3A5			●
	Macitentan (Opsumit)	CYP3A4	CYP2C19,CYP3A5			●
Phosphodiesterase inhibitors	Sildenafil (Viagra, Revatio)	CYP3A4	CYP2C9,CYP3A5			●
	Tadalafil (Cialis, Adcirca)	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
Other Drugs Used in Angina						
Other cardiac preparations	Ranolazine (Ranexa)	CYP3A4	CYP2D6,CYP3A5			●
	Ivabradine (Corlanor, Procoralan)	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 (Lipitor)	CYP3A4,SLCO1B1	CYP3A5,ABCG8,UGT2B7			
	Fluvastatin (Lescol, Lescol XL)	CYP2C9,SLCO1B1	CYP3A4,UGT2B7			
	Lovastatin (Mevacor, Altoprev)	CYP3A4,SLCO1B1	CYP3A5			
	Cerivastatin (Baycol, Lipobay)	CYP3A4,SLCO1B1	CYP3A5			
	Pitavastatin (Livalo)	UGT1A3,UGT2B7	CYP2C9			
	Pravastatin (Pravachol)	SLCO1B1,HMGCR				
	Rosuvastatin (Crestor)	CYP2C9,SLCO1B1	CYP3A4,UGT2B7			
	Simvastatin	CYP3A4,SLCO1B1	CYP3A5,UGT2B7			
MTTP inhibitors	Lomitapide	CYP3A4	CYP3A5,LDLR			
Drug Therapy for Hypercholesterolemia and Dyslipidemia (Blood vessels)						
Fibrates	Gemfibrozil (Lopid)	CYP3A4	CYP3A5,UGT2B7			
	Clofibrate (Atromid-S)	UGT2B7				
Abbreviations: MTTP, microsomal triglyceride transfer protein; GI, gastrointestinal tract. Rosuvastatin and Pravastatin are considered alternative Statins since are not extensively metabolized by the CYPs.						

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	CYP2C19,CYP1A2,CYP3A4,PROC,PROS1			
	Acenocoumarol	CYP2C9,VKORC1	CYP2C19,CYP1A2			
	Phenprocoumon	CYP2C9,VKORC1	CYP3A4			
Direct factor Xa inhibitors	Rivaroxaban (Xarelto)	CYP3A4	CYP3A5			
	Apixaban (Eliquis)	CYP3A4	CYP3A5			
Antiplatelet Drugs						
ADP receptor (P2Y12) inhibitors Nucleotide/nucleo side analogs	Ticagrelor (Brilinta)	CYP3A4	CYP3A5			
ADP receptor (P2Y12) inhibitors Thienopyridines	Clopidogrel (Plavix)*	CYP2C19	ABCC3			
	Prasugrel (Effient)*	BCHE,CYP3A4	CYP2B6,CYP2C9,CYP2C19,CYP3A5,CYP2D6			
Irreversible cyclooxygenase inhibitors	Aspirin (Ecotrin)	GLYAT,UGTs,Renal Excretion	CYP2C9,CYP3A4,CYP3A5			
Phosphodiesterase inhibitors	Cilostazol (Pletal)	CYP3A4	CYP2C19,CYP3A5			
Protease-activated receptor-1 (PAR-1) antagonists	Vorapaxar (Zontivity)	CYP3A4	CYP3A5			
Abbreviations: P2Y12, purinergic receptor P2Y12. * - Indicates a prodrug.						

SNPs of Importance for Venous Thromboembolism Risk, Warfarin sensitivity and MTHFR enzyme function

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
MTHFR	Ala222Val	665C>T	rs1801133	C/C	Normal MTHFR enzyme function.
MTHFR	Glu429Ala	1286A>C	rs1801131	C/C	Severely impaired MTHFR enzyme function.
VKORC1		-1639G>A	rs9923231	G/A	Medium warfarin sensitivity; medium warfarin dosage

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 (Incruse Ellipta)	CYP2D6				●
	Aclidinium (Tudorza Pressair)	CYP2D6	CYP3A4,CYP3A5			●
Beta2-adrenergic agonist	Arformoterol (Brovana)	CYP2D6,UGT1A1	CYP2C19			●
	Indacaterol (Arcapta Neohaler)	UGT1A1,CYP3A4	CYP3A5,CYP1A2,CYP2D6			●
	Formoterol (Perforomist)	CYP2D6	CYP2C19,CYP2C9			●
	Salmeterol (Serevent Diskus)	CYP3A4	CYP3A5			●
	Vilanterol (Breo Ellipta)	CYP3A4	CYP3A5			●
Corticosteroid	Budesonide (Entocort, Uceris)	CYP3A4	CYP3A5			●
	Fluticasone (Cutivate, Flonase Allergy Relief)	CYP3A4	CYP3A5			●
	Mometasone (Nasonex)	CYP3A4	CYP3A5			●
Phosphodiesterase inhibitor	Roflumilast (Daliresp)	CYP3A4	CYP1A2,CYP3A5		◐	
	Theophylline (Theo-24, Elixophylline)	**CYP1A2**		◑		
5-lipoxygenase inhibitor	**Zileuton (Zyflo, Zyflo CR)**	**CYP1A2**	CYP2C9, CYP3A4,CYP3A5		◐	
Leukotriene receptor-1 antagonist	Montelukast (Singulair)	CYP3A4	CYP2C9,CYP3A5,ABCC1			●
	Pranlukast (Onon)	CYP3A4	CYP3A5			●
	Zafirlukast (Accolate)	CYP2C9	CYP3A4,CYP3A5			●
Treatment of cystic fibrosis (specifics mutations in the CFTR gene)	Ivacaftor (Kalydeco)	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 (Anzemet)	CYP3A4	CYP2D6,CYP3A5			●
	Tropisetron (Navoban)	CYP3A4	CYP2D6,CYP3A5			●
Antiemetic, 5-HT3 receptor antagonist Isoquinoline derivative	**Palonosetron (Aloxi)**	**CYP1A2**	CYP2D6,CYP3A4,CYP3A5		●	
Antiemetic, 5-HT3 receptor antagonist Indazole derivative	Granisetron (Sancuso, Sustol)	CYP3A4	CYP3A5			●
Antiemetic, 5-HT3 receptor antagonist	Ondansetron (Zofran, Zuplenz)	CYP2B6	CYP1A2,CYP2D6, CYP3A4		●	
Antiemetic, dopamine-receptor antagonist	Domperidone (Motilium)	CYP3A4	CYP3A5			●
	Prochlorperazine (Compro)	CYP2D6	CYP3A4,CYP3A5			●
	Metoclopramide (Reglan)	CYP2D6	CYP1A2,CYB5R1,CYB5R2,CYB5R3,CYB5R4			●
Antiemetic, NK1 receptor antagonist	Aprepitant (Emend)	CYP3A4	CYP3A5,CYP1A2,CYP2C19		●	
Antiemetic, H1 histamine receptor antagonist	Diphenhydramine (Benadryl, Banophen)	CYP2D6	CYP3A4,CYP3A5			●
	Hydroxyzine (Vistaril)	ADHs	CYP3A4,CYP3A5			●
	Promethazine (Phenergan, Phenadoz)	CYP2D6	SULTs			●
Cannabinoids	Dronabinol (Marinol, Syndros)	CYP2C9	CYP2C19,CYP3A4,CYP3A5			●
Benzodiazepines	Midazolam (Versed)	CYP3A4	CYP3A5			●
Anticholinergics	Scopolamine (Transderm scop)	CYP3A4	CYP3A5			●
Steroids	Dexamethasone (Decadron)	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 (Zantac, Heartburn Relief)	Renal Excretion	CYP1A2,CYP2C19,FMO3,CYP3A4,CYP3A5		✓	
Proton-pump inhibitor	Omeprazole (Zegerid, Prilosec OTC)	CYP2C19	CYP3A4,CYP2C9,CYP3A5		✓	
	Dexlansoprazole (Dexilant)	CYP2C19	CYP3A4,CYP3A5			✓
	Esomeprazole (Nexium)	CYP2C19	CYP3A4,CYP3A5			✓
	Lansoprazole (Prevacid)	CYP3A4	CYP2C19,CYP3A5			✓
	Rabeprazole (AcipHex)	Non Enz	CYP2C19,CYP3A4,CYP3A5		✓	
	Ilaprazole (Noltec)	CYP3A4	CYP3A5			✓
	Pantoprazole (Protonix)	CYP2C19	CYP3A4,CYP2D6,CYP2C9,CYP3A5			✓

Abbreviations: Non Enz, non-enzymatic metabolism.

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 (Lotronex)	CYP2C9	CYP3A4,CYP1A2		✓	
	Cilansetron	CYP3A4	CYP2D6,CYP1A2,CYP2C19,CYP3A5			✓
Acting on serotonin receptors 5-HT4 agonists	Mosapride (Mopride, Mopid)	CYP3A4	CYP3A5			✓
	Prucalopride (Resolor, Resotran)	Renal Excretion	CYP3A4,CYP3A5			✓
Gastroprokinetic						
Serotonin 5-HT_4 receptor agonist	Cisapride (Prepulsid, Propulsid)	CYP3A4	CYP3A5			✓
	Cinitapride (Cintapro, Pemix)	CYP3A4	CYP3A5			✓
Dopamine antagonists	Metoclopramide (Reglan)	CYP2D6	CYP1A2,CYB5R1,CYB5R2,CYB5R3,CYB5R4			✓
	Clebopride	CYP3A4	CYP3A5			✓
	Domperidone (Motilium)	CYP3A4	CYP3A5			✓
Antipropulsives						
Opioids	Loperamide (Anti-diarrhea, Diamode)	CYP3A4	CYP3A5			✓
	Morphine (Duramorph, Infumorph P/F)	UGT2B7	ABCC3,OPRM1,COMT		✓	
Centrally acting anti-obesity drugs						
Stimulant/ Amphetamine/ Appetite suppressant agent	Sibutramine (Meridia)	CYP3A4	CYP3A5			✓
	Phentermine (Adipex-P, Lomaira)	Renal Excretion	CYP3A4,CYP3A5		✓	
Anorectic	Lorcaserin (Belviq)	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	Nateglinide (Starlix)	CYP2C9	CYP3A4,CYP3A5			●
Sulfonylurea 1st generation	Chlorpropamide (Diabinese)	Renal Excretion	CYP2D6		●	
	Tolazamide (Tolinase)	CYP2C9				●
	Tolbutamide (Orinase)	CYP2C9	CYP2C19		●	
Sulfonylurea 2nd generation	Glipizide (Glucotrol)	CYP2C9	CYP3A4			●
	Glyburide (Diabeta, Glynase)	CYP3A4	CYP2C9,CYP2C19,CYP3A5			●
	Gliquidone (Glurenorm)	CYP2C9				●
	Gliclazide (Diamicron)	CYP2C9	CYP2C19		●	
	Glimepiride (Amaryl)	CYP2C9				●
DPP-IV inhibitor	Saxagliptin (Onglyza)	CYP3A4	CYP3A5			●
	Alogliptin (Nesina)	Renal Excretion	CYP2D6,CYP3A4,CYP3A5			●
	Linagliptin (Tradjenta)	Renal Excretion	CYP3A4,CYP3A5		●	
	Sitagliptin (Januvia)	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 (Axert)	CYP3A4	CYP2D6,CYP3A5			●
	Eletriptan (Relpax)	CYP3A4	CYP3A5			●
	Frovatriptan (Frova)	**CYP1A2**		◐		
	Naratriptan (Amerge)	**CYP1A2**	CYP2C9,CYP2D6		●	
	Zolmitriptan (Zomig, Zomig ZMT)	**CYP1A2**		◐		
Ergot alkaloids	Dihydroergotamine (D.H.E.45)	CYP3A4	CYP3A5			●
	Ergotamine (Cafergot, Ergomar)	CYP3A4	CYP3A5			●
Antihistamines						
Aminoalkyl ethers	Diphenhydramine (Benadryl, Banophen)	CYP2D6	CYP3A4,CYP3A5			●
Substituted alkylamines	Chlorpheniramine (Chlor-Trimeton, Allergy-4-hour)	CYP3A4	CYP3A5			●
Phenothiazine derivatives	Promethazine (Phenergan, Phenadoz)	CYP2D6	SULTs			●
Piperazine derivatives	Hydroxyzine (Vistaril)	ADHs	CYP3A4,CYP3A5			●
	Cyclizine (Marezine, Valoid)	CYP2D6				●
Other antihistamines	Terfenadine (Seldane, Triludan)	CYP3A4	CYP3A5			●
	Loratadine (Claritin, Allergy Relief)	CYP3A4,CYP2D6	CYP3A5,CYP2C9			●
	Astemizole (Hismanal)	CYP3A4	CYP3A5			●
Treatment of secondary hyperparathyroidism						
Calcimimetic	Cinacalcet (Sensipar)	CYP3A4	CYP2D6,CYP3A5,CYP1A2			●
Abortifacient						
Progestin Antagonist	Mifepristone (Korlym, Mifeprex)	CYP3A4	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 (Celexa)	CYP2C19,CYP2D6	CYP3A4,CYP3A5,HTR2A			
	Escitalopram (Lexapro)	CYP3A4,CYP2C19	CYP2D6,CYP3A5,HTR2C			
	Dapoxetine (Priligy)	CYP2D6	CYP3A4,CYP3A5,FMO1			
	Fluoxetine (Prozac, Sarafem)	CYP2D6	CYP3A4,CYP2C9,CYP3A5,CYP2C19,HTR2A			
	Paroxetine (Paxil, Seroxat)	CYP2D6	CYP3A4,CYP1A2,CYP3A5,CYP2C9,HTR2A			
	Sertraline (Zoloft)	CYP2B6	CYP2C19,CYP2C9,CYP3A4,CYP2D6			
	Fluvoxamine (Faverin, Fevarin)	CYP2D6	CYP1A2,HTR2A			
SMSs	Vilazodone (Viibryd)	CYP3A4	CYP3A5,CYP2C19,CYP2D6			
SNRIs	Levomilnacipran (Fetzima)	CYP3A4	CYP3A5,CYP2C19,CYP2D6			
	Venlafaxine (Effexor XR)	CYP2D6	CYP2C19,CYP3A4,CYP2C9,CYP3A5,SLC6A3,HTR2A			
	Desvenlafaxine (Pristiq, Khedezla)	CYP3A4	CYP3A5,CYP2D6			
	Duloxetine (Cymbalta, Irenka)	CYP2D6	CYP1A2,HTR2A			
NRIs	Atomoxetine (Strattera)	CYP2D6	CYP2C19,CYP3A4,CYP3A5,SLC6A2			
	Reboxetine (Edronax)	CYP3A4	CYP3A5			
	Maprotiline (Ludiomil)	CYP2D6	CYP1A2			
TCAs that preferentially inhibit the reuptake of serotonin	Clomipramine (Anafranil)	CYP2D6	CYP3A4,CYP2C19,CYP1A2,CYP2C9,HTR2A			
	Imipramine (Tofranil)	CYP1A2,CYP2D6	CYP2C19,CYP3A4,CYP3A5			
TCAs that preferentially inhibit the reuptake of norepinephrine	Desipramine (Norpramin)	CYP2D6	CYP1A2,CYP2C19			
	Nortriptyline (Pamelor)	CYP2D6	CYP1A2,CYP2C19			
	Protriptyline (Vivactil)	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 (Elavil, Vanatrip)	CYP2D6	CYP3A4,CYP2C19,CYP2C9,CYP1A2,CYP2B6			●
	Doxepin (Silenor, Zonalon)	CYP2D6,CYP2C19	CYP1A2,CYP3A4,CYP3A5			●
	Dosulepin (Prothiaden)	CYP2D6,CYP2C9	CYP3A4,CYP1A2,CYP3A5,CYP2C19			●
TeCAs	Mianserin (Tolvon)	CYP2D6	CYP3A4,CYP1A2,CYP2B6,CYP3A5			●
	Amoxapine (Asendin)	CYP2D6	CYP3A4,CYP3A5			●
TCA with antipsychotic and sedative properties	Trimipramine (Surmontil)	CYP2D6	CYP2C19,CYP2C9			●
	Moclobemide (Amira, Aurorix)	CYP2C19	CYP2D6,CYP1A2,HTR2A		●	
Atypical antidepressants						
SMSs	Vortioxetine (Brintellix)	CYP2D6	CYP2C9,CYP3A4,CYP3A5,UGTs,CYP2C19,CYP2B6			●
NaSSAs	**Mirtazapine (Remeron, Remeronsoltab)**	**CYP1A2**	CYP2D6,CYP3A4,CYP3A5,HTR2A		●	
SARIs	Trazodone (Desyrel)	CYP3A4	CYP2D6,CYP3A5			●
	Nefazodone (Serzone)	CYP2D6, CYP3A4	CYP3A5			●
Antidepressant and smoking cessation aid	Bupropion (Zyban, Aplenzin)	CYP2B6	CYP3A4,CYP2D6,CYP1A2,CYP3A5		●	
Antidepressant and anti-anxiety	Buspirone (BuSpar, Vanspar)	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 the Treatment of Depression and Psychosis, and the Treatment of Alcohol and Tobacco Use Disorders

Gene	Marker	Genotype	Drug	Level of Evidence	Results
COMT	rs4680	A/G	Fluvoxamine (Faverin, Fevarin)	3	Patients with major Depressive Disorder may have an increased response to fluvoxamine treatment
COMT	rs4680	A/G	Venlafaxine (Effexor XR)	3	Depressive patients and patients with Anxiety Disorders may have an intermediate response
COMT	rs4680	A/G	Paroxetine (Paxil, Seroxat)	3	Depressive patients may have an intermediate response
ANKK1/DRD2	rs1800497	A/A	Bupropion (Zyban, Aplenzin)	1B	Patients may be less likely to quit smoking
ANKK1/DRD2	rs1800497	A/A	Antipsychotics	2A	Schizophrenia patients may have a decreased risk for tardive dyskinesia
ANKK1/DRD2	rs1800497	A/A	Ethanol	2B	Patients may have an increased risk for Alcoholism
ANKK1/DRD2	rs1800497	A/A	Clozapine Olanzapine Risperidone	2B	Patients may have increased risk of side effects including hyperprolactinemia and weight gain
ANKK1/DRD2	rs1800497	A/A	Nicotine	3	Patients may have an increased likelihood of smoking cessation when treated with nicotine replacement therapy
ANKK1/DRD2	rs1800497	A/A	Risperidone (Risperdal)	3	Schizophrenia patients may have more improvement in symptoms
HTR2A	rs7997012	A/G	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 (Bromidol, Bromodol)	CYP3A4	CYP3A5			
	Droperidol (Inapsine)	CYP3A4	CYP3A5			
	Haloperidol (Haldol)	UGTs,CYP3A4	CYP1A2,CYP2D6,CYP3A5,HTR2C			
Phenothiazines with aliphatic side-chain	Chlorpromazine (Thorazine, Largactil)	CYP2D6	CYP1A2,CYP3A4,CYP3A5			
	Levomepromazine (Nozinan, Levoprome)	CYP3A4	CYP1A2,CYP3A5			
	Promazine (Sparine)	**CYP1A2**	CYP3A4,CYP2C19,CYP2C9,CYP3A5			
	Cyamemazine (Tercian)	**CYP1A2**	CYP3A4,CYP2C9,CYP3A5			
Phenothiazines with piperazine structure	Fluphenazine (Prolixin)	CYP2D6				
	Perphenazine (Trilafon)	CYP2D6				
	Prochlorperazine (Compro)	CYP2D6	CYP3A4,CYP3A5			
	Trifluoperazine (Stelazine)	**CYP1A2**				
Phenothiazines with piperidine structure	Thioridazine (Mellaril)	CYP2D6	CYP1A2,CYP3A4,CYP2C19,CYP3A5			
Phenothiazines used as an anti-histamine, sedative, and antiemetic	Promethazine (Phenergan, Phenadoz)	CYP2D6	SULTs			
Diphenyl-butylpiperidine	Pimozide (Orap)	CYP3A4,CYP2D6	CYP1A2,CYP3A5			
Thioxanthene derivative	**Thiothixene (Navane)**	**CYP1A2**	CYP3A4,CYP3A5			
	Zuclopenthixol (Clopixol)	CYP2D6	CYP3A4,CYP3A5			
Tricyclics	**Loxapine (Adasuve)**	**CYP1A2**	CYP3A4, CYP2D6,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	Quetiapine (Seroquel, Seroquel XR)	CYP3A4,CYP2D6	CYP3A5,CYP1A2,CYP2C9,CYP2C19			●
	Asenapine (Saphris, Sycrest)	CYP1A2,UGT1A4	CYP2D6,CYP3A4,CYP3A5		●	
	Olanzapine (Zyprexa, Zyprexa Relprevv)	**CYP1A2**	CYP2D6		●	
	Clozapine (Clozaril, FazaClo)	CYP1A2,CYP2D6	CYP3A4,FMO3,CYP2C9,CYP2C19,CYP3A5,SLC6A3,SLC1A1,HTR2C		●	
Indole derivatives	Sertindole (Serdolect, Serlect)	CYP2D6	CYP3A4,CYP3A5			●
	Ziprasidone (Geodon)	CYP3A4	AOX1,CYP3A5			●
	Lurasidone (Latuda)	CYP3A4	CYP3A5			●
Other antipsychotics	Aripiprazole (Abilify)	CYP2D6	CYP3A4,CYP3A5			●
	Risperidone	CYP2D6	CYP3A4,CYP3A5,SLC1A1,HTR2A,HTR2C			●
	Iloperidone (Fanapt)	CYP2D6	CYP3A4,CYP3A5			●
	Paliperidone (Invega, Invega Trinza)	CYP2D6	CYP3A4,CYP3A5			●
	Zotepine (Zoleptil)	CYP3A4	CYP1A2,CYP3A5,CYP2D6		●	

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
HTR2C	rs3813929	C/C	Olanzapine (Zyprexa, Zyprexa Relprevv)	3	Patients with psychiatric disorders or schizophrenia may have an increased risk of weight gain
COMT	rs4680	A/G	Haloperidol (Haldol)	3	Schizophrenia patients may have an increased risk for developing extrapyramidal symptoms

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 (ProCentra, Dexedrine Spansule)	Renal Excretion,CYP2D6	FMO3,GLYAT		✓	
	Levoamphetamine (Benzedrine)	Renal Excretion,CYP2D6	FMO3		✓	
NDRI	Dexmethylphenidate (Focalin)	CYP2D6	Renal Excretion		✓	
Psychostimulant	Lisdexamfetamine (Vyvanse)	Hydrolysis	CYP2D6,Renal Excretion		✓	
	Methylphenidate (Concerta, Daytrana)	CYP2D6	Renal Excretion,SLC6A2,SLC6A3			✓
Anti ADHD Non-stimulants						
NERI	Atomoxetine (Strattera)	CYP2D6	CYP2C19,CYP3A4,CYP3A5,SLC6A2			✓
Central alpha-2 Adrenergic Agonist	Clonidine (Catapres, Kapvay)	CYP2D6	CYP1A2,CYP3A4,CYP3A5		✓	
	Guanfacine (Intuniv, Tenex)	CYP3A4	CYP3A5			✓
Antidepressants	Bupropion (Zyban, Aplenzin)	CYP2B6	CYP3A4,CYP2D6,CYP1A2,CYP3A5		✓	
	Imipramine (Tofranil)	CYP1A2,CYP2D6	CYP2C19,CYP3A4,CYP3A5		✓	
	Desipramine (Norpramin)	CYP2D6	CYP1A2,CYP2C19		✓	
	Reboxetine (Edronax)	CYP3A4	CYP3A5			✓
Wakefulness-promoting agent	Modafinil (Provigil)	Hydrolysis,CYP2D6	CYP1A2,CYP3A4,CYP2B6,CYP3A5		✓	
	Armodafinil (Nuvigil)	CYP3A4	CYP3A5			✓
Anti-insomnia						
Melatonin Receptor Agonist	**Ramelteon (Rozerem)**	**CYP1A2**	CYP2C19,CYP3A4,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 (Luminal)	CYP2C19,CYP2C9			✓	
Carbamates	Felbamate (Felbatol)	CYP3A4	CYP3A5			✗
Carboxamides	Carbamazepine	CYP3A4,EPHX1	CYP2B6, UGT2B7, CYP1A2, CYP3A5, HLA-B*1502, HLA-A*3101			✗
Fatty acids	Tiagabine (Gabitril)	CYP3A4	CYP3A5,CYP1A2,CYP2D6,CYP2C19			✗
	Divalproex (Depakote)	CYP2C9	CYP2B6		✓	
Hydantoin	Phenytoin (Dilantin Phenytek)	CYP2C19	CYP2C9,CYP3A4,CYP3A5,CYP2D6,HLA-B*1502		✓	
	Mephenytoin (Mesantoin)	CYP2C19	CYP2C9,CYP2B6,CYP1A2,CYP2D6		✓	
Oxazolidinediones	Trimethadione (Tridione)	CYP2C9	CYP3A4,CYP3A5			✗
	Paramethadione (Paradione)	CYP2C9				✗
Pyrimidinedione	Primidone (Mysoline)	CYP2C9	CYP2C19		✓	
Pyrrolidines	Brivaracetam (Briviact)	CYP2C19,CYP2C9	CYP3A4,CYP3A5,CYP2B6		✓	
Succinimides	Ethosuximide (Zarontin)	CYP3A4	CYP3A5			✗
Sulfonamides	Zonisamide (Zonegran)	CYP3A4	CYP2C19,CYP3A5			✗
Other	Lacosamide (Vimpat)	CYP2C9	CY2C19,CYP3A4		✓	
	Perampanel (Fycompa)	CYP3A4	CYP3A5			✗
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 (Versed)	CYP3A4	CYP3A5			●
	Triazolam (Halcion)	CYP3A4	CYP3A5			●
	Brotizolam (Lendormin)	CYP3A4	CYP3A5			●
Benzodiazepine Intermediate-acting	Alprazolam (Xanax)	CYP3A4	CYP3A5			●
	Bromazepam (Lexotan, Lexotanil)	**CYP1A2**	CYP2D6		●	
	Clobazam (Onfi)	CYP2C19	CYP3A4,CYP3A5,CYP2B6			●
	Flunitrazepam (Rohypnol)	CYP2C19	CYP2C9,CYP3A4,CYP3A5		●	
	Estazolam (ProSom)	CYP3A4	CYP3A5			●
	Clonazepam (Klonopin)	CYP3A4	CYP2C19,CYP3A5			●
	Oxazepam-r (Serax)	UGT2B7			●	
	Quazepam (Doral)	CYP3A4	CYP2C19,CYP3A5			●
	Lormetazepam (Noctamid, Loramet)	CYP3A4	CYP3A5			●
	Lorazepam-r	UGT2B7			●	
	Nitrazepam (Alodorm, Apodorm)	CYP3A4	CYP3A5			●
	Temazepam (Restoril)	CYP2C19	CYP3A4,CYP3A5,UGT2B7		●	
Benzodiazepine Long-acting	Diazepam (Valium, Diastat)	CYP2C19,CYP3A4	CYP3A5,CYP2B6,CYP1A2		●	
	Clorazepate (Tranxene)	CYP3A4	CYP3A5			●
	Chlordiazepoxide (Librium, Poxi)	CYP3A4	CYP3A5			●
	Flurazepam (Dalmane, Dalmadorm)	CYP3A4	CYP3A5			●
	Nordazepam (Nordaz, Stilny)	CYP3A4	CYP3A5			●
Nonbenzodiazepine hypnotic	Zolpidem (Ambien, Edluar)	CYP3A4	CYP3A5,CYP1A2,CYP2C9,CYP2D6			●
	Zaleplon (Sonata)	AOX1,CYP3A4	CYP3A5		●	
	Zopiclone (Imovane, Zimovane)	CYP3A4	CYP2C9,CYP3A5			●
	Eszopiclone (Lunesta)	CYP3A4	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 & Anti-Parkinson disease						
Acetylcholinesterase inhibitor	**Tacrine (Cognex)**	**CYP1A2**	CYP2D6		●	
	Donepezil (Aricept)	CYP2D6	CYP3A4,CYP3A5			●
	Galantamine (Razadyne, Razadyne ER)	CYP2D6	CYP3A4,CYP3A5			●
Inhibitor of MAO-B	Selegiline (Emsam, Zelapar)	CYP2B6	CYP2C9,CYP3A4,CYP3A5,FMO3			●
	Rasagiline (Azilect)	**CYP1A2**		◔		
COMT inhibitors	Entacapone (Comtan)	UGT1A9,CYP3A4	CYP3A5,UGT2B7			●
Dopamine receptor agonists	Bromocriptine (Parlodel, Cycloset)	CYP3A4	CYP3A5			●
	Ropinirole (Requip)	**CYP1A2**	UGTs,Renal Excretion	◔		
Anticholinergics - Antimuscarinics	Diphenhydramine (Benadryl, Banophen)	CYP2D6	CYP3A4,CYP3A5			●
Anti-hyperkinetic movement	Tetrabenazine (Xenazine)	CYP2D6	CYP1A2			●
Anti-amyotrophic lateral sclerosis drug	**Riluzole (Rilutek)**	**CYP1A2**		◔		
Abbreviations: NMDA, N-methyl-D-aspartate; COMT, Catechol-O-methyltransferase.						

Additional SNP of Importance for different Medical Condition and personality

Gene	Marker	Genotype	Results
DRD2	rs6277	T/C	Your genotype is associated with addictive behaviors. Your brain's reward system may not respond normally to dopamine, a neurotransmitter that regulates rewards and behavior. Your genotype may predispose you to an increased propensity for drug abuse.

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 (Chloromycetin, Pentamycetin)	CYP2C9	UGT2B7			●
Lincosamides	Clindamycin (Evoclin, Clindagel)	CYP3A4	CYP3A5			●
Antibiotic						
Macrolides	Clarithromycin (Biaxin)	CYP3A4	CYP3A5			●
	Erythromycin (Eryc)	CYP3A4	CYP3A5			●
	Telithromycin (Ketek)	CYP3A4	CYP3A5			●
Antibacterials: nucleic acid inhibitors						
DHPS inhibitor Intermediate-acting sulfonamides	Sulfamethoxazole (Bactrim, Sulfatrim)	Renal Excretion	CYP2C9		●	
Anaerobic DNA inhibitors/ Nitroimidazole	Tinidazole (Tindamax)	CYP3A4	CYP3A5			●
	Ornidazole (dazolic)	CYP3A4	CYP3A5			●
DNA-dependent RNA polymerase inhibitors	Rifampicin (Rifadin)	CYP3A4	CYP3A5,CYP2C19,RE			●
	Rifabutin (Mycobutin)	CYP3A4	CYP1A2,CYP3A5		●	
Other drugs against mycobacteria	Bedaquiline (Sirturo)	CYP3A4	CYP2C19,CYP3A5			●
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	Hydroxychloroquine (Plaquenil)	CYP2D6	CYP3A4,CYP3A5			●
	Primaquine (Jasoprim, Malirid)	CYP2D6				●
Methanolquinolines	Quinine (Qualaquin)	CYP3A4,CYP2D6	CYP2C19,CYP3A5			●
	Mefloquine (Lariam, Mephaquin)	CYP3A4	CYP3A5			●
Artemisinin and derivatives	Artemisinin (Alaxin)	CYP3A4	CYP2B6,CYP3A5			●
	Artemether (Coartem)	CYP3A4	CYP3A5			●
	Arteether (Artemotil)	CYP3A4	CYP2B6,CYP3A5			●
Biguanides	Proguanil (Paludrine)	CYP2C19			●	
Other antimalarials	Halofantrine (Halfan)	CYP3A4	CYP3A5			●
	Pentamidine (Nebupent, Pentam)	CYP2C19	CYP1A2,CYP2D6		●	
Anthelmintic						
Benzimidazoles	Albendazole (Albenza)	CYP3A4	CYP1A2,CYP3A5		●	
Antifungals						
Imidazoles	Ketoconazole (Nizoral, Xolegel)	CYP3A4	FMO3,CYP26A1		●	
Triazoles	Itraconazole (Sporanox)	CYP3A4				●
	Voriconazole (Vfend, Vfend IV)	CYP2C19	CYP2C9, CYP3A4,CYP3A5		●	
Allylamines	Terbinafine (Lamisil, Jock Itch)	CYP2C9	CYP1A2,CYP3A4,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 (Kaletra)	CYP3A4	SLCO1B1,CYP3A5,ABCC1			●
	Ritonavir (Norvir)	CYP3A4	CYP2D6,CYP3A5,ABCC1			●
	Saquinavir (Invirase)	CYP3A4	CYP3A5			●
	Indinavir (Crixivan)	CYP3A4	CYP2D6,CYP3A5			●
	Nelfinavir (Viracept)	CYP2C19	CYP3A4,CYP3A5			●
	Fosamprenavir (Lexiva)	CYP3A4	CYP3A5			●
Protease inhibitor 2nd generation	Atazanavir (Reyataz)	CYP3A4	CYP3A5			●
	Darunavir (Prezista)	CYP3A4	CYP3A5,SLCO3A1			●
	Tipranavir (Aptivus)	CYP3A4	CYP3A5			●
NNRTI 1st generation	Delavirdine (Rescriptor)	CYP3A4	CYP2D6,CYP3A5			●
	Efavirenz (Sustiva)	CYP2B6	CYP3A4,CYP3A5		●	
NNRTI 2nd generation	Nevirapine (Viramune, Viramune XR)	CYP3A4	CYP2B6,CYP3A5,SLCO3A1			●
	Etravirine (Intelence)	CYP3A4	CYP2C9,CYP2C19,CYP3A5			●
	Rilpivirine (Edurant)	CYP3A4	CYP3A5			●
Nucleoside reverse transcriptase inhibitor (NRTI)	Zidovudine (Retrovir)	UGT2B7	Renal Excretion,SLCO3A1,ABCC1		●	
CCR5 Co-receptor Antagonist	Maraviroc (Selzentry)	CYP3A4	CYP3A5			●
Hepatitis C Virus NS3/4A Protease Inhibitor	Boceprevir (Victrelis)	CYP3A4	IFNL3,CYP3A5			●
	Telaprevir (Incivek, Incivo)	CYP3A4	CYP3A5,IFNL3			●
	Paritaprevir (Viekira, Technivie/Viekirax)	CYP3A4	CYP3A5			●
	Simeprevir (Olysio, Sovriad)	CYP3A4	CYP2C19,CYP3A5,IFNL3			●
Other antivirals	Enfuvirtide (Fuzeon)	CYP2C19	CYP1A2		●	
	Elvitegravir (Vitekta, Stribild)	CYP3A4	CYP3A5			●
	Dolutegravir (Tivicay)	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 (Endoxan, Cytoxan)*	CYP2B6	CYP2C19,CYP3A4,CYP2C9,CYP3A5,ALDH1A1,ABCC3	◔		
	Iphosphamide*	CYP2B6	CYP3A4,CYP3A5		●	
Nitrosoureas	**Carmustine (Bicnu, Gliadel Wafer)**	**CYP1A2**	Renal Excretion		●	
Antimetabolites						
Folic acid analogues	Methotrexate (Trexall, Rasuvo)	Renal Excretion	AOX1,SLCO1B1,SLC19A1,ABCC1,ABCC3		●	

* - Indicates a prodrug.

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 (Marqibo, Vincasar PFS)	CYP3A4	CYP3A5,ABCC3			
	Vinblastine (Alkaban-AQ, Velban)	CYP3A4	CYP3A5			
Podophyllotoxin derivatives	Etoposide (Etopophos, Toposar)	CYP3A4	CYP3A5,CYP1A2			
	Teniposide (Vumon)	CYP2C19	CYP3A4,CYP3A5			
Taxanes	Docetaxel (Docefrez, Taxotere)	CYP3A4	CYP3A5,ABCC6			
	Cabazitaxel (Jevtana)	CYP3A4	CYP3A5			
	Paclitaxel (Abraxane)	CYP3A4	CYP3A5			

Derivative of camptothecin

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 (Tarceva)	CYP3A4	CYP1A2,CYP3A5		✓	
	Gefitinib (Iressa)	CYP3A4	CYP2D6,CYP3A5			✓
	Vandetanib (Caprelsa)	CYP3A4	FMO3,FMO1,CYP3A5			✓
EGFR and epidermal growth factor receptor (HER2)	Lapatinib (Tykerb)	CYP3A4,CYP2C19	CYP3A5			✓
	Neratinib (Nerlynx)	CYP3A4	CYP3A5			✓
C-KIT and PDGFR	Masitinib (Masivet)	CYP3A4	CYP3A5			✓
FLT3	Lestaurtinib	CYP3A4	CYP3A5			✓
RET, VEGFR and EGFR	Vandetanib (Caprelsa)	CYP3A4	FMO3,FMO1,CYP3A5			✓
c-MET and VEGFR2	Cabozantinib (Cabometyx, Cometriq)	CYP3A4	CYP3A5			✓
Multiple targets (c-KIT, FGFR, PDGFR and VEGFR)	Axitinib (Inlyta)	CYP3A4	CYP1A2,CYP2C19,CYP3A5		✓	
	Nintedanib (Ofev, Vargatef)	**CYP1A2**	CYP2C9,CYP2C19,CYP2D6		✓	
	Pazopanib (Votrient)	CYP3A4, UGT1A1	CYP1A2,CYP3A5		✓	
	Ponatinib (Iclusig)	CYP3A4	CYP2D6,CYP3A5			✓
	Regorafenib (Stivarga)	CYP3A4	CYP3A5			✓
	Sorafenib (Nexavar)	CYP3A4	CYP3A5			✓
	Sunitinib (Sutent)	CYP3A4	CYP3A5			✓
	Toceranib (Palladia)	CYP3A4	CYP3A5			✓
Protein kinase inhibitor (non-receptor)						
BCR-ABL	Imatinib (Gleevec)	CYP3A4	CYP3A5,SLCO1A2,SLC22A4			✓
	Nilotinib (Tasigna)	CYP3A4,UGT1A1	CYP1A2,CYP2C9,CYP2C19,CYP2D6,CYP3A5			✓
	Dasatinib (Sprycel)	CYP3A4	CYP3A5			✓
	Ponatinib (Iclusig)	CYP3A4	CYP2D6,CYP3A5			✓
Src	Bosutinib (Bosulif)	CYP3A4	CYP3A5			✓
Janus kinase	Lestaurtinib	CYP3A4	CYP3A5			✓
	Ruxolitinib (Jakafi)	CYP3A4	CYP3A5			✓
	Pacritinib	CYP3A4	CYP3A5			✓
	Tofacitinib (Xeljanz, Jakvinus)	CYP3A4	CYP2C19,CYP3A5			✓
Selective inhibitor of the cyclin-dependent kinases CDK4 and CDK6	Abemaciclib (Verzenio)	CYP3A4	CYP3A5			✓
	Palbociclib (Ibrance)	CYP3A4	CYP3A5			✓
	Ribociclib (Kisqali)	CYP3A4	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
Protein kinase inhibitor (non-receptor)						
EML4-ALK	Ceritinib (Zykadia)	CYP3A4	CYP2C9,CYP3A5			
	Crizotinib (Xalkori)	CYP3A4	CYP3A5			
Bruton tyrosine kinase	Ibrutinib (Imbruvica)	CYP3A4	CYP2D6,CYP3A5			
BRAF inhibitor (V600E mutation-positive)	Vemurafenib (Zelboraf)	CYP3A4	CYP3A5			
Other Targeted therapy						
mTOR Inhibitors	Sirolimus (Rapamune)	CYP3A4	CYP3A5			
	Everolimus (Zortress, Afinitor)	CYP3A4	CYP3A5			
Hedgehog pathway inhibitor	Vismodegib (Erivedge)	CYP2C9	CYP3A4,CYP3A5			
Hormone antagonists and related agents						
Selective estrogen receptor modulators (SERM)	Toremifene (Fareston)	CYP3A4	CYP2D6,CYP3A5			
	Tamoxifen (Soltamox)*	CYP3A4,CYP2D6,CYP2C9	CYP3A5,CYP2B6,FMO1,FMO3,CYP2C19,CYP1A2,F2,F5			
SERD	Fulvestrant (Faslodex)	CYP3A4	CYP3A5			
Anti-androgens	**Flutamide (Eulexin)**	**CYP1A2**	CYP3A4,CYP3A5			
	Nilutamide (Nilandron)	CYP2C19	FMO3			
	Enzalutamide (Xtandi)	CYP3A4	CYP3A5			
	Bicalutamide (Casodex)	CYP3A4	CYP3A5			
Aromatase inhibitors	Anastrozole (Arimidex)	CYP3A4	CYP3A5			
	Letrozole (Femara)	CYP3A4	CYP3A5			
	Exemestane (Aromasin)	CYP3A4	CYP3A5			
Other hormone antagonists and related agents	Abiraterone (Zytiga)	CYP3A4	CYP3A5,SULT2A1			
Hematologic						
Thrombopoiesis Stimulating Agent	**Eltrombopag (Promacta)**	**CYP1A2**	F5,SERPINC1			

Abbreviations: C-KIT, tyrosine-protein kinase Kit; PDGFR, Platelet-derived growth factor receptor; FLT3, FMS-like tyrosine kinase-3; RET, RET proto-oncogene; VEGFR, Vascular endothelial growth factor receptor; Src, Proto-oncogene tyrosine-protein kinase Src; EML4-ALK, echinoderm microtubule associated protein like 4 – anaplastic lymphoma kinase; BRAF, proto-oncogene B-Raf; mTOR, mammalian target of rapamycin; SERD, selective estrogen receptor down-regulator. * - Indicates a prodrug.

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 (Myfortic, CellCept)	CYP3A4	CYP3A5,UGT2B7,SLCO1B1,HPRT1		●	
Calcineurin Inhibitors	Pimecrolimus (Elidel)	CYP3A4	CYP3A5			●
	Tacrolimus (Prograf, Protopic)	CYP3A4	CYP3A5,UGT2B7		●	
	Cyclosporine (Neoral, Sandimmune)	CYP3A4	CYP3A5,UGT2B7		●	
mTOR Inhibitors	Temsirolimus (Torisel)	CYP3A4	CYP3A5			●
	Everolimus (Zortress, Afinitor)	CYP3A4	CYP3A5			●
Immunomodulation						
Immunomodulator and anti-angiogenic	**Pomalidomide (Pomalyst, Imnovid)**	**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
Intravenous agents (non-opioid)						
Barbiturates	Hexobarbital (Citopan, Evipan)	CYP2C19	CYP2C9,CYP1A2		●	
	Thiamylal (Surital, Thioseconal)	CYP2C9			●	
Benzodiazepines	Diazepam (Valium, Diastat)	CYP2C19,CYP3A4	CYP3A5,CYP2B6,CYP1A2		●	
	Midazolam (Versed)	CYP3A4	CYP3A5			●
Other Anesthetics	Ketamine (Ketalar)	CYP3A4	CYP2B6,CYP2C9,CYP3A5			●
Skeletal muscle relaxants						
Muscle Relaxants	Carisoprodol (Soma)	CYP2C19			●	
	Cyclobenzaprine (Amrix, Fexmid)	**CYP1A2**	CYP2D6,CYP3A4,CYP3A5		●	
	Tizanidine (Zanaflex)	**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 (Oxytrol, Ditropan XL)	CYP3A4	CYP3A5			
	Tolterodine (Detrol, Detrol LA)	CYP2D6,CYP3A4	CYP2C9,CYP3A5,CYP2C19			
	Solifenacin (VESIcare)	CYP3A4	CYP3A5			
	Darifenacin (Enablex)	CYP2D6	CYP3A4,CYP3A5			
Drugs used in erectile dysfunction						
Phosphodiesterase inhibitors	Sildenafil (Viagra, Revatio)	CYP3A4	CYP2C9,CYP3A5			
	Tadalafil (Cialis, Adcirca)	CYP3A4	CYP3A5			
	Vardenafil (Levitra, Staxyn)	CYP3A4	CYP2C9,CYP3A5			
	Avanafil (Strendra)	CYP3A4	CYP3A5			
	Udenafil (Zydena)	CYP3A4	CYP3A5			
Drugs used in benign prostatic hypertrophy						
Alpha-adrenoreceptor antagonists	Alfuzosin (Uroxatral)	CYP3A4	CYP3A5,Renal Excretion			
	Tamsulosin (Flomax)	CYP3A4	CYP2D6,CYP3A5,Renal Excretion			
	Silodosin (Rapaflo)	CYP3A4	UGT2B7,CYP3A5			
Testosterone-5-alpha reductase inhibitors	Finasteride (Proscar, Propecia)	CYP3A4	CYP3A5			
	Dutasteride (Avodart)	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 (Estinyl)	CYP3A4,CYP2C9	CYP3A5,CYP2C19,CYP1A2			●
	Estradiol (Vagifem)	**CYP1A2**	CYP3A4,CYP3A5		●	
Progestogens	Desogestrel (Azalia, Cerazette)	CYP3A4,HSD3B1	CYP3A5,CYP2C9,CYP2C19		●	
	Dienogest (Natazia, Qlaira)	CYP3A4	CYP3A5			●
	Mestranol (Ortho-Novum, Norinyl)	CYP2C9			●	
Emergency contraceptives	Levonorgestrel (Plan B, Next choice)	CYP3A4	CYP3A5			●
	Ulipristal (Ella)	CYP3A4	CYP1A2,CYP2D6,CYP3A5			●
Androgens						
3-oxoandrosten-(4) derivatives	Testosterone (Andriol, Androderm)	CYP3A4,CYP19A1	HSD3B2,CYP3A5,SULTs			●
Antiandrogens						
Antiandrogens	Cyproterone (Androcur)	CYP3A4	CYP3A5			●
Other sex hormones and modulators of the genital system						
Selective estrogen receptor modulators (SERMs)	Ospemifene (Osphena)	CYP3A4	CYP2C9,CYP3A5,CYP2C19,CYP2B6			●
Steroid hormone						
Glucocorticoids	Dexamethasone (Decadron)	CYP3A4	CYP17A1,CYP3A5			●
	Cortisol (hydrocortisone) (Solu-cortef, Anucort-hc)	CYP3A4	CYP3A5			●
	Prednisone (Deltasone, Rayos)	HSD11B2	CYP3A4,CYP3A5,SLC19A1,SULTs,UGTs			●
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
Amphetamines	3,4-methylenedioxy-methamphetamine (MDMA) (Ecstasy)	Renal Excretion,CYP2D6	CYP1A2,CYP3A4,CYP3A5,FMO3		●	
	Methamphetamine (Desoxyn, recreational drug)	CYP2D6,Renal Excretion	FMO3,ACSM1,GLYAT			●
Barbiturates	Amobarbital	CYP3A4	CYP3A5,CYP2B6,CYP2C9			●
	Phenobarbital (Luminal)	CYP2C19,CYP2C9			●	
Benzodiazepines	Alprazolam (Xanax)	CYP3A4	CYP3A5			●
	Clonazepam (Klonopin)	CYP3A4	CYP2C19,CYP3A5			●
	Diazepam (Valium, Diastat)	CYP2C19,CYP3A4	CYP3A5,CYP2B6,CYP1A2		●	
Cannabinoids & Related Drugs	Cannabidiol (CBD) (CBD oil)	CYP3A4	CYP2C19,CYP3A5			●
	Delta 9-tetra hydrocannabinol (9_THC) (Marinol, Syndros)	CYP2C9	CYP2C19,CYP3A4,CYP3A5			●
	Cannabinol (CBN)	CYP2C9	CYP2C19,CYP3A4,CYP3A5			●
Synthetic Cannabis	**JWH-018**	**CYP1A2**	CYP2C9	◐		
	AM2201	**CYP1A2**	CYP2C9	◐		
Xanthine	**Caffeine**	**CYP1A2**		◐		
Dissociative Drugs	Ketamine (Ketalar)	CYP3A4	CYP2B6,CYP2C9,CYP3A5			●
	Phencyclidine (PCP) (Angel dust)	CYP3A4	CYP3A5,CYP1A2			●
Ergoline derivatives	Lysergic acid diethylamide (LSD)	CYP3A4	CYP3A5			●

Genomic Test Results

Genotype/Haplotype Details

CYP1A2

Allele Tested: *1A,*1C,*1F.

Genetic results: CYP1A2 *1F/*1F

Phenotype: Extensive metabolizer with higher inducibility

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP1A2		-3860G>A	*1C	rs2069514	G/G
CYP1A2		-163C>A	*1F	rs762551	A/A

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

Allele Tested: *1,*18.

Genetic results: CYP2B6 *1/*1

Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP2B6	Ile328Thr	983T>C	*18	rs28399499	T/T

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

CYP2C9

Allele Tested: *1,*2,*3,*4,*5,*6,*8,*11,*13.

Genetic results: CYP2C9 *1/*2

Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP2C9	Arg144Cys	430C>T	*2	rs1799853	C/T
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	*8	rs7900194	G/G
CYP2C9	Arg335Trp	1003C>T	*11	rs28371685	C/C
CYP2C9	Leu90Pro	269T>C	*13	rs72558187	T/T

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

Allele Tested: *1,*2,*3,*4,*5,*6,*7,*8,*10,*17.

Genetic results: CYP2C19 *1/*1

Phenotype: Extensive metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP2C19	Splicing defect	681G>A	*2	rs4244285	G/G
CYP2C19	Trp212Ter	636G>A	*3	rs4986893	G/G
CYP2C19	Met1Val	1A>G	*4	rs28399504	A/A
CYP2C19	Arg433Trp	1297C>T	*5	rs56337013	C/C
CYP2C19	Arg132Gln	395G>A	*6	rs72552267	G/G
CYP2C19	Splicing defect	819+2T>A	*7	rs72558186	T/T
CYP2C19	Trp120Arg	358T>C	*8	rs41291556	T/T
CYP2C19	Pro227Leu	680C>T	*10	rs6413438	C/C
CYP2C19		-806C>T	*17	rs12248560	C/C

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

Allele Tested: *1,*2,*3,*4A,*4K,*4M,*5,*6A,*6C,*7,*9,*10,*12,*14A,*14B,*15,*17,*29,*34,*39,*41,*69,and CNVs.

Genetic results: CYP2D6 *2/*3

Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP2D6	Arg296Cys	886C>T	*2	rs16947	T/C
CYP2D6	Ser486Thr	1457G>C	*2	rs1135840	G/C
CYP2D6	Arg259Glyfs	775delA	*3	rs35742686	A/-
CYP2D6	Splicing defect	506-1G>A	*4	rs3892097	G/G
CYP2D6			*5/CNVs	CYP2D6_CNVs	2
CYP2D6	Trp152Glyfs	454delT	*6	rs5030655	T/T
CYP2D6	His324Pro	971A>C	*7	rs5030867	A/A
CYP2D6	Lys281del	841_843delAAG	*9	rs5030656	AAG/AAG
CYP2D6	Pro34Ser	100C>T	*10	rs1065852	C/C
CYP2D6	Gly42Arg	124G>A	*12	rs5030862	G/G
CYP2D6	Gly169Ter/Arg	505G>A	*14	rs5030865	G/G
CYP2D6	46fs	137-138insT	*15	rs774671100	-/-
CYP2D6	Thr107Ile	320C>T	*17	rs28371706	C/C
CYP2D6	Val338Met	1012G>A	*29	rs59421388	G/G
CYP2D6	Splicing defect	985+39G>A	*41	rs28371725	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

CYP3A4

Allele Tested: *1A,*1B,*22.

Genetic results: CYP3A4 *1A/*22

Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP3A4		-392A>G	*1B	rs2740574	A/A
CYP3A4		522-191C>T	*22	rs35599367	C/T

Genotype/Haplotype Details

CYP3A5

Allele Tested: *1,*2,*3A,*6,*7.

Genetic results: CYP3A5 *3A/*3A

Phenotype: Poor metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
CYP3A5	Thr398Asn	1193C>A	*2	rs28365083	C/C
CYP3A5	Splicing defect	689-1A>G	*3	rs776746	G/G
CYP3A5	Splicing defect	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

Allele Tested: *1,*2.

Genetic results: VKORC1 *1/*2

Phenotype: Intermediate sensitivity to Warfarin

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
VKORC1		-1639G>A	*2	rs9923231	G/A

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

Genotype/Haplotype Details

UGT2B7

Allele Tested: *1a,*2b.

Genetic results: UGT2B7 *1a/*2b

Phenotype: Intermediate metabolizer

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
UGT2B7		-161C>T	*2b	rs7668258	C/T

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

OPRM1

Allele Tested: *1,*2.

Genetic results: OPRM1 *1/*1

Phenotype: Sensitive to Opioids

Gene	Protein change	Nucleotide change	Allele tested	Marker	Genotype
OPRM1	Asn40Asp	118A>G	*2	rs1799971	A/A

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Risk of Laboratory Technical Problems or Laboratory Error

Standard and effective procedures are in place at testing laboratory to protect against and prevent both technical and operational problems although problems may still occur. Errors can occur due to improper sample collection by patients and physicians. Damage to sample can occur during shipment due to such issues as improper paperwork, mislabeled/misaddressed packaging, loss/delay in receipt of sample at certified testing lab, etc. Issues which may prevent the lab from obtaining results include, but are not limited to: contamination of DNA sample; human &/or testing system error; results which cannot be interpreted; and, mislabeling of DNA sample.

When such issues are encountered, the lab may request a new sample. Re-testing does not guarantee that results will be obtained.

There is a statistically small percentage of inaccurate reporting that may include, but is not limited to such issues as: a false report that a genotype is present. Such errors may cause, but is not limited to: incorrect decisions/recommendations on medical treatment; incorrect decisions/recommendations on diet and/or fitness plans. In cases where laboratory error is suspected or is proven to have occurred, the patient's healthcare professional may recommend/request additional evaluation/testing. Additional testing may be recommended/requested to verify results for any reason presented by patient's healthcare professional.

Limitations

Testing purpose(s): 1) To provide information on how tested individual's genetic profile may affect carrier status for: a) certain inherited disease, b) reaction to certain drugs, c) risk of certain common health conditions, and/or d) response to selected diet, exercise, and/or nutrition recommendations. 2) To obtain information on tested individual's ancient ancestry. Testing purposes are dependent upon specific genetic testing ordered by patient's healthcare professional. Based on testing results, patients should make no changes to medical care [including, but not limited to, changes in dosage or frequency of medication, diet and/or exercise regimens, or pregnancy planning] without the advice of and consultation with a healthcare professional.

Genetic testing is an evolving science. Current testing protocols and results are based on the current/existing developments, information and testing techniques known at this time.

In the future, new variants may be identified and/or more research may be developed on the significance of currently identified variants that will drive changes in the interpretation of previously obtained genetic testing results. Current testing may not include identification of certain variants associated with: diet, exercise or nutrition; disease; and/or, drug response due to these issues.

Factors such as age, diet, ethnicity, family health history, and/or personal health, not related to genetics can also impact the likelihood of developing certain conditions or exhibiting certain drug reactions. Therefore, patients may not always exhibit and/or require the specific diet, nutrition and/or exercise, disease, or drug response expected or consistent with his/her genetic test results.

The genetic associations of certain conditions, particularly those related to diet and exercise, have only been observed/studied in Caucasian populations only. This limitation means that interpretations and recommendations are made in the context of Caucasian-only studies and results may or may not be relevant to those tested who are non-Caucasian or mixed ethnicity individuals.

Healthcare professionals may recommend additional testing to be performed by an independent laboratory or consult with an outside, independent genetic counselor or healthcare professional.

FDA Disclaimer and Physician Notice:

Advanced Genomic Solutions (AGS) Ltd. is accredited by the College of American Pathologists (CAP Number: 9479295) and Clinical Laboratory Improvement Amendments (CLIA) of 1988 (CLIA Number: 99D2143058) to perform high complexity clinical testing. This test was developed and its performance characteristics determined by AGS. It has not been cleared or approved by the US Food and Drug Administrations. This test is not intended for the purpose of medical diagnosis / medical treatment and is used for advisory purposes only. This test only detects specific allele(s) instead of all alleles for the genes. It does not rule out the possibility that other alleles in the genes might be potential variants. Individuals carrying non-tested alleles may have different responses and phenotype results. Apart from genetic factors, non-genetic factors such as age, diet, supplements, concomitant medications, personal health history, family health history, ethnicity, pregnancy and environmental factors need to be taken into account when making clinical decisions for medications and their dosages. Patients are advised to consult their treating doctors before any medication change. Inappropriate or premature medication change or cessation may result in serious health consequences. The laboratorydisclaims all responsibilityfor any negative or potentiallynegative side effects experienced by the user.

Methodology and Limitations:

Testing for genetic variation/mutation on listed genes was performed using PCR with allele-specific probes and/or the application refractory mutation system (ARMS). Test results do not rule out the possibility that this individual could be a carrier of other mutations/variations not detected by this gene mutation variation panel. Rare mutations surrounding these alleles may also affect our detection of genetic variations. Other non-genetic and genetic factors that are not tested by this assay can affect the management and sensitivity of drugs. Thus, the interpretation is given as a probability. Therefore, this genetic information shall be interpreted in conjunction with other clinical findings and familial history for the administration of specific drugs.

Tested Alleles Include:

COMT, CYP1A2 (*1C, *1F), CYP2B6 (*18), CYP2C19 (*2, *3, *4, *5, *6, *7, *8, *10, *17), CYP2C9 (*2, *3, *4, *5, *6, *8, *11, *13), CYP2D6 (*2, *3, *4, *6, *7, *9, *10, *12, *14, *15, *17, *29, *41, CNVs (Copy number variations)), CYP3A4 (*1B, *22), CYP3A5 (*2, *3A, *6, *7), DRD2, F2, F5, HTR2A, HTR2C, MTHFR, OPRM1, SLCO1B1 (*5), UGT2B7 (*2B), VKORC1 (*2)

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Pharmacogenomic Test Summary

CYP1A2	***1F/*1F**	**Extensive metabolizer with higher inducibility**
CYP2B6	*1/*1	Extensive metabolizer
CYP2C9	*1/*2	Intermediate metabolizer
CYP2C19	*1/*1	Extensive metabolizer
CYP2D6	*2/*3	Intermediate metabolizer
CYP3A4	*1A/*22	Intermediate metabolizer
CYP3A5	***3A/*3A**	**Poor metabolizer**
VKORC1	*1/*2	Intermediate sensitivity to Warfarin
SLCO1B1	*1A/*5	Intermediate function
UGT2B7	*1a/*2b	Intermediate metabolizer
OPRM1	*1/*1	Sensitive to Opioids

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