



DOIT SCIENTIFIC JSC

## PRECISE Pharmacogenomics Testing

知·健康 智·生活

## Pharmacogenomics testing in adults

Name:	test	Gender:	male	Age:	45
Weight(kg):	-	Birthplace:	-	Nation:	-
Phone:	-	Sample type:	peripheral blood	In/out-patient:	-
Hospital:	-	Department:	-	Referring physician:	-
Treatment area:	-	Patient ID:	-	Bed No.:	-
Date sampling:	2020-02-17	Barcode:	301560000140		

Test requested : Pharmacogenomics testing in adults(127 drugs)

Testing method : High throughput sequencing

History of adverse drug reactions(ADR) : -

ADR symptoms : -

### Testing results

Gene	Testing position	Result	Gene	Testing position	Result
ABCB1	c.2677T>A/G	T/T	CRHR1	c.1107+111C>T	C/C
	c.3435T>C	T/T	CYP1A1	c.-30+606G>T	G/G
ACE	D/I polymorphism	I/I	CYP2B6	c.516G>T	G/T
ADD1	c.1378G>T/A	G/T	CYP2C19	c.636G>A	G/G
ADRB1	c.1165G>C	C/C		c.681G>A	G/G
ADRB2	c.46A>G	A/A		c.-806C>T	C/C
AGTR1	c.*86A>C	A/C	CYP2C9	c.430C>T	C/C
ALDH2	c.1510G>A	G/G		c.1075A>C	A/A
ALOX5	c.432-6550A>G	A/G	CYP2D6	g.100C>T	C/T
ANKK1	c.2137G>A	A/G		g.984A>G	A/A
APOE	c.388T>C	T/T		g.997C>T/G	C/C
	c.526C>T	C/C		g.1758G>A/T	G/G
C11orf65	c.175-5285G>T	G/T		g.1846G>A	G/G
CHIA	c.304G>A/C	G/G		g.2850C>T	C/T
COMT	c.472G>A	A/G		g.2988G>A	G/G

Gene	Testing position	Result	Gene	Testing position	Result
CYP2D6	g.3384A>C	C/C	LTA4H	c.-1400C>T	C/C
	g.3435C>A	C/C	LTC4S	c.-444A>C	A/A
	g.4172C>T/G	C/C	MT-RNR1	m.1494C>T	Wild-type
	g.4180G>C	C/C		m.1555A>G	Wild-type
		full-gene-deletion	fullGene/fullGene	NAT2	c.282C>T
CYP3A5	c.-253-1G>A	G/G	c.341T>C		T/T
CYP4F2	c.1297G>A	G/G	c.481C>T		C/C
DRD2	c.-585A>G	A/G	c.590G>A		G/G
EPHX1	c.337T>C	T/T	c.803G>A		A/A
	c.416A>G	A/A	c.857G>A	G/G	
G6PD	c.95A>G	A/A	NOS1AP	c.178-13122C>T	C/T
	c.196T>A	T/T	NUDT15	c.52G>A	G/G
	c.202G>A	G/G		c.55_56insGAGTCG	-/-
	c.392G>T	G/G		c.415C>T	C/T
	c.487G>A	G/G		c.416G>A	G/G
	c.493A>G	A/A	OPRM1	c.118A>G	A/G
	c.517T>C	T/T	POLG	c.1399G>A	G/G
	c.519C>T	C/C	PPARG	c.34C>G	C/C
	c.563C>T	C/C	SCN1A	c.603-91G>A	A/G
	c.592C>T	C/C	SCN2A	c.56G>A	G/G
	c.871G>A	G/G		c.971-32A>G	A/G
	c.1004C>T	C/C	SLC22A1	c.1222A>C/G	G/G
	c.1024C>T	C/C	SLC22A2	c.808T>G	G/T
	c.1360C>T	C/C	SLC47A1	c.922-158G>A	A/G
	c.1376G>T	G/G	SLCO1B1	c.521T>C	C/T
	c.1388G>A	G/G	STXBP1	c.922A>T	A/A
GRIK4	c.83-10039T>C	C/T	TPMT	c.719A>G/C	A/A
HLA-A	*31:01	Negative	UGT1A	c.*211T>C	C/C
HLA-B	*15:02	Negative		c.*339G>C	C/C
	*58:01	Negative	c.-53_-52TA[5][6][7][8]	TA[6]/TA[6]	
HTR1A	c.-1019G>C	C/C	UGT1A1	c.211G>A	A/G
IFNL4	g.1332A>C	A/A		c.-364C>T	C/C
	g.5710G>A	G/G	UGT1A4	c.142T>G/A	T/T
ITPA	c.94C>A/G	C/C	UGT2B15	c.253T>G	G/T
	c.124+21A>C	A/A	VKORC1	c.174-136C>T	T/T
LDLR	c.*666T>C	C/C		c.-1639G>A	A/A

## Medication recommendations

Class	Drug	Recommendation
<b>(1)Cardiovascular and Cerebrovascular Diseases Drugs</b>	1.Benazepril	*Increase dose
	2.Fosinopril	*Increase dose
	3.Captopril	Normal response expected
	4.Lisinopril	*Increase dose
	5.Perindopril	*Increase dose
	6.Enalapril	*Increase dose
	7.Carvedilol	*Decrease dose
	8.Candesartan	*Increase dose
	9.Losartan	*Increase dose
	10.Metoprolol	Normal response expected
	11.Propranolol	*Increase dose
	12.Bucindolol	Normal response expected
	13.Digoxin	*Decrease dose
	14.Bumetanide	Normal response expected
	15.Furosemide	Normal response expected
	16.Spirolactone	*Increase dose
	17.Hydrochlorothiazide	Normal response expected
	18.Torasemide	Normal response expected
	19.Indapamide	Normal response expected
	20.Atorvastatin	*Decrease dose
	21.Fluvastatin	*Decrease dose
	22.Pitavastatin	*Decrease dose
	23.Pravastatin	*Increase dose
	24.Rosuvastatin	*Decrease dose
	25.Simvastatin	*Decrease dose
	26.Aspirin	Normal response expected

Class		Drug	Recommendation
<b>(1)Cardiovascular and Cerebrovascular Diseases Drugs</b>	Antiplatelet Drugs	27.Clopidogrel	Normal response expected
	Anti-thrombotic Drugs	28.Warfarin	*Consult doctor before use
	Anti-anginal Drugs	29.Nitroglycerin	Normal response expected
	Anti-arrhythmic Drugs	30.Propafenone	Normal response expected
		31.Amiodarone	*Consider alternatives or use with caution
<b>(2)Antidiabetic Drugs</b>		32.Metformin	*Adjust dose base on clinical response
		33.Glibenclamide	Normal response expected
		34.Glipizide	Normal response expected
		35.Gliquidone	Normal response expected
		36.Glimepiride	Normal response expected
		37.Gliclazide	Normal response expected
		38.Rosiglitazone	*Decrease dose
		39.Repaglinide	*Decrease dose
<b>(3)Anti-gout Drugs</b>		40.Allopurinol	Normal response expected
<b>(4)Anti-Infective Drugs</b>	Antiviral Drugs	41.Ribavirin	*Consult doctor before use
		42.Peginterferon Alfa-2A	*Consult doctor before use
		43.Peginterferon Alfa-2B	*Consult doctor before use
	Sulfonamide antimicrobial Drugs	44.Sulfamethoxazole and Trimethoprim	Normal response expected
		45.Sinomin	Normal response expected
		46.Sulfadiazine	Normal response expected
		47.Sulfasalazine	Normal response expected
	Quinolone antimicrobial Drugs	48.Norfloxacin	Normal response expected
	Nitrofurans antimicrobial Drugs	49.Nitrofurantoin	Normal response expected
		50.Furazolidone	Normal response expected
	Anti-tuberculostatic Drugs	51.Streptomycin	Normal response expected
52.Isoniazide		Normal response expected	

Class		Drug	Recommendation
<b>(4)Anti-Infective Drugs</b>	Anti-tuberculostatic Drugs	53.Pyrazinamide	Normal response expected
		54.Rifampin	Normal response expected
	Antifungal Drugs	55.Voriconazole	Normal response expected
	Aminoglycoside antibiotics	56.Amikacin	Normal response expected
		57.Netilmicin	Normal response expected
		58.Sisomicin	Normal response expected
		59.Etomicin	Normal response expected
		60.Kanamycin	Normal response expected
		61.Gentamicin	Normal response expected
		62.Tobramycin	Normal response expected
		63.Micronomicin	Normal response expected
64.Neomycin	Normal response expected		
<b>(5)Antipyretic-Analgesic and Anti-Inflammatory Drugs</b>	26.Aspirin	Normal response expected	
	65.Acetaminophen	*Use with caution	
	66.Ibuprofen	Normal response expected	
	67.Chlorphenamine	Normal response expected	
	68.Paracetamol	*Use with caution	
	69.Paracetamol, Pseudoephedrine Hydrochloride and Dextromethorphan Hydrobromide / Paracetamol, Pseudoephedrine Hydrochloride, Dextromethorphan Hydrobromide and Chlorpheniramine Maleate	*Use with caution	
	70.Indomethacin	Normal response expected	
	71.Diclofenac	Normal response expected	
	72.Ketoprofen	Normal response expected	
	73.Piroxicam	Normal response expected	
	74.Celecoxib	Normal response expected	
<b>(6)Digestive system Drugs</b>	75.Esomeprazole	Normal response expected	
	76.Omeprazole	Normal response expected	
	77.Lansoprazole	Normal response expected	

Class		Drug	Recommendation
(6) Digestive system Drugs		78. Rabeprazole	Normal response expected
		79. Pantoprazole	Normal response expected
(7) Respiratory system Drugs	Anti-asthmatic Drugs	80. Budesonide	Normal response expected
		81. Salbutamol	*Consider alternatives or use with caution
		82. Formoterol	*Consider alternatives or use with caution
		83. Salmeterol	Normal response expected
		84. Montelukast	*Use with caution or combine with other drug
	Antitussive Drugs	85. Dextromethorphan	Normal response expected
(8) Psychiatric Drugs		86. Citalopram	Normal response expected
		87. Escitalopram	Normal response expected
		88. Paroxetine	Normal response expected
		89. Sertraline	Normal response expected
		90. Venlafaxine	Normal response expected
		91. Amitriptyline	Normal response expected
		92. Doxepin	Normal response expected
		93. Mirtazapine	Normal response expected
		94. Desipramine	Normal response expected
		95. Bupropion	*Consider alternatives or use with caution
		96. Oxazepam	*Increase dose
		97. Lorazepam	*Increase dose
		98. Risperidone	Normal response expected
		99. Haloperidol	*Consider alternatives or use with caution
		100. Clozapine	*Increase dose
(9) Antiepileptic		101. Olanzapine	Normal response expected
		102. Carbamazepine	Normal response expected
		103. Divalproex Sodium	Normal response expected
		104. Lamotrigine	*Consider alternatives or use with caution

Class	Drug	Recommendation
<b>(9)Antiepileptic</b>	105.Phenytoin	Normal response expected
	106.Oxcarbazepine	*Consider alternatives or use with caution
	107.Phenobarbital	Normal response expected
	108.Diazepam	Normal response expected
	109.Topiramate	*Consider alternatives or use with caution
	110.Levetiracetam	Normal response expected
<b>(10)Immunosuppressants</b>	111.Tacrolimus	Normal response expected
	112.Sirolimus	Normal response expected
	113.Ciclosporin	Normal response expected
	114.Mercaptopurine	*Decrease dose
	115.Thioguanine	*Decrease dose
	116.Azathioprine	*Decrease dose
<b>(11)Antiparasitic Drugs</b>	117.Quinine	Normal response expected
	118.Chloroquine	Normal response expected
	119.Primaquine	Normal response expected
	120.Pyrimethamine	Normal response expected
<b>(12)Analgesic Drugs</b>	121.Codeine	Normal response expected
	122.Morphine	*Increase dose
	123.Methadone	Normal response expected
	124.Oxycodone	Normal response expected
	125.Tramadol	Normal response expected
<b>(13)Narcotic Drugs</b>	126.Prilocaine	Normal response expected
	127.Lidocaine	Normal response expected

\*Medication recommendations are based on the gene variants on the report, other variants may also be influences of drug dose. If any adverse drug reactions had occurred before, please consult doctor before use.



## Statement

1. This report is only responsible for the specimen submitted. Any report without signature of the lab technician and the reviewer is invalid. Any alteration and deletion of the report is invalid.
2. Referring to the current clinical research results, this report only interprets the variants within the test range, without considering the influence of other factors, such as unknown gene mutation, weight, age, gender, drug interaction, food, environment, etc.
3. The report is only for clinical reference, not as the only basis for formulation, modification and adjustment of medication plan. The final medication plan of the subject shall be formulated by the clinician or clinical pharmacist.
4. The test results and recommendations for each drug are provided in the appendix, where the clinical annotation levels of evidence comes from the PharmGKB (<https://www.pharmgkb.org/page/clinAnnLevels>). According to the strength of evidence, it can be divided into six levels: level 1a, 1b, 2a, 2b, 3 and 4.  

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 2B 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) study 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.

Other sources: including FDA (U.S. Food and Drug Administration) drug instructions and other published research results.
5. If more than one gene locus is detected for a drug, the drug use recommendations in this report are drawn from the following rules: it is suggested that the drug use risk locus is prior to the normal drug use locus; the locus with high level of evidence is prior to the locus with low level of evidence.

6. The loci used for haplotype detection of HLA-A \*31:01,HLA-B \*58:01 and HLA-B \*15:02 were rs17179220, rs78489254 and rs144012689, respectively. The detection range of some genes is shown in the table below.

Gene	Position	Haplotype
CYP2C19	c.681G>A,c.636G>A,c.-806C>T	*2,*3,*17
CYP2C9	c.430C>T,c.1075A>C	*2,*3
CYP2D6	full-gene-deletion,g.4180G>C,g.4172C>T/G,g.3435C>A,g.3384A>C,g.2988G>A,g.2850C>T,g.1846G>A,g.1758G>A/T,g.997C>T/G,g.984A>G,g.100C>T	*2,*4,*5,*10,*14,*41,*65,*69
CYP3A5	c.-253-1G>A	*3
NAT2	c.282C>T,c.341T>C,c.481C>T,c.590G>A,c.803G>A,c.857G>A	*4,*5,*6,*7,*12,*13
NUDT15	c.55_56insGAGTCG,c.52G>A,c.415C>T,c.416G>A	*2,*3,*4,*5,*6

Note: if the gene in the table does not detect the haplotype within the detection range, it is determined as \* 1.

7. The laboratory reserves the right of final interpretation for the contents of this report. If you have any questions, please contact us within 7 working days after receiving the results.

Tested by :

Checked by :

Report date : 2020-03-11

## Appendix Description of results

### Cardiovascular and Cerebrovascular Diseases Drugs

#### 1. Anti-hypertensive Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
1	Benazepril	ACE	I/I	The subject may have a poor response to benazepril.	3	*Increase dose
		ADRB2 c.46A>G	A/A	The subject may have a poor response to benazepril.	3	
2	Fosinopril	ACE	I/I	The hypertension patient may have a poor response to fosinopril.	other source	*Increase dose
3	Captopril	ACE	I/I	The subject may have a normal response to captopril.	2A	Normal response expected
4	Lisinopril	ACE	I/I	The subject may have a poor response to lisinopril.	3	*Increase dose
5	Perindopril	AGTR1 c.*86A>C	A/C	The subject may have a normal response to perindopril.	3	*Increase dose
		ACE	I/I	The subject may have a poor response to perindopril.	3	
6	Enalapril	ACE	I/I	The subject may have a poor response to enalapril.	3	*Increase dose
7	Carvedilol	UGT1A1 c.211G>A	A/G	The patient with angina or heart failure may have decreased glucuronidation of carvedilol.	3	*Decrease dose
		CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal clearance of carvedilol. The plasma concentrations of mirtazapine may be normal.	3	
8	Candesartan	AGTR1 c.*86A>C	A/C	The subject may have a poor response to candesartan.	3	*Increase dose
9	Losartan	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have normal metabolism of losartan.	3	*Increase dose
		AGTR1 c.*86A>C	A/C	The subject may have a poor response to losartan.	3	

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
10	Metoprolol	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal conversion of metoprolol. The plasma concentrations of metoprolol may be normal. Initiate therapy with recommended standard dosing.	2A	Normal response expected
		ADRB1 c.1165G>C	C/C	The subject may have a normal response to metoprolol.	3	
11	Propranolol	ADRB2 c.46A>G	A/A	The subject may have a poor response to propranolol.	3	*Increase dose

## 2. Anti-heart failure Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
12	Bucindolol	ADRB1 c.1165G>C	C/C	The subject may have a normal response to bucindolol.	3	Normal response expected
13	Digoxin	ABCB1 c.3435T>C	T/T	The subject may have increased plasma concentrations of digoxin.	2A	*Decrease dose

## 3. Diuretic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
14	Bumetanide	ADD1 c.1378G>T/A	G/T	The subject may have a normal response to bumetanide.	3	Normal response expected
15	Furosemide	ADD1 c.1378G>T/A	G/T	The subject may have a normal response to furosemide.	3	Normal response expected
16	Spirolactone	ADD1 c.1378G>T/A	G/T	The patient with liver cirrhosis may have a poor response to spironolactone.	2B	*Increase dose
17	Hydrochlorothiazide	ADD1 c.1378G>T/A	G/T	The subject may have a normal response to hydrochlorothiazide.	3	Normal response expected
18	Torsemide	ADD1 c.1378G>T/A	G/T	The subject may have a normal response to torsemide.	3	Normal response expected
19	Indapamide	ADD1 c.1378G>T/A	G/T	The subject may have a normal response to indapamide.	other source	Normal response expected

#### 4. Statins

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
20	Atorvastatin	SLCO1B1 c.521T>C	C/T	The subject treated with atorvastatin may have higher serum concentrations, which will increase the risk of composite adverse events. Consider a reduced dose and the maximum dose should not exceed 40 mg/day.	other source	*Decrease dose
21	Fluvastatin	SLCO1B1 c.521T>C	C/T	The subject who is treated with fluvastatin may have higher serum concentrations and an increased risk of liver dysfunction and rhabdomyolysis.	other source	*Decrease dose
22	Pitavastatin	SLCO1B1 c.521T>C	C/T	The subject who is treated with pitavastatin may have higher serum concentrations and an increased risk of liver dysfunction and rhabdomyolysis.	other source	*Decrease dose
23	Pravastatin	APOE	E3/E3	The subject may have a poor response to pravastatin.	3	*Increase dose
		LDLR c.*666T>C	C/C	The subject may have a poor response to pravastatin.	3	
24	Rosuvastatin	SLCO1B1 c.521T>C	C/T	The subject who is treated with rosuvastatin may have higher serum concentrations and an increased risk of statin-related myopathy.	2A	*Decrease dose
25	Simvastatin	SLCO1B1 c.521T>C	C/T	The subject who is treated with simvastatin may have higher serum concentrations and an increased risk of statin-related myopathy.	1A	*Decrease dose

#### 5. Antiplatelet Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
26	Aspirin	LTC4S c.-444A>C	A/A	The subject treated with aspirin may have a decreased, but not absent, risk of urticaria.	2B	Normal response expected
		CHIA c.304G>A/C	G/G	The patient with asthma may have a decreased risk of aspirin-induced asthma.	3	
		ABCB1 c.3435T>C	T/T	The subject may have a decreased risk of aspirin resistance.	other source	
27	Clopidogrel	CYP2C19	*1/*1	The subject is a CYP2C9 normal metabolizer and may have normal platelet inhibition. Initiate therapy with recommended starting dose.	1A	Normal response expected

## 6. Anti-thrombotic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
28	Warfarin	VKORC1 c.-1639G>A	A/A	The subject have a normal response to warfarin and may require a normal dose.	1A	*Consult doctor before use
		CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer.	1A	
		CYP4F2 c.1297G>A	G/G	The subjectt have a normal metabolism of vitamin K1 to hydroxyvitamin K1 and may require a normal dose.	1A	

\*According to the FDA Label for warfarin, the expected maintenance daily dose for adult is 3-4mg. Determine the INR daily to achieve optimal anticoagulation.

## 7. Anti-anginal Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
29	Nitroglycerin	ALDH2 c.1510G>A	G/G	The subject may have a normal enzyme activity of ALDH2. The response of nitroglycerin to myocardial ischemia is normal.	other source	Normal response expected

## 8. Anti-arrhythmic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
30	Propafenone	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer. The plasma concentrations of propafenone and the active metabolite 5-hydroxypropafenone may be normal. Initiate therapy with recommended standard dosing.	2A	Normal response expected
31	Amiodarone	NOS1AP c.178-13122C>T	C/T	The subject may have an increased risk of drug-induced ventricular arrhythmia and QT prolongation when treated with amiodarone.	3	*Consider alternatives or use with caution

## Antidiabetic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
32	Metformin	C11orf65 c.175-5285G>T	G/T	The patient with Diabetes Mellitus, Type 2 may have a decreased response to metformin.	2B	*Adjust dose base on clinical response
		SLC47A1 c.1222A>G	A/G	The patient with diabetes mellitus or polycystic ovarian syndrome may have a decreased response to metformin.	3	
		SLC22A1 c.1222A>C/G	G/G	The subject treated with metformin may have a normal response and may have a decreased risk for gastrointestinal side effects.	3	
		SLC22A2 c.808T>G	G/T	The subject may have decreased clearance of metformin.	3	
33	Glibenclamide	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased risk of hypoglycemia.	3	Normal response expected
		G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency and may have a decreased risk of hemolysis or hemolytic anemia.	FDA	
34	Glipizide	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased risk of hypoglycemia.	3	Normal response expected
		G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency and may have a decreased risk of hemolysis or hemolytic anemia.	FDA	
35	Gliquidone	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased risk of hypoglycemia.	3	Normal response expected
		G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency and may have a decreased risk of hemolysis or hemolytic anemia.	FDA	
36	Glimepiride	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased risk of hypoglycemia.	3	Normal response expected
		G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency and may have a decreased risk of hemolysis or hemolytic anemia.	FDA	
37	Gliclazide	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased risk of hypoglycemia.	3	Normal response expected
		G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency and may have a decreased risk of hemolysis or hemolytic anemia.	FDA	
38	Rosiglitazone	SLCO1B1 c.521T>C	C/T	The activity of drug transporter encoded by SLCO1B1 gene is decreased. The subject may have higher plasma concentrations of rosiglitazone.	3	*Decrease dose
39	Repaglinide	SLCO1B1 c.521T>C	C/T	The activity of drug transporter encoded by SLCO1B1 gene is decreased. The subject may have higher plasma concentrations of repaglinide.	3	*Decrease dose

## Anti-gout Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
40	Allopurinol	HLA-B *58:01	Negative	The subject has a decreased risk of Severe Cutaneous Adverse Reactions when treated with allopurinol.	1A	Normal response expected



## Anti-Infective Drugs

### 1. Antiviral Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
41	Ribavirin	IFNL4 g.5710G>A	G/G	The patient with Hepatitis C genotype 1 may have higher response rates (SVR) to triple therapy (telaprevir, peginterferon alfa-2a/b and ribavirin).	1A	*Consult doctor before use
		IFNL4 g.1332A>C	A/A	The patient with HCV genotype 1 may have increased response (lower SVR) and shorter treatment cycle to peginterferon alfa and ribavirin therapy.	1B	
		ITPA c.124+21A>C	A/A	The patient with chronic hepatitis C may have an increased risk of anemia but a decreased risk of thrombocytopenia when taking peg interferon alfa-2b and ribavirin.	2B	
		ITPA c.94C>A/G	C/C	The patient with chronic hepatitis C may have an increased risk of anemia but a decreased risk of thrombocytopenia when taking peg interferon alfa-2b and ribavirin.	2B	
42	Peginterferon Alfa-2A	IFNL4 g.5710G>A	G/G	The patient with Hepatitis C genotype 1 may have higher response rates (SVR) to triple therapy (telaprevir, peginterferon alfa-2a/b and ribavirin).	1A	*Consult doctor before use
		IFNL4 g.1332A>C	A/A	The patient with HCV genotype 1 may have increased response (lower SVR) and shorter treatment cycle to peginterferon alfa and ribavirin therapy.	1B	
43	Peginterferon Alfa-2B	IFNL4 g.1332A>C	A/A	The patient with HCV genotype 1 may have increased response (lower SVR) and shorter treatment cycle to peginterferon alfa and ribavirin therapy.	1B	*Consult doctor before use
		IFNL4 g.5710G>A	G/G	The patient with Hepatitis C genotype 1 may have higher response rates (SVR) to triple therapy (telaprevir, peginterferon alfa-2a/b and ribavirin).	1B	
		ITPA c.124+21A>C	A/A	The patient with chronic hepatitis C may have an increased risk of anemia but a decreased risk of thrombocytopenia when taking peg interferon alfa-2b and ribavirin.	2B	
		ITPA c.94C>A/G	C/C	The patient with chronic hepatitis C may have an increased risk of anemia but a decreased risk of thrombocytopenia when taking peg interferon alfa-2b and ribavirin.	2B	

## 2. Sulfonamide antimicrobial Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
44	Sulfamethoxazole and Trimethoprim	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with sulfamethoxazole / trimethoprim (co-trimoxazole).	FDA	Normal response expected
45	Sinomim	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with sulfamethoxazole.	FDA	Normal response expected
46	Sulfadiazine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with sulfadiazine.	FDA	Normal response expected
47	Sulfasalazine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with sulfadiazine.	FDA	Normal response expected

## 3. Quinolone antimicrobial Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
48	Norfloxacin	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with norfloxacin.	FDA	Normal response expected

## 4. Nitrofurans antimicrobial Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
49	Nitrofurantoin	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with nitrofurantoin.	FDA	Normal response expected
50	Furazolidone	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with furazolidone.	other source	Normal response expected

## 5. Anti-tuberculostatic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
51	Streptomycin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
52	Isoniazide	NAT2	*4/*4	The subject is a NAT2 rapid acetylator and may have a lower, but not absent, risk of liver injury when treated with isoniazid.	2A	Normal response expected
53	Pyrazinamide	NAT2	*4/*4	The subject is a NAT2 rapid acetylator and may have a lower, but not absent, risk of liver injury when treated with Rifater (containing isoniazid, pyrazinamide and rifampin).	2A	Normal response expected
54	Rifampin	NAT2	*4/*4	The subject is a NAT2 rapid acetylator and may have a lower, but not absent, risk of liver injury when treated with Rifater (containing isoniazid, pyrazinamide and rifampin).	2A	Normal response expected

## 6. Antifungal Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
55	Voriconazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	1A	Normal response expected

## 7. Aminoglycoside antibiotics

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
56	Amikacin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
57	Netilmicin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
58	Sisomicin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
59	Etimicin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
60	Kanamycin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
61	Gentamicin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
62	Tobramycin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
63	Micronomicin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	
64	Neomycin	MT-RNR1 m.1555A>G	Wild-type	The subject with the 1555A allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	1B	Normal response expected
		MT-RNR1 m.1494C>T	Wild-type	The subject with the 1494C allele may have a lower, but not absent, risk of experiencing aminoglycoside-induced hearing loss.	2B	

## Antipyretic-Analgesic and Anti-Inflammatory Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
26	Aspirin	LTC4S c.-444A>C	A/A	The subject treated with aspirin may have a decreased, but not absent, risk of urticaria.	2B	Normal response expected
		CHIA c.304G>A/C	G/G	The patient with asthma may have a decreased risk of aspirin-induced asthma.	3	
		ABCB1 c.3435T>C	T/T	The subject may have a decreased risk of aspirin resistance.	other source	
65	Acetaminophen	UGT1A c.*339G>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	*Use with caution
		UGT1A c.*211T>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	
66	Ibuprofen	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have normal metabolism of ibuprofen.	other source	Normal response expected
67	Chlorphenamine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal metabolism of chlorphenamine.	other source	Normal response expected
68	Paracetamol	UGT1A c.*339G>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	*Use with caution
		UGT1A c.*211T>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
69	Paracetamol, Pseudoephedrine Hydrochloride and Dextromethorphan Hydrobromide / Paracetamol, Pseudoephedrine Hydrochloride, Dextromethorphan Hydrobromide and Chlorpheniramine Maleate	UGT1A c.*339G>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	*Use with caution
		UGT1A c.*211T>C	C/C	The subject may have an increased risk of liver failure due to unintentional acetaminophen overdose, avoid taking more than the prescribed dose of an acetaminophen-containing product or taking multiple acetaminophen-containing products at the same time.	3	
70	Indomethacin	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased, but not absent, risk of gastrointestinal bleeding when treated with indomethacin.	other source	Normal response expected
71	Diclofenac	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased, but not absent, risk of gastrointestinal bleeding when treated with diclofenac.	2A	Normal response expected
72	Ketoprofen	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased, but not absent, risk of gastrointestinal bleeding when treated with ketoprofen.	other source	Normal response expected
73	Piroxicam	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer, the plasma concentrations of piroxicam is normal.	FDA	Normal response expected
74	Celecoxib	CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have normal metabolism of celecoxib.	2A	Normal response expected

## Digestive system Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
75	Esomeprazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	3	Normal response expected
76	Omeprazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	2A	Normal response expected
77	Lansoprazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	2A	Normal response expected
78	Rabeprazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	2A	Normal response expected
79	Pantoprazole	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	3	Normal response expected

## Respiratory system Drugs

### 1. Anti-asthmatic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
80	Budesonide	CRHR1 c.1107+111C>T	C/C	The subject treated with budesonide may have a normal response.	2B	Normal response expected
81	Salbutamol	ADRB2 c.46A>G	A/A	The patient with asthma may have a decreased response to salbutamol and may have an increased risk of asthma exacerbations.	other source	*Consider alternatives or use with caution
82	Formoterol	ADRB2 c.46A>G	A/A	The patient with asthma may have a decreased response to formoterol, be alert to insufficient treatment.	other source	*Consider alternatives or use with caution
83	Salmeterol	ADRB2 c.46A>G	A/A	The patient with asthma may have a normal response to salmeterol.	other source	Normal response expected
84	Montelukast	LTA4H c.- 1400C>T	C/C	The patient with asthma may have a decreased response to montelukast, be alert to insufficient treatment.	3	*Use with caution or combine with other drug
		LTC4S c.- 444A>C	A/A	The patient with asthma may have a normal response to montelukast.	3	
		ALOX5 c.432- 6550A>G	A/G	The patient with asthma may have a normal response to montelukast.	3	

### 2. Antitussive Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
85	Dextromethorphan	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal metabolism of dextromethorphan.	4	Normal response expected



## Psychiatric Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
86	Citalopram	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended standard dosing.	1A	Normal response expected
87	Escitalopram	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	1A	Normal response expected
88	Paroxetine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and has normal metabolism of paroxetine. The serum concentrations may be normal. Initiate therapy with recommended standard dosing.	1A	Normal response expected
		HTR1A c.-1019G>C	C/C	The patient with panic disorder who is treated with paroxetine may have a normal response.	2B	
89	Sertraline	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	1A	Normal response expected
90	Venlafaxine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal clearance of mirtazapine. The plasma concentrations of mirtazapine may be normal.	2A	Normal response expected
91	Amitriptyline	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	1A	Normal response expected
		CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and has normal metabolism of amitriptyline. The plasma concentrations of active drug may be normal. Initiate therapy with recommended starting dose.	1A	

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
92	Doxepin	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and has normal metabolism of doxepin. The plasma concentrations of active drug may be normal. Initiate therapy with recommended starting dose.	1A	Normal response expected
		CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer. Initiate therapy with recommended starting dose.	1A	
93	Mirtazapine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal clearance of mirtazapine. The plasma concentrations of mirtazapine may be normal.	2A	Normal response expected
94	Desipramine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and has normal metabolism of desipramine. The plasma concentrations of active drug may be normal. Initiate therapy with recommended starting dose.	1A	Normal response expected
95	Bupropion	ANKK1 c.2137G>A	A/G	The subject has decreased response to bupropion and may be less likely to quit smoking.	3	*Consider alternatives or use with caution
96	Oxazepam	UGT2B15 c.253T>G	G/T	The subject treated with oxazepam may have increased clearance and decreased serum concentrations.	2B	*Increase dose
97	Lorazepam	UGT2B15 c.253T>G	G/T	The subject who is treated with lorazepam may have increased clearance and decreased serum concentrations.	2B	*Increase dose
98	Risperidone	DRD2 c.- 585A>G	A/G	The patient with schizophrenia may be more likely to have improvement in symptoms when treated with risperidone.	2A	Normal response expected
99	Haloperidol	COMT c.472G>A	A/G	The patient treated with schizophrenia may have an increased risk for developing extrapyramidal symptoms when treated with haloperidol.	3	*Consider alternatives or use with caution
100	Clozapine	COMT c.472G>A	A/G	The patient with schizophrenia may have a poorer response when treated with clozapine.	3	*Increase dose
101	Olanzapine	PPARG c.34C>G	C/C	The patient with schizophrenia may have lower weight gain when treated with olanzapine.	3	Normal response expected

## Antiepileptic

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
102	Carbamazepine	HLA-B *15:02	Negative	The subject treated with carbamazepine may have a decreased, but not absent, risk of Severe Cutaneous Adverse Reactions.	1A	Normal response expected
		HLA-A *31:01	Negative	The subject treated with carbamazepine may have a decreased, but not absent, risk of Severe Cutaneous Adverse Reactions.	1A	
103	Divalproex Sodium	POLG c.1399G>A	G/G	The subject has a decreased risk of valproate-induced acute liver failure.	FDA	Normal response expected
104	Lamotrigine	UGT1A4 c.142T>G/A	T/T	The subject may have a normal serum concentration, as well as normal response to lamotrigine.	2B	*Consider alternatives or use with caution
		SCN2A c.971-32A>G	A/G	The subject treated with lamotrihine may have an increased risk of drug resistance.	3	
105	Phenytoin	HLA-B *15:02	Negative	The subject treated with phenytoin may have a decreased, but not absent, risk of Severe Cutaneous Adverse Reactions.	1A	Normal response expected
		CYP2C9	*1/*1	The subject is a CYP2C9 normal metabolizer and may have a decreased, but not absent, risk of side effects when treated with phenytoin.	1A	
106	Oxcarbazepine	HLA-B *15:02	Negative	The subject treated with oxcarbazepine may have a decreased, but not absent, risk of Stevens-Johnson Syndrome (SJS).	1A	*Consider alternatives or use with caution
		SCN2A c.971-32A>G	A/G	The subject treated with oxcarbazepine may have an increased risk of drug resistance.	3	
107	Phenobarbital	SCN2A c.56G>A	G/G	The subject may have a normal response when treated with phenobarbital.	3	Normal response expected
		CYP1A1 c.-30+606G>T	G/G	The promoter activity of CYP1A1 gene is normal. The subject may have a normal response when treated with phenobarbital.	3	
		ABCB1 c.3435T>C	T/T	The subject treated with phenobarbital may have a decreased, but not absent, risk of drug resistance.	3	
108	Diazepam	CYP2C19	*1/*1	The subject is a CYP2C19 normal metabolizer and may have normal plasma concentrations of diazepam.	3	Normal response expected
109	Topiramate	SCN2A c.971-32A>G	A/G	The subject treated with topiramate may have an increased risk of drug resistance.	3	*Consider alternatives or use with caution
110	Levetiracetam	STXBP1 c.922A>T	A/A	The subject treated with levetiracetam may have a normal response.	other source	Normal response expected

## Immunosuppressants

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
111	Tacrolimus	CYP3A5	*3/*3	The subject is a CYP3A5 poor metabolizer. Initiate therapy with standard recommended dose. Use therapeutic drug monitoring to guide dose adjustments.	1A	Normal response expected
112	Sirolimus	CYP3A5	*3/*3	The subject is a CYP3A5 poor metabolizer. Initiate therapy with recommended starting dose.	2A	Normal response expected
113	Ciclosporin	CYP3A5	*3/*3	The subject is a CYP3A5 poor metabolizer and may require a normal dose of cyclosporine to reach target blood concentration.	2B	Normal response expected
114	Mercaptopurine	TPMT c.719A>G/C	A/A	The subject is a TPMT normal metabolizer and may have normal concentrations of thioguanine nucleotides (TGN) metabolites. Start with normal starting dose and adjust doses of mercaptopurine without any special emphasis on mercaptopurine compared to other agents. Allow at least 2 weeks to reach steady-state after each dose adjustment.	1A	*Decrease dose
		NUDT15	*1/*3	The subject is a NUDT15 intermediate metabolizer and may have increased risk of thiopurine-related leukopenia, neutropenia, myelosuppression. Start with reduced starting doses (30-80% of normal dose) and adjust doses of mercaptopurine based on degree of myelosuppression and disease-specific guidelines. Allow 2-4 weeks to reach steady-state after each dose adjustment. If myelosuppression occurs and depending on other therapy, emphasis should be on reducing mercaptopurine over other agents. If normal starting dose is already < 75 mg/m <sup>2</sup> /day or 1.5 mg/kg/day, dose reduction may not be recommended.	2B	
115	Thioguanine	TPMT c.719A>G/C	A/A	The subject is a TPMT normal metabolizer and may have normal concentrations of thioguanine nucleotides (TGN) metabolites. Start with normal starting dose and adjust doses of thioguanine and of other myelosuppressive therapy without any special emphasis on thioguanine. Allow 2 weeks to reach steady-state after each dose adjustment.	1A	*Decrease dose
		NUDT15	*1/*3	The subject is a NUDT15 intermediate metabolizer and may have increased risk of thiopurine-related leukopenia, neutropenia, myelosuppression. Start with reduced doses (50% to 80% of normal dose) and adjust doses of thioguanine based on degree of myelosuppression and disease-specific guidelines. Allow 2-4 weeks to reach steady-state after each dose adjustment. If myelosuppression occurs, and depending on other therapy, emphasis should be on reducing thioguanine over other agents.	2B	
116	Azathioprine	TPMT c.719A>G/C	A/A	The subject is a TPMT normal metabolizer and may have normal concentrations of thioguanine nucleotides (TGN) metabolites. Start with normal starting dose and adjust doses of azathioprine based on disease-specific guidelines. Allow 2 weeks to reach steady state after each dose adjustment.	1A	*Decrease dose
		NUDT15	*1/*3	The subject is a NUDT15 intermediate metabolizer and may have increased risk of thiopurine-related leukopenia, neutropenia, myelosuppression. Start with reduced starting doses (30-80% of normal dose) and adjust doses of azathioprine based on degree of myelosuppression and disease-specific guidelines. Allow 2-4 weeks to reach steady-state after each dose adjustment.	1A	

## Antiparasitic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
117	Quinine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with quinine.	FDA	Normal response expected
118	Chloroquine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with pyrimethamine.	FDA	Normal response expected
119	Primaquine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with primaquine.	FDA	Normal response expected
120	Pyrimethamine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of hemolysis when treat with pyrimethamine.	3	Normal response expected

## Analgesic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
121	Codeine	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal morphine formation. Use label recommended age- or weight-specific dosing.	1A	Normal response expected
122	Morphine	OPRM1 c.118A>G	A/G	The subject may have a decreased response to morphine.	2B	*Increase dose
123	Methadone	CYP2B6 c.516G>T	G/T	The subject may have a normal metabolism to morphine.	2A	Normal response expected
		ABCB1 c.3435T>C	T/T	The subject may have a normal response to morphine.	2B	
124	Oxycodone	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer.	2A	Normal response expected
125	Tramadol	CYP2D6	*2/*10	The subject is a CYP2D6 normal metabolizer and may have normal conversion of tramadol. The plasma concentrations of tramadol may be normal. Initiate therapy with recommended standard dosing.	1B	Normal response expected

## Narcotic Drugs

No.	Drug	Gene	Result	Interpretation	Level	Recommendation
126	Prilocaine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of methemoglobinemia when treat with prilocaine.	FDA	Normal response expected
127	Lidocaine	G6PD	Without G6PD mutation	The subject doesn't have a mutation associated with G6PD deficiency, and may have a reduced, but not absent, risk of methemoglobinemia when treat with lidocaine.	FDA	Normal response expected

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