GeneSight® Analgesic
COMBINATORIAL PHARMACOGENOMIC TEST

genesight

Patient, Sample
DOB: 7/22/1984
Order Number: 9904
Report Date: 6/22/2016
Clinician: Sample Clinician
Reference: 1456CIP

Questions? Call 855.891.9415 or email medinfo@assurexhealth.com

OPIOIDS

USE AS DIRECTED	MODERATE GENE-DRUG INTERACTION		SIGNIFICANT GENE-DRUG INTERACTION	
naltrexone (Revia®, Vivitrol®)	**buprenorphine** (Butrans®)	4	**fentanyl** (Duragesic®)	4
tapentadol (Nucynta®)	**buprenorphine/naloxone** (Suboxone®)	4	**hydromorphone** (Dilaudid®)	4
			meperidine (Demerol®)	4
			methadone (Dolophine®)	4
			morphine (Avinza®)	4
			oxymorphone (Opana®)	4
			tramadol (Ultram®)	3,4
			hydrocodone (Vicodin®)	1,4,6
			oxycodone (Oxycontin®)	1,4,6
			codeine (Codeine Contin®)	1,4,6,8

NON-OPIOIDS

USE AS DIRECTED	MODERATE GENE-DRUG INTERACTION		SIGNIFICANT GENE-DRUG INTERACTION	
ketorolac (Toradol®)	**carisoprodol** (Soma®)	1	**ibuprofen** (Advil®, Motrin®)	1,6
	cyclobenzaprine (Flexeril®)	2,7	**meloxicam** (Mobic®)	1,6
	naproxen (Aleve®, Naprosyn®)	3,7	**celecoxib** (Celebrex®)	1,6,8
			diclofenac (Voltaren®)	1,6,8

CLINICAL CONSIDERATIONS

1: Serum level of the active compound may be too high, lower doses may be required.
2: Serum level of the active compound may be too low, higher doses may be required.
3: Difficult to predict dose adjustments due to conflicting variations in metabolism.
4: Genotype may impact drug mechanism of action and result in reduced efficacy.
6: Use of this drug may increase risk of side effects.
7: Serum level may be too low in smokers.
8: FDA label identifies a potential gene-drug interaction for this medication.

All analgesic medications require clinical monitoring.
This report is not intended to imply that the drugs listed are approved for the same indications or that they are comparable in safety or efficacy. The brand name is shown for illustrative purposes only; other brand names may be available. The prescribing physician should review the prescribing information for the drug(s) being considered and make treatment decisions based on the patient's individual needs and the characteristics of the drug prescribed.

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PATIENT GENOTYPES AND PHENOTYPES

PHARMACODYNAMIC GENES (PD)

OPRM1 — **Reduced Response**
G/G

This patient is homozygous for the 118A>G mutation and may experience reduced analgesia with standard opioid doses.

PHARMACOKINETIC GENES (PK)

CYP1A2 — **Ultrarapid Metabolizer**
-163C>A - A/A

This genotype is most consistent with the ultrarapid metabolizer phenotype. This patient may have increased enzyme activity as compared to individuals with the normal phenotype.

CYP2B6 — **Extensive (Normal) Metabolizer**
*1/*1

CYP2B6*1 allele enzyme activity: Normal
CYP2B6*1 allele enzyme activity: Normal

This genotype is most consistent with the extensive (normal) metabolizer phenotype.

CYP2C19 — **Intermediate Metabolizer**
*1/*2

CYP2C19*1 allele enzyme activity: Normal
CYP2C19*2 allele enzyme activity: None

This genotype is most consistent with the intermediate metabolizer phenotype. This patient may have reduced enzyme activity as compared to individuals with the normal phenotype.

CYP2C9 — **Poor Metabolizer**
*2/*2

CYP2C9*2 allele enzyme activity: Reduced
CYP2C9*2 allele enzyme activity: Reduced

This genotype is most consistent with the poor metabolizer phenotype. This patient may have reduced enzyme activity as compared to individuals with the normal phenotype.

CYP3A4 — **Extensive (Normal) Metabolizer**
*1/*1

CYP3A4*1 allele enzyme activity: Normal
CYP3A4*1 allele enzyme activity: Normal

This genotype is most consistent with the extensive (normal) metabolizer phenotype.

CYP2D6 — **Ultrarapid Metabolizer**
*2A/*2A

CYP2D6*2A allele enzyme activity: Increased
CYP2D6*2A allele enzyme activity: Increased

This genotype is most consistent with the ultrarapid metabolizer phenotype. This patient may have increased enzyme activity as compared to individuals with the normal phenotype.

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GENE-DRUG INTERACTIONS

USE AS DIRECTED

	CYP1A2	CYP2B6	CYP2C19	CYP2C9	CYP3A4	CYP2D6
OPIOIDS						
naltrexone (Revia®, Vivitrol®)						
tapentadol (Nucynta®)			●	●		●
NON-OPIOIDS						
ketorolac (Toradol®)						

MODERATE GENE-DRUG INTERACTION

	CYP1A2	CYP2B6	CYP2C19	CYP2C9	CYP3A4	CYP2D6
OPIOIDS						
buprenorphine (Butrans®)					○	
buprenorphine/naloxone (Suboxone®)			●		○	●
NON-OPIOIDS						
carisoprodol (Soma®)			●			
cyclobenzaprine (Flexeril®)	●				○	●
naproxen (Aleve®, Naprosyn®)	●			●		

SIGNIFICANT GENE-DRUG INTERACTION

	CYP1A2	CYP2B6	CYP2C19	CYP2C9	CYP3A4	CYP2D6
OPIOIDS						
codeine (Codeine Contin®)					○	●
fentanyl (Duragesic®)					○	
hydrocodone (Vicodin®)				●	○	●
hydromorphone (Dilaudid®)				●	○	●
meperidine (Demerol®)		○	●		○	
methadone (Dolophine®)		○	●	●	○	●
morphine (Avinza®)					○	
oxycodone (Oxycontin®)					○	●
oxymorphone (Opana®)					○	
tramadol (Ultram®)		○			○	●
NON-OPIOIDS						
celecoxib (Celebrex®)				●	○	
diclofenac (Voltaren®)			●	●	○	
ibuprofen (Advil®, Motrin®)			●	●	○	
meloxicam (Mobic®)				●	○	

● - Variation was found in patient genotype that may impact medication response.
○ - This gene is associated with medication response, but patient genotype is normal.

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TEST INFORMATION

The buccal swab sample was collected on 6/20/2016 and received in the laboratory on 6/21/2016. Genomic DNA was isolated and the relevant genomic regions were amplified by polymerase chain reaction (PCR). Analysis of CYP2D6 deletion and duplication was completed by electrophoresis of PCR products. Analysis of CYP1A2, CYP2B6, CYP2C19, CYP2C9, CYP2D6, CYP3A4 and OPRM1 was completed by using iPLEX MassARRAY® technology (Agena Bioscience). The following genetic variants may be detected in the assay: CYP1A2 -3860G>A (NG_008431.1:g.28338G>A), -2467T>delT (NM_000761.4:c.-1635delT), -739T>G (NM_000761.4:c.-10+103T>G), -729C>T (NM_000761.4:c.-10+113C>T), -163C>A (NM_000761.4:c.-9-154C>A), 125C>G (NM_000761.4:c.125C>G), 558C>A (NM_000761.4:c.558C>A), 2116G>A (NM_000761.4:c.1042G>A), 2473G>A (NM_000761.4:c.1130G>A) , 2499A>T (NM_000761.4:c.1156A>T), 3497G>A (NM_000761.4:c.1217G>A), 3533G>A (NM_000761.4:c.1253+1G>A), 5090C>T (NM_000761.4:c.1291C>T), 5166G>A (NM_000761.4:c.1367G>A), 5347C>T (NM_000761.4:c.1548C>T); CYP2B6 *1, *4 (NM_000767.4:c.785A>G), *6 (NM_000767.4:c.516G>T; c.785A>G), *9 (NM_000767.4:c.516G>T); CYP2C19 *1, *2 (NM_000769.2:c.681G>A), *3 (NM_000769.2:c.636G>A), *4 (NM_000769.2:c.1A>G), *5 (NM_000769.2:c.1297C>T),*6 (NM_000769.2:c.395G>A), *7 (NM_000769.2:c.819+2T>A), *8 (NM_000769.2:c.358T>C), *17 (NM_000769.2:c.-806C>T); CYP2C9 *1, *2 (NM_000771.3:c.430C>T), *3 (NM_000771.3:c.1075A>C), *4 (NM_000771.3:c.1076T>C), *5 (NM_000771.3:c.1080C>G), *6 (NM_000771.3:c.817delA); CYP2D6 *1, *2 (NM_000106.5:c.886C>T; c.1457G>C), *2A (NM_000106.5:c.-1584C>G; c.886C>T; c.1457G>C), *3 (NM_000106.5:c.775delA), *4 (NM_000106.5:c.506-1G>A; c.100C>T; c.1457G>C), *5 (CYP2D6 Deletion), *6 (NM_000106.5:c.454delT), *7 (NM_000106.5:c.971A>C), *8 (NM_000106.5:c.505G>T; c.886C>T; c.1457G>C), *9 (NM_000106.5:c.841_843delAAG), *10 (NM_000106.5:c.100C>T; c.1457G>C), *11, *12 (NM_000106.5:c.124G>A; c.886C>T; c.1457G>C), *14 (NM_000106.5:c.505G>A; c.886C>T; c.1457G>C), *15, *17 (NM_000106.5:c.320C>T; c.886C>T; c.1457G>C), *41 (NM_000106.5:c.985+39G>A; c.886C>T; c.1457G>C), gene duplication; CYP3A4 *1, *13 (NM_017460.5:c.1247C>T), *15A (NM_017460.5:c.485G>A), *22 (NM_017460.5:c.522-191C>T); OPRM1 118A>G (NM_000914.4:c.118A>G). The following rare genetic variants have not been observed by the Assurex Health, Inc. laboratory: CYP1A2 125C>G, 558C>A; CYP2C19 *7.

This test was developed and its performance characteristics determined by Assurex Health. It has not been cleared or approved by the U.S. Food and Drug Administration.
These interpretations are based upon data available in scientific literature and prescribing information for the relevant drugs. Interpretations are, in some instances, based on data regarding the pharmacokinetic, pharmacodynamic and pharmacogenomics properties of a drug derived from non-clinical studies (e.g. *in vitro* studies). Findings from studies performed in a non-clinical setting or clinical studies involving healthy subjects are not necessarily indicative of clinical performance in a particular patient.

This report was reviewed and verified on 6/22/2016 by:

Nina E. King, PhD, HCLD(ABB), CC(NRCC), CQ(NYSDOH)

Disclaimer of Liability
The information contained in this report is provided as a service and does not constitute medical advice. At the time of report generation this information is believed to be current and is based upon published research; however, research data evolves and amendments to the prescribing information of the drugs listed will change over time. While this report is believed to be accurate and complete as of the date issued, THE DATA IS PROVIDED “AS IS”, WITHOUT WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. As medical advice must be tailored to the specific circumstances of each case, the treating healthcare provider has ultimate responsibility for all treatment decisions made with regard to a patient including any made on the basis of a patient’s genotype.

Genetic testing was completed by a CLIA and CAP accredited laboratory in the United States located at:

6000 Mason-Montgomery Road
Mason, OH 45040

Customer Service
Please contact 855.891.9415 or medinfo@assurexhealth.com for assistance with report interpretation. For all other inquires please contact 866.757.9204 or support@assurexhealth.com.

GeneSight Analgesic Test Version: 2.0