

**Patient, Sample**

Date of Birth: 7/22/1984

Clinician: Sample Clinician

Order Number: 3740219

Report Date: 5/12/2021

Reference: 145CIP

Questions about report interpretation?

Contact our medical information team:

855.891.9415 | [medinfo@genesight.com](mailto:medinfo@genesight.com)

## Antidepressants

### Use as Directed

bupropion (Wellbutrin®)  
 clomipramine (Anafranil®)  
 desipramine (Norpramin®)  
 desvenlafaxine (Pristiq®)  
 imipramine (Tofranil®)  
 levomilnacipran (Fetzima®)  
 nortriptyline (Pamelor®)  
 selegiline (Emsam®)  
 trazodone (Desyre®)  
 vilazodone (Viibryd®)  
 vortioxetine (Trintellix®)

### Moderate Gene-drug Interaction

fluoxetine (Prozac®)	1
venlafaxine (Effexor®)	1
sertraline (Zoloft®)	1,4
citalopram (Celexa®)	1,4
escitalopram (Lexapro®)	1,4
mirtazapine (Remeron®)	2,7
amitriptyline (Elavil®)	3,7
doxepin (Sinequan®)	3,7

### Significant Gene-drug Interaction

duloxetine (Cymbalta®)	2,7
fluvoxamine (Luvox®)	2,7
paroxetine (Paxil®)	4,6

### Clinical Considerations

- 1: Serum level may be too high, lower doses may be required.
- 2: Serum level 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 moderately reduced efficacy.
- 6: Use of this drug may increase risk of side effects.
- 7: Serum level may be too low in smokers.

**All psychotropic medications require clinical monitoring. Medications should not be changed based solely on the test results. The results of this test are intended to supplement other clinical information considered by a healthcare provider within the context of a comprehensive medical evaluation.**

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, the characteristics of the drug prescribed, and the risk and safety information provided in the drug's labeling. Propranolol and oxcarbazepine prescribed for neuropsychiatric disorders might be considered off-label. Please consult their respective FDA drug labels for specific guidelines regarding their use.

The GeneSight Psychotropic test interpretations are based on a thorough review of published peer-reviewed literature, internal research, and FDA label information when applicable. The clinical validity and utility of the GeneSight Psychotropic test have been evaluated for patients with major depressive disorder who failed at least one psychotropic medication in multiple clinical studies.

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## Anxiolytics and Hypnotics

### Use as Directed

alprazolam (Xanax®)  
 buspirone (BuSpar®)  
 clonazepam (Klonopin®)  
 eszopiclone (Lunesta®)  
 temazepam (Restoril®)  
 zolpidem (Ambien®)

### Moderate Gene-drug Interaction

chlordiazepoxide (Librium®) 1  
 clorazepate (Tranxene®) 1  
 diazepam (Valium®) 1  
 lorazepam (Ativan®) 1  
 oxazepam (Serax®) 1  
 propranolol (Inderal®) 2,7

### Significant Gene-drug Interaction

## Clinical Considerations

- 1: Serum level may be too high, lower doses may be required.
- 2: Serum level may be too low, higher doses may be required.
- 7: Serum level may be too low in smokers..

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## Antipsychotics

### Use as Directed

**aripiprazole** (Abilify®)  
**brexpiprazole** (Rexulti®)  
**cariprazine** (Vraylar®)  
**fluphenazine** (Prolixin®)  
**iloperidone** (Fanapt®)  
**lumateperone** (Caplyta®)  
**lurasidone** (Latuda®)  
**paliperidone** (Invega®)  
**perphenazine** (Trilafon®)  
**quetiapine** (Seroquel®)  
**risperidone** (Risperdal®)  
**ziprasidone** (Geodon®)

### Moderate Gene-drug Interaction

<b>asenapine</b> (Saphris®)	2,7
<b>chlorpromazine</b> (Thorazine®)	2,7
<b>haloperidol</b> (Haldol®)	2,7
<b>thioridazine</b> (Mellaril®)	2,7

### Significant Gene-drug Interaction

<b>clozapine</b> (Clozaril®)	2,7
<b>olanzapine</b> (Zyprexa®)	2,7
<b>thiothixene</b> (Navane®)	2,7

### Clinical Considerations

- 2: Serum level may be too low, higher doses may be required.
- 7: Serum level may be too low in smokers.

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## Mood Stabilizers

### Use as Directed

**valproic acid/divalproex**  
(Depakote®)

### Moderate Gene-drug Interaction

### Significant Gene-drug Interaction

<b>lamotrigine</b> (Lamictal®)	6
<b>oxcarbazepine</b> (Trileptal®)	6,8
<b>carbamazepine</b> (Tegretol®)	6,9

### No Proven Genetic Markers

**gabapentin** (Neurontin®) 10

**lithium** (Eskalith®) 10

**topiramate** (Topamax®) 10

## Clinical Considerations

- 6: Use of this drug may increase risk of side effects.
- 8: FDA label identifies a potential gene-drug interaction for this medication.
- 9: Per FDA label, this medication is contraindicated for this genotype.
- 10: While this medication does not have clinically proven genetic markers that allow it to be categorized, it may be an effective choice based on other clinical factors.

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## Stimulants

### Use as Directed

**dexmethylphenidate**

(Focalin®)

**methylphenidate**

(Ritalin®, Concerta®)

### Moderate Gene-drug Interaction

### Significant Gene-drug Interaction

### No Proven Genetic Markers

**amphetamine salts** (Adderall®) 10

**dextroamphetamine** (Dexedrine®) 10

**lisdexamfetamine** (Vyvanse®) 10

## Non-stimulants

### Use as Directed

**atomoxetine** (Strattera®)

**guanfacine** (Intuniv®)

### Moderate Gene-drug Interaction

### Significant Gene-drug Interaction

### No Proven Genetic Markers

**clonidine** (Kapvay®) 10

## Clinical Considerations

10: While this medication does not have clinically proven genetic markers that allow it to be categorized, it may be an effective choice based on other clinical factors.

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## Patient Genotypes and Phenotypes

### Pharmacodynamic Genes

PD

<p><b>ADRA2A</b> G/G</p> <p><b>Normal Response</b></p> <p>This patient is homozygous for the G allele of the -1291G&gt;C polymorphism in the adrenergic alpha-2A receptor gene. This genotype suggests a normal response to certain ADHD medications.</p>	<p><b>HTR2A</b> G/G</p> <p><b>Increased Sensitivity</b></p> <p>This individual is homozygous variant for the G allele of the -1438G&gt;A polymorphism for the Serotonin Receptor Type 2A. They carry two copies of the G allele. This genotype has been associated with an increased risk of adverse drug reactions with certain selective serotonin reuptake inhibitors.</p>
<p><b>HLA-A*3101</b> A/A</p> <p><b>Lower Risk</b></p> <p>This patient is homozygous for the A allele of the rs1061235 A&gt;T polymorphism indicating absence of the HLA-A*3101 allele. This genotype suggests a lower risk of serious hypersensitivity reactions, including Stevens-Johnson syndrome (SJS), toxic epidermal necrolysis (TEN), maculopapular eruptions, and Drug Reaction with Eosinophilia and Systemic Symptoms when taking certain mood stabilizers.</p>	<p><b>SLC6A4</b> L/S</p> <p><b>Intermediate Response</b></p> <p>This patient is heterozygous for the short/long promoter polymorphism of the serotonin transporter gene. The short promoter allele is reported to decrease expression of the serotonin transporter compared to the homozygous long promoter allele. The patient may have a moderately decreased likelihood of response to certain selective serotonin reuptake inhibitors due to the presence of the short form of the gene.</p>
<p><b>HLA-B*1502</b> Present</p> <p><b>Higher Risk</b></p> <p>This patient carries either the HLA-B*1502 allele or a closely related *15 allele. Presence of HLA-B*1502 or some of the closely related *15 alleles suggests higher risk of serious dermatologic reactions including toxic epidermal necrolysis (TEN) and Stevens-Johnson syndrome (SJS) when taking certain mood stabilizers.</p>	

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## Patient Genotypes and Phenotypes

### Pharmacokinetic Genes

PK

#### **CES1A1** Extensive (Normal) Metabolizer

GLY/GLY

CES1A1 - GLY allele enzyme activity: Normal  
 CES1A1 - GLY allele enzyme activity: Normal

This genotype is most consistent with the extensive (normal) metabolizer phenotype. This patient is expected to have normal enzyme activity.

#### **CYP2D6** Extensive (Normal) Metabolizer

\*1/\*1

CYP2D6\*1 allele enzyme activity: Normal  
 CYP2D6\*1 allele enzyme activity: Normal

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

#### **CYP1A2** Ultrarapid Metabolizer

-163C&gt;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.

#### **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.

#### **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.

#### **UGT1A4** Extensive (Normal) Metabolizer

\*1/\*1

UGT1A4\*1 allele enzyme activity: Normal  
 UGT1A4\*1 allele enzyme activity: Normal

This genotype is most consistent with the extensive (normal) metabolizer phenotype. The patient is expected to have normal enzyme activity.

#### **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.

#### **UGT2B15** Intermediate Metabolizer

\*2/\*2

UGT2B15\*2 allele enzyme activity: Reduced  
 UGT2B15\*2 allele enzyme activity: Reduced

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** Intermediate Metabolizer

\*1/\*2

CYP2C9\*1 allele enzyme activity: Normal  
 CYP2C9\*2 allele enzyme activity: Reduced

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.

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## Additional Genotypes Not Included in Categorizing Medications

**Genotypes reported in this section have not been shown to be reliable markers of medication outcomes**

**COMT**

VAL/VAL

This patient is homozygous for the Val allele of the Val158Met polymorphism in the catechol-o-methyltransferase gene.

A summary of the studies that have assessed the potential effect of COMT genotype on response to psychotropic medications can be found here: <https://genesight.com/comt>.

To categorize medications on this pharmacogenomic test, a gene must have a variant that has been shown to have a significant impact on medication outcomes, as demonstrated in multiple well-designed studies. Studies assessing the gene in this section have not shown that it is a reliable marker of medication outcomes. Therefore, this gene does not currently meet the criteria for categorizing medications. The patient's genotype is provided for informational purposes only.



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## Gene-drug Interactions

### Use as Directed

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Antidepressants</b>									
bupropion (Wellbutrin®)			○			○	○		
clomipramine (Anafranil®)		●		●*		○	○		
desipramine (Norpramin®)						○			
desvenlafaxine (Pristiq®)				●			○		
imipramine (Tofranil®)		●		●*		○	○		
levomilnacipran (Fetzima®)				●		○	○		
nortriptyline (Pamelor®)						○			
selegiline (Emsam®)		●	○	●			○		
trazodone (Desyre®)		●				○	○		
vilazodone (Viibryd®)				●		○	○		
vortioxetine (Trintellix®)			○	●	●	○	○		
<b>Anxiolytics and hypnotics</b>									
alprazolam (Xanax®)							○		
buspirone (BuSpar®)						○	○		
clonazepam (Klonopin®)							○		
eszopiclone (Lunesta®)					●		○		
temazepam (Restoril®)			○		●		○		●
zolpidem (Ambien®)		●		●	●	○	○		
<b>Antipsychotics</b>									
aripiprazole (Abilify®)						○	○		
brexpiprazole (Rexulti®)						○	○		
cariprazine (Vraylar®)						○	○		
fluphenazine (Prolixin®)		●		●	●	○	○		
iloperidone (Fanapt®)						○	○		
lumateperone (Caplyta®)							○		
lurasidone (Latuda®)							○		
paliperidone (Invega®)						○	○		
perphenazine (Trilafon®)		●		●		○	○		

● Variation was found in patient genotype that may impact medication metabolism.

\* This gene-drug interaction is recognized by the FDA or CPIC.

○ This gene is associated with medication metabolism, but the predicted patient phenotype is normal.

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## Gene-drug Interactions

### Use as Directed (Continued)

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Antipsychotics</b>									
quetiapine (Seroquel®)						○	○		
risperidone (Risperdal®)						○	○		
ziprasidone (Geodon®)		●					○		
<b>Mood stabilizers</b>									
valproic acid/divalproex (Depakote®)			○		●			○	
<b>Stimulants</b>									
dexamethylphenidate (Focalin®)	○								
methylphenidate (Ritalin®, Concerta®)	○								
<b>Non-stimulants</b>									
atomoxetine (Strattera®)						○			
guanfacine (Intuniv®)							○		

### Moderate Gene-drug Interaction

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Antidepressants</b>									
amitriptyline (Elavil®)		●		● *	●	○	○	○	
citalopram (Celexa®)				● *		○	○		
doxepin (Sinequan®)		●		● *	●	○	○	○	
escitalopram (Lexapro®)				● *		○	○		
fluoxetine (Prozac®)				●	●	○	○		
mirtazapine (Remeron®)		●			●	○	○		
sertraline (Zoloft®)			○	● *			○		
venlafaxine (Effexor®)				●	●	○	○		
<b>Anxiolytics and hypnotics</b>									
chlordiazepoxide (Librium®)		●					○		●
clorazepate (Tranxene®)		●					○		●
diazepam (Valium®)		●	○	●	●		○		●
lorazepam (Ativan®)									●
oxazepam (Serax®)									●

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## Gene-drug Interactions

### Moderate Gene-drug Interaction (Continued)

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Anxiolytics and hypnotics</b>									
propranolol (Inderal®)		●				○			
<b>Antipsychotics</b>									
asenapine (Saphris®)		●				○	○	○	
chlorpromazine (Thorazine®)		●				○	○		
haloperidol (Haldol®)						○	○	○	
thioridazine (Mellaril®)		●		●		○	○		
chlorpromazine (Thorazine®)		●				○	○		
haloperidol (Haldol®)		●				○	○	○	
thioridazine (Mellaril®)		●		●		○	○		

### Significant Gene-drug Interaction

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Antidepressants</b>									
duloxetine (Cymbalta®)		●				○			
fluvoxamine (Luvox®)		●				○			
paroxetine (Paxil®)						○	○		
<b>Antipsychotics</b>									
clozapine (Clozaril®)		●				○	○	○	
olanzapine (Zyprexa®)		●				○	○	○	
thiothixene (Navane®)		●							
<b>Mood stabilizers</b>									
carbamazepine (Tegretol®)							○		
lamotrigine (Lamictal®)								○	
oxcarbazepine (Trileptal®)									

### No Proven Genetic Markers

	CES1A1 Normal	CYP1A2 Ultrarapid	CYP2B6 Normal	CYP2C19 Intermediate	CYP2C9 Intermediate	CYP2D6 Normal	CYP3A4 Normal	UGT1A4 Normal	UGT2B15 Intermediate
<b>Stimulants</b>									
amphetamine salts (Adderall®)									

● Variation was found in patient genotype that may impact medication metabolism.

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## Test Information

The buccal swab sample was collected on 5/10/2021 and received in the laboratory on 5/11/2021. Genomic DNA is isolated and the relevant genomic regions are amplified by polymerase chain reaction (PCR). Analysis of CYP2D6 deletion and duplication, HLA-B\*1502 and SLC6A4 is completed by electrophoresis of PCR products. Analysis of CES1A1, CYP1A2, CYP2B6, CYP2C19, CYP2C9, CYP2D6 CYP3A4, ADRA2A, COMT, HTR2A, rs1061235 (indicating presence of the HLA-A\*3101 allele or certain HLA-A\*33 alleles), UGT1A4 and UGT2B15 is completed by using iPLEX MassARRAY® technology (Agena Bioscience). The following genetic variants may be detected in the assay: CES1A1 Gly143Glu (NM\_001025194.1:c.428G>A); 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 \*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 \*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 \*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 \*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 (NM\_000106.6:c.181-1G>C; NM\_000106.5:c.886C>T; c.1457G>C), \*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 (NM\_000106.6:c.137dup), \*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 \*13 (NM\_017460.5:c.1247C>T), \*15A (NM\_017460.5:c.485G>A), \*22 (NM\_017460.5:c.522-191C>T); ADRA2A -1291G>C (NM\_000681.3:c.-1252G>C); COMT Val158Met (NM\_007310.2:c.322G>A); HLA-B\*1502; rs1061235 (NM\_002116.7:c.\*66A>T); HTR2A -1438G>A (NM\_000621.4:c.-998G>A); SLC6A4 L, S; UGT1A4 \*3 (NM\_007120.2:c.142T>G); UGT2B15 \*2 (NM\_001076.3:c.253G>T). The following rare genetic variants have not been observed by the Assurex Health Inc. Laboratory: CYP1A2 125C>G, 558C>A; CYP2C19\*7. \*1 is the reference allele and is reported by default if the other tested alleles are not detected.

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. References used to inform medication categorizations can be found here: <https://genesight.com/references>.

This report was reviewed and verified on 5/12/2021 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.

GeneSight Psychotropic is covered by U.S. Patent No. 9,111,028

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

6000 Mason-Montgomery Road

Mason, OH 45040

Laboratory Director: Nina King, PhD

### Customer Service

Please contact 855.891.9415 or [medinfo@genesight.com](mailto:medinfo@genesight.com) for assistance with report interpretation. For all other inquires please contact 866.757.9204 or [support@genesight.com](mailto:support@genesight.com).

**GeneSight Psychotropic Test Version: 4.0**