Helix

Helix Pharmacogenomics (PGx) Cardiovascular Panel

Patient Name: Jane Doe	**Patient ID:** 0123456	**Order Date:** 2025-04-29
Date of Birth: 01/01/1990	**Helix ID:** Test12345	**Report Date:** 2025-04-29
Sex Assigned at Birth: Female	**Provider Name:** Client Client	
Specimen Type: WHOLE BLOOD	**Collection Date:** 2025-01-23	

Note: This report is intended for use by a medical professional. Please discuss any adjustments to your medication with your treating provider.

Drug Summary

Antiarrhythmics	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Flecainide (Tambocor®)		⚠		
Propafenone (Rhythmol SR®)		⚠		

Anticoagulants	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Warfarin (Coumadin®, Jantoven®)				?

Antiplatelets	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Clopidogrel (Plavix®)	✓			

Beta blockers	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Metoprolol (Lopressor®, Toprol XL®)	✓			

Statins	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Atorvastatin (Lipitor®, Atorvaliq)	✓			
Fluvastatin (Lescol XL®)		⚠		
Lovastatin (Mevacor®, Altoprev®)	✓			
Pitavastatin (Livalo®, Zypitamag®)	✓			
Pravastatin (Pravachol®)	✓			
Rosuvastatin (Crestor®, Ezallor Sprinkle®)	✓			
Simvastatin (Zocor®, FloLipid®)	✓			

Legend

SYMBOL	IMPLICATION
◆!	Major gene-drug interaction, consider different drug
⚠	Major gene-drug interaction, consider reduced or increased dose
✓	No recommended action
?	Impact not determined, consider standard dose and alter as needed

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Gene Summary

GENE	RESULT	STATUS
ABCB1, rs1045642	C/C	rs1045642 C homozygote
ABCB1, rs1128503	C/C	rs1128503 C homozygote
ABCB1, rs2032582	G/G	rs2032582 G homozygote
ABCG2, rs2231142	C/A	Decreased function
CYP2C Cluster	G/G	Variant absent
CYP2C19	*1/*1	Normal Metabolizer
CYP2C9	*1/*2	Intermediate Metabolizer
CYP2D6	*1/*4	Intermediate Metabolizer
CYP3A4	*1/*1	Normal Metabolizer
CYP4F2	*1/*3	Deficient
GRK4, rs1024323	N/A	Indeterminate
SLCO1B1	*14/*37	Normal Function
VKORC1, rs9923231	C/T	rs9923231 T carrier

Drug Details

Antiarrhythmics

Flecainide (Tambocor®) — *Use caution*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Propafenone (Rhythmol SR®) — *Use caution*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Limited Evidence Drug-Gene Associations

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Digoxin (Lanoxin®) *Limited Evidence*

Gene	Result	Status
ABCB1, rs1045642	C/C	rs1045642 C homozygote
ABCB1, rs1128503	C/C	rs1128503 C homozygote
ABCB1, rs2032582	G/G	rs2032582 G homozygote

Quinidine (Quinidex®) *Limited Evidence*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Anticoagulants

Warfarin (Coumadin®, Jantoven®) *Metabolizer Impact Unknown*

Gene	Result	Status
CYP2C Cluster	G/G	Variant absent
CYP2C9	*1/*2	Intermediate Metabolizer
CYP4F2	*1/*3	Deficient
VKORC1, rs9923231	C/T	rs9923231 T carrier

Antihypertensives

Limited Evidence Drug-Gene Associations

Losartan (Cozaar®) *Limited Evidence*

Gene	Result	Status
CYP2C9	*1/*2	Intermediate Metabolizer
CYP3A4	*1/*1	Normal Metabolizer

Antiplatelets

Clopidogrel (Plavix®) *Normal response expected*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

Beta blockers

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Metoprolol (Lopressor®, Toprol XL®) *Normal response expected*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Limited Evidence Drug-Gene Associations

Atenolol (Tenormin®) *Limited Evidence*

Gene	Result	Status
GRK4, rs1024323	N/A	Indeterminate

Carvedilol (Coreg®) *Limited Evidence*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Nebivolol (Bystolic®) *Limited Evidence*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Propranolol (Inderal®) *Limited Evidence*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Timolol (Timoptol®) *Limited Evidence*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Statins

Atorvastatin (Lipitor®, Atorvaliq) *Normal response expected*

Gene	Result	Status
SLCO1B1	*14/*37	Normal Function

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Fluvastatin (Lescol XL®)

Use caution

Gene	Result	Status
CYP2C9	*1/*2	Intermediate Metabolizer
SLCO1B1	*14/*37	Normal Function

Lovastatin (Mevacor®, Altoprev®)

Normal response expected

Gene	Result	Status
SLCO1B1	*14/*37	Normal Function

Pitavastatin (Livalo®, Zypitamag®)

Normal response expected

Gene	Result	Status
SLCO1B1	*14/*37	Normal Function

Pravastatin (Pravachol®)

Normal response expected

Gene	Result	Status
SLCO1B1	*14/*37	Normal Function

Rosuvastatin (Crestor®, Ezallor Sprinkle®)

Normal response expected

Gene	Result	Status
ABCG2, rs2231142	C/A	Decreased function
SLCO1B1	*14/*37	Normal Function

Simvastatin (Zocor®, FloLipid®)

Normal response expected

Gene	Result	Status
SLCO1B1	*14/*37	Normal Function

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Methods and Limitations

Data were generated from extracted DNA using the validated Helix Exome+ assay by the Helix clinical laboratory. The Exome+ assay is based on target enrichment followed by next generation sequencing using paired end reads on an Illumina DNA sequencing system. Star alleles were determined using a proprietary algorithm which performs variant calling and then determines star allele solutions based on a combination of defining SNPs and exon-level copy number.

Metabolizer status was determined based on star allele solutions according to CPIC guidelines, with the following exceptions: (1) metabolizer status was set as Indeterminate if a novel nonsense or truncating novel mutation was observed within the gene, (2) metabolizer status was set as Indeterminate if the combination of defining SNPs and copy number suggested a novel star allele solution, and (3) if more than two copies of a gene were detected then metabolizer status was set as Indeterminate. Drug/gene considerations were limited to guidelines published by FDA, CPIC, or PharmGKB.

Phasing could not be performed for genotypes, and therefore in some cases the star allele solution could not be disambiguated between two or more equally likely possibilities. In these cases, if the metabolizer status was the same regardless of possible star allele solutions, the more common star allele solution was provided along with the metabolizer status. If the metabolizer status was different for the equally-likely star allele solutions, the star alleles were reported as Unknown and the metabolizer status was considered Indeterminate.

All samples were sequenced and interpreted in Helix's CLIA-certified (#05D2117342) and CAP-accredited (#9382893) laboratory in San Diego, California. These tests have not been cleared or approved by the U.S. Food and Drug Administration.

The reportable range includes the following results: ABCB1: rs2032582, rs1128503, rs1045642; ABCG2: rs2231142; CYP2C cluster: rs12777823; CYP2C9: *1–*61; CYP2C19: *1–*19, *22–*26, *28–*39; CYP2D6: *1–*15, *4N, *17–*65, *68–*75, *81, *83–*114; CYP3A4: *1–*24, *26, *28–*38; CYP4F2: *1,*3; GRK4: rs1024323; SLCO1B1: *1–*16, *19, *20, *23–*34, *36–*44, *47–*49; VKORC1: rs9923231. Sensitivity may be reduced for the CYP2D6*13 allele.

Results are based on: Atorvastatin, SLCO1B1 (CPIC A); Clopidogrel, CYP2C19 (FDA Section 1); Flecainide, CYP2D6 (PGKB 1A); Fluvastatin, CYP2C9, SLCO1B1 (CPIC A); Lovastatin, SLCO1B1 (CPIC A); Metoprolol, CYP2D6 (PGKB 1A); Pitavastatin, SLCO1B1 (CPIC A); Pravastatin, SLCO1B1 (CPIC A); Propafenone, CYP2D6 (FDA Section 1); Rosuvastatin, ABCG2, SLCO1B1 (CPIC A); Simvastatin, SLCO1B1 (CPIC A); Warfarin, CYP2C cluster (PGKB 1A); Warfarin, CYP2C9, CYP4F2, VKORC1 (FDA Section 1, CPIC A).

Disclaimer

The interpretations and drug considerations provided by Helix are intended solely for use by a medical professional and do not constitute medical advice by Helix. All treatment decisions and diagnoses remain the full responsibility of the treating provider. Results included in this report are based on the guidelines published by the FDA and CPIC, and do not account for other factors that may impact drug response, such as environment, medical conditions, drug-drug interactions, or additional genetic variants. Helix is not responsible or liable for any errors, omissions, or ambiguities in the interpretation or use of the results of this report. Administration of any medication listed in this report requires careful therapeutic monitoring regardless of the drug considerations outlined in this report. All dates and times displayed are Pacific Time and may vary from the dates and times for Collection, Order and Report for the providers/patients.

Result Notations

https://www.fda.gov/medical-devices/precision-medicine/table-pharmacogenetic-associations
https://cpicpgx.org/guidelines
https://www.pharmgkb.org/guidelineAnnotations

Report Signed By

Kenneth David Becker, PhD, HCLD, CQ, CGMBS

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Helix's Sequence Once, Query Often® Model

When your provider orders a genetic test through Helix, we use our proprietary Sequence Once, Query Often® model to perform whole exome sequencing and analyze the specific genes related to the test. Helix securely stores your whole exome for future clinical use. With your permission, this allows your health care providers to order future medically necessary genetic tests from Helix without needing another sample. Instead, these tests are conducted through digital analysis of your stored genetic information.

To learn more about how Helix protects the privacy and security of your genetic information and learn more about your rights, please visit https://www.helix.com/privacy-and-policy-highlights.