Helix

Helix Pharmacogenomics (PGx) Cancer 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

Antiemetics

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Ondansetron (Zofran®)	✓			
Tropisetron (Novaban®)	✓			

Antifungals

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Voriconazole (Vfend®)	✓			

Antineoplastics

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Gefitinib (Iressa®)	✓			
Mercaptopurine (Purixan®)	✓			
Tamoxifen (Soltamox®)			!	
Thioguanine (Tabloid®)	✓			

Fluoropyramidines

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Capecitabine (Xeloda®)				?
Fluorouracil (Efudex®, Adrucil®)				?
Tegafur (Teysuno®)				?

Immunosuppressants

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Azathioprine (Imuran®, Azasan®)	✓			
Tacrolimus (Prograf®)	✓			

Proton Pump Inhibitors

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Dexlansoprazole (Dexilant®)		!		
Lansoprazole (Prevacid®)		!		
Omeprazole (Prilosec®)		!		
Pantoprazole (Protonix®)		!		

Uric Acid Inhibitors

	Normal Interaction	Use with Caution	Consider Alternatives	Impact Unknown
Allopurinol (Zyloprim®, Aloprim®)		!		

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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

Gene Summary

GENE	RESULT	STATUS
ABCG2, rs2231142	C/A	Decreased function
ATIC, rs4673993	T/T	Variant absent
CYP2C19	*1/*1	Normal Metabolizer
CYP2D6	*1/*4	Intermediate Metabolizer
CYP3A5	*3/*3	Poor Metabolizer
DPYD	N/A	Indeterminate
F5, c.1601G>A (p.Arg534Gln)	G/G	Variant absent
HLA-B*57:01	ABSENT	HLA-B: *57:01 negative
MTHFR, c.665C>T (p. Ala222Val)	T/T	Detected, homozygous
NUDT15	*1/*1	Normal Metabolizer
SLC19A1, rs1051266	G/G	rs1051266 G homozygote
TPMT	*1/*1	Normal Metabolizer

Drug Details

Antiemetics

Ondansetron (Zofran®) — *Normal response expected*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Tropisetron (Novaban®) — *Normal response expected*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Antifungals

Voriconazole (Vfend®) — *Normal response expected*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

Antineoplastics

Gefitinib (Iressa®) — *Normal response expected*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Mercaptopurine (Purixan®) — *Normal response expected*

Gene	Result	Status
NUDT15	*1/*1	Normal Metabolizer
TPMT	*1/*1	Normal Metabolizer

Tamoxifen (Soltamox®) — *Consider alternative medication*

Gene	Result	Status
CYP2D6	*1/*4	Intermediate Metabolizer

Thioguanine (Tabloid®) — *Normal response expected*

Gene	Result	Status
NUDT15	*1/*1	Normal Metabolizer
TPMT	*1/*1	Normal Metabolizer

Limited Evidence Drug-Gene Associations

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Pazopanib (Votrient®) — *Limited Evidence*

Gene	Result	Status
HLA-B*57:01	ABSENT	HLA-B: *57:01 negative

Fluoropyramidines

Capecitabine (Xeloda®) — *Metabolizer Impact Unknown*

Gene	Result	Status
DPYD	N/A	Indeterminate

Fluorouracil (Efudex®, Adrucil®) — *Metabolizer Impact Unknown*

Gene	Result	Status
DPYD	N/A	Indeterminate

Tegafur (Teysuno®) — *Metabolizer Impact Unknown*

Gene	Result	Status
DPYD	N/A	Indeterminate

Immunosuppressants

Azathioprine (Imuran®, Azasan®) — *Normal response expected*

Gene	Result	Status
NUDT15	*1/*1	Normal Metabolizer
TPMT	*1/*1	Normal Metabolizer

Tacrolimus (Prograf®) — *Normal response expected*

Gene	Result	Status
CYP3A5	*3/*3	Poor Metabolizer

Limited Evidence Drug-Gene Associations

Methotrexate (Rasuvo®, Otrexup®) *Limited Evidence*

Gene	Result	Status
ATIC, rs4673993	T/T	Variant absent
MTHFR, c.665C>T (p. Ala222Val)	T/T	Detected, homozygous
SLC19A1, rs1051266	G/G	rs1051266 G homozygote

Platelet-stimulating agents

Limited Evidence Drug-Gene Associations

Avatrombopag (Doptelet®) *Limited Evidence*

Gene	Result	Status
F5, c.1601G>A (p.Arg534Gln)	G/G	Variant absent

Eltrombopag (Promacta®) *Limited Evidence*

Gene	Result	Status
F5, c.1601G>A (p.Arg534Gln)	G/G	Variant absent

Lusutrombopag (Mulpleta®) *Limited Evidence*

Gene	Result	Status
F5, c.1601G>A (p.Arg534Gln)	G/G	Variant absent

Proton Pump Inhibitors

Dexlansoprazole (Dexilant®) *Use caution*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

Lansoprazole (Prevacid®) *Use caution*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

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Omeprazole (Prilosec®) *Use caution*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

Pantoprazole (Protonix®) *Use caution*

Gene	Result	Status
CYP2C19	*1/*1	Normal Metabolizer

Uric Acid Inhibitors

Allopurinol (Zyloprim®, Aloprim®) *Increase dose*

Gene	Result	Status
ABCG2, rs2231142	C/A	Decreased function

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: ABCG2: rs2231142; ATIC: rs4673993; CYP2C19: *1–*19, *22–*26, *28–*39; CYP2D6: *1–*15, *4N, *17–*65, *68–*75, *81, *83–*114; CYP3A5: *1, *3, *6–*9; DPYD: *1, *2A, *3, *4, *6–*8, *9B, *10–*13, HapB3, rs150036960, rs72549310, rs80081766, rs150385342, rs141462178, rs200562975, rs2297595, rs139834141, rs6670886, rs115232898, rs72549308, rs72549307, rs45589337, rs146356975, rs150437414, rs145112791, rs201018345, rs183385770, rs143154602, rs72549305, rs75017182, rs140602333, rs143815742, rs61622928, rs200064537, rs764666241, rs142512579, rs186169810, rs72975710, rs144395748, rs57918000, rs199549923, rs72549304, rs111858276, rs138391898, rs148994843, rs190951787, rs142619737, rs201615754, rs59086055, rs138616379, rs145773863, rs147601618, rs17376848, rs3918289, rs55971861, rs138545885, rs137999090, rs145548112, rs146529561, rs60511679, rs112766203, rs56005131, rs199634007, rs200687447, rs60139309, rs201035051, rs55674432, rs147545709, rs67376798, rs141044036, rs145529148, rs72547602, rs72547601, rs202144771, rs139459586, rs140114515, rs148799944, rs114096998; F5: c.1601G>A (p.Arg534Gln); HLA-B*57:01; MTHFR: c.665C>T (p. Ala222Val); NUDT15: *1–*20; TPMT: *1, *2, *3A, *3B, *3C, *4–*44; SLC19A1: rs1051266; Sensitivity may be reduced for the CYP2D6*13 allele.

Results are based on: Allopurinol, ABCG2 (PGKB 1A); Azathioprine, NUDT15, TPMT (FDA Section 1, CPIC A); Capecitabine, DPYD (FDA Section 1, CPIC A); Dexlansoprazole, CYP2C19 (PGKB 1A); Fluorouracil, DPYD (FDA Section 1, CPIC A); Gefitinib, CYP2D6 (FDA Section 1); Lansoprazole, CYP2C19 (PGKB 1A; CPIC A); Mercaptopurine, NUDT15, TPMT (FDA Section 1, CPIC A); Omeprazole, CYP2C19 (PGKB 1A; CPIC A); Ondansetron, CYP2D6 (CPIC A); Pantoprazole, CYP2C19 (FDA Section 1; CPIC A); Tacrolimus, CYP3A5 (FDA Section 1); Tamoxifen, CYP2D6 (CPIC A); Tegafur, DPYD (PGKB 1A); Thioguanine, NUDT15, TPMT (FDA Section 1, CPIC A); Tropisetron, CYP2D6 (CPIC A); Voriconazole, CYP2C19 (FDA Section 1, CPIC A).

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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

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.