PHARMACOGENOMIC REPORT

Biron

Pain management

YOUR RESULTS ARE CONFIDENTIAL. As per the Genetic Non-Discrimination Act (S-201), no person, company or institution, including insurers and employers, can force you to share this report.

DO NOT MAKE ANY CHANGES TO YOUR CURRENT MEDICATION(S) WITHOUT TALKING TO YOUR DOCTOR FIRST. While genetics is important, other factors also contribute to how you react to medications. The final choice of medications used will be based on your health care provider's professional judgement. This test does not determine your risk of any health problem. It only evaluates select portions of your DNA that help predict how you may react to the medications covered.

ADMINISTRATIVE DATA

Patient Name
First Last Name

Gender: Female
Date of birth: 2023-10-03
Phone Number: (514) 000-1111
Email: demo@biron.com

Ordering Clinician
N/A

Patient Address
4105 Boul. Matte
Brossard, BC
J4Y 2Z2

Sample ID: bio021548
Sample Type: saliva

Date ordered: 2023-10-31
Date of sample reception: 2023-10-31
Date of report: 2023-11-02

Clinical Support
Email: genetics@biron.com **Phone:** 1-866-923-9222 #8702 **Fax:** (514) 317-2241

VARIANT(S) OF VERY IMPORTANT PHARMACOGENES (VIPS)

CYP1A2 IND, CYP2C19 IM, POR IA, UGT1A1 IM, UGT2B7 variable, UGT2B15 IM.

Very Important Pharmacogenes (VIPs) - visit pharmgkb.org/vips for more information.
Abbreviations - NM: Normal Metaboliser, IM: Intermediate Metaboliser, PM: Poor Metaboliser, RM: Rapid Metaboliser, UM: Ultrarapid Metaboliser, Ind: Inducible Metaboliser, NA: Normal Activity, IA: Intermediate Activity, PA: Poor Activity.

CAUTIONARY INFORMATION - MEDICATIONS TO AVOID OR USE WITH CAUTION

Medication	Identified risk	Recommendation
Clopidogrel Plavix®	Reduced clopidogrel active metabolite formation; increased on-treatment platelet reactivity; increased risk for adverse cardiac and cerebrovascular events (CYP2C19 IM).	Cardiovascular indications: avoid standard dose (75mg/day) if possible; use prasugrel or ticagrelor at standard dose if no contraindication. Neurovascular: consider alternative P2Y12 inhibitor at standard dose if clinically indicated and no contraindication.[1]

PGx RECOMMENDATIONS - PSYCHIATRY

Dose increase may be required.

Dose reduction may be required.

Exposure is difficult to predict, insufficient data to calculate dose adjustments.

All of the tested variants associate with an increased likelihood of a better response, compared to non-carriers.

> 50% of tested variants are associated with an increased likelihood of a poorer response and/or adverse drug reactions, compared to non-carriers.

Medication not recommended by peer-reviewed guidelines.

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
Antidepressants			
Selective serotonin reuptake inhibitors (SSRIs)			
Fluoxetine (Prozac®)	CYP2D6 NM, CYP2C9 NM - Normal exposure	5/6 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR2A, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Fluvoxamine (Luvox®)	CYP2D6 NM, ABCB1 - Initiate with recommended dose but may require a higher dose.	5/6 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR2A, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Paroxetine (Paxil®)	CYP2D6 NM, ABCB1 - Initiate therapy with recommended starting dose but may require a higher dose.	5/6 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR2A, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Citalopram (Celexa®)	CYP2C19 IM - Initiate with recommended dose but consider a slower titration schedule and do not exceed the following daily doses: 30mg for adults up to 65 yrs; 15mg for adults 65 yrs or older.[2,3]	5/6 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR2A, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	0/3 variants: no increased risk of gastrointestinal or SSRI-induced sexual side effects.
Escitalopram (Cipralex®)	CYP2C19 IM - Initiate with recommended dose but consider a slower titration schedule and do not exceed the following daily doses: 15mg for adults up to 65 yrs; 7.5mg for adults 65 yrs or older.[2,3]	5/6 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR2A, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	0/3 variants: no increased risk of gastrointestinal or SSRI-induced sexual side effects.
Sertraline (Zoloft®)	CYP2B6 NM, CYP2C19 IM - Initiate therapy with recommended starting dose but with a slower titration	4/5 variants: increased likelihood of a poorer response (BDNF, FKBP5, GRIK4, HTR7); consider adding L-methylfolate 15mg/day (MTHFR).	0/3 variants: no increased risk of gastrointestinal or SSRI-induced sexual side effects.

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
	schedule and a lower maintenance dose.[2]		
Serotonin–norepinephrine reuptake inhibitors (SNRIs)			
Desvenlafaxine (Pristiq®)	UGT1A1 IM, UGT2B15 IM - Initiate with recommended dose; a low dose may be adequate.	! 2/2 variants: increased likelihood of a poorer response (FKBP5, GRIK4); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Duloxetine (Cymbalta®)	↑ CYP1A2 Ind, CYP2D6 NM - Initiate therapy with recommended starting dose but may require a higher dose, especially with CYP1A2 inducers, such as smoke.	! 2/3 variants: increased likelihood of a poorer response (FKBP5, GRIK4); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Venlafaxine (Effexor XR®)	↑ CYP2D6 NM, ABCB1 - Initiate with recommended dose but may require a higher dose.	! 4/4 variants: increased likelihood of a poorer response (COMT, FKBP5, GRIK4, SLC6A2); consider adding L-methylfolate 15mg/day (MTHFR).	no marker available
Other antidepressants			
Trazodone (Desyrel®)	CYP3A4 NM - Normal exposure	no marker available	no marker available
Bupropion (Wellbutrin®)	POR - Initiate with recommended dose; a low dose may be adequate.	! 1/1 variant: increased likelihood of a poorer response for treatment of depressive symptoms (HTR2A).	no marker available
Ketamine (Ketalar®)	POR - Initiate therapy with recommended starting dose; a low dose may be adequate.	0/1 variant: no increased likelihood of a poorer response.	! 1/1 variant: increased risk of emergent hypertension (SLC6A2).
Mirtazapine (Remeron®)	↑ CYP1A2 Ind - Initiate with recommended dose but may require a higher dose, especially with CYP1A2 inducers, such as smoke.	! 2/2 variants: increased likelihood of a poorer response (FKBP5, TPH2).	no marker available
Tricyclic antidepressants (TCAs)			
Clomipramine (Anafranil®)	Normal exposure	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available
Imipramine (Tofranil®)	Normal exposure	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available
Desipramine (Norpramin®)	↑ CYP2D6 NM, ABCB1 - Initiate with recommended dose but may require a higher dose.	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available
Nortriptyline (Aventyl®)	↑ CYP2D6 NM, ABCB1 - Initiate with recommended dose but may require a higher dose.	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available
Amitriptyline (Elavil®)	~ ABCB1, CYP2C19 IM - Initiate therapy with recommended starting dose but monitor	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
	response and tolerance more closely; insufficient data to calculate dose adjustments.		
Trimipramine (Surmontil®)	ABCB1, CYP2C19 IM - Initiate therapy with recommended starting dose but monitor response and tolerance more closely; insufficient data to calculate dose adjustments.	! 1/1 variant: increased likelihood of a poorer response (TPH2)	no marker available
Central alpha-adrenergic agonists			
Clonidine (Catapres®)	CYP2D6 NM - Normal exposure	! 1/1 variant: increased likelihood of a poorer response (GNB3).	no marker available
Mood Stabilizers			
Gabapentin (Neurontin®)	ABCB1 - Initiate with recommended dose; a low dose may be adequate.	no marker available	no marker available
Lamotrigine (Lamictal®)	UGT2B7 IM - Initiate with recommended dose; a low dose may be adequate.	no marker available	HLA-B*15:02 negative - Normal risks of cutaneous adverse reactions.
Levetiracetam (Keppra®)	ABCB1 - Initiate with recommended dose; a low dose may be adequate.	no marker available	no marker available
Phenytoin (Dilantin®)	CYP2C9 NM - Normal exposure	no marker available	HLA-B*15:02 negative - normal risks of cutaneaous adverse reactions.
Pregabalin (Lyrica®)	no marker available	no marker available	no marker available
Topiramate (Topamax®)	no marker available	0/1 variant: no increased likelihood of a poorer response for treatment of alcohol-related disorders.	no marker available
Carbamazepine (Tegretol®)	UGT2B7 RM - Initiate with recommended dose but may require a higher dose.	no marker available	HLA-A*31:01 negative, HLA-B*15:02 negative - Normal risks of cutaneous adverse reactions.
Oxcarbazepine (Trileptal®)	UGT2B7 RM - Initiate with recommended dose but may require a higher dose.	no marker available	HLA-B*15:02 negative - Normal risks of cutaneous adverse reactions.
Valproic acid, Divalproex (Depakene®, Epival®)	CYP2A6 NM, CYP2C9 NM - Normal exposure	no marker available	! 1/1 variant: increased likelihood of weight gain (ANKK1).

PGx RECOMMENDATIONS - PAIN MANAGEMENT

Dose increase may be required.

Dose reduction may be required.

Exposure is difficult to predict, insufficient data to calculate dose adjustments.

All of the tested variants associate with an increased likelihood of a better response, compared to non-carriers.

> 50% of tested variants are associated with an increased likelihood of a poorer response and/or adverse drug reactions, compared to non-carriers.

Medication not recommended by peer-reviewed guidelines.

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
Analgesic			
Acetaminophen (Tylenol®)	no marker available	no marker available	no marker available
Antimetabolite			
Methotrexate	ABCB1, MTHFR - Consider using a lower dose.	no marker available	no marker available
Cannabinoids			
Cannabidiol (CBD)	CYP3A4 NM, CYP2C9 NM - Normal exposure	no marker available	no marker available
Nabilone (Cesamet®)	no marker available	no marker available	no marker available
Tetrahydrocannabinol (THC)	CYP3A4 NM, CYP2C9 NM - Normal exposure	no marker available	1/2 variants: increased risk of cannabis use disorder (CNR1).
Muscle Relaxant			
Carisoprodol (Soma®)	CYP2C19 IM - Initiate therapy with recommended starting dose and use with caution; a low dose may be adequate.	no marker available	no marker available
Methocarbamol (Robaxin®)	no marker available	no marker available	no marker available
Cyclobenzaprine (Flexeril®)	CYP1A2 Ind - Initiate with recommended dose but may require a higher dose, especially with CYP1A2 inducers, such as smoke.	no marker available	no marker available
Tizanidine (Zanaflex®)	CYP1A2 Ind - Initiate with recommended dose but may require a higher dose, especially with CYP1A2 inducers, such as smoke.	no marker available	no marker available
Nonsteroidal Anti-Inflammatory Drugs (NSAID)			
Acetylsalicylic acid (Aspirin®)	no marker available	no marker available	no marker available

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
Celecoxib (Celebrex®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Diclofenac (Voltaren®)	UGT2B7 IM - Initiate with recommended dose; a low dose may be adequate.	no marker available	no marker available
Etodolac (Ultradol®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Flurbiprofen (Ansaid®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Ibuprofen (Advil®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Indomethacin (Indocid®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Ketorolac (Toradol®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Meloxicam (Mobicox®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Naproxen (Naprosyn®)	no marker available	no marker available	no marker available
Piroxicam (Feldene®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Tenoxicam (Mobiflex®)	CYP2C9 NM - Normal exposure	no marker available	no marker available
Nabumetone (Relafen®)	↓ CYP1A2 Ind - Initiate with recommended dose; a low dose may be adequate, especially with CYP1A2 inducers, such as smoke.	no marker available	no marker available
Opioids			
Buprenorphine (Butrans®)	CYP3A4 NM - Normal exposure	no marker available	no marker available
Butorphanol (Stadol®)	no marker available	no marker available	no marker available
Fentanyl (Duragesic®)	CYP3A4 NM, CYP3A5 PM - Normal exposure	no marker available	no marker available
Hydrocodone (Hycodan®)	CYP2D6 NM - Normal exposure	0/1 variant: no increased likelihood of a poorer response.	no marker available
Hydromorphone (Dilaudid®)	no marker available	0/1 variant: no increased likelihood of a poorer response.	no marker available
Meperidine (Demerol®)	POR - Initiate therapy with recommended starting dose; a low dose may be adequate.	no marker available	no marker available
Methadone	POR - Initiate therapy with recommended starting dose; a low dose may be adequate.	no marker available	no marker available
Nalbuphine (Nubain®)	no marker available	no marker available	no marker available

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
Oxycodone (Supeudol®)	CYP3A4 NM, CYP2D6 NM - Normal exposure	0/1 variant: no increased likelihood of a poorer response.	no marker available
Remifentanil (Ultiva®)	no marker available	no marker available	no marker available
Sufentanil (Sufenta®)	CYP3A4 NM - Normal exposure	no marker available	no marker available
Tapentadol (Nucynta®)	no marker available	no marker available	no marker available
Tramadol (Ultram®)	CYP2D6 NM - Normal exposure	0/1 variant: no increased likelihood of a poorer response.	no marker available
Codeine	↑ CYP2D6 NM, UGT2B7 RM - Initiate with recommended dose but may require a higher dose.	0/1 variant: no increased likelihood of a poorer response.	no marker available
Morphine	↑ UGT2B7 RM - Initiate with recommended dose but may require a higher dose.	0/1 variant: no increased likelihood of a poorer response.	0/1 variant: no increased risk of gastrointestinal side effects (FAAH).
Opioid antagonists			
Naloxone (Narcan®)	no marker available	! 1/1 variant: no increased likelihood of a poorer response (OPRM1).	no marker available
Naltrexone (Revia®)	no marker available	! 1/1 variant: increased likelihood of a poorer response when used in combination with bupropion for weight loss (ANKK1).	no marker available

PGx RECOMMENDATIONS - COMPLEMENTARY TREATMENTS

Dose increase may be required.

Dose reduction may be required.

Exposure is difficult to predict, insufficient data to calculate dose adjustments.

All of the tested variants associate with an increased likelihood of a better response, compared to non-carriers.

> 50% of tested variants are associated with an increased likelihood of a poorer response and/or adverse drug reactions, compared to non-carriers.

Medication not recommended by peer-reviewed guidelines.

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
Antiemetics			
Dimenhydrinate (Gravol®)	no marker available	no marker available	no marker available
Granisetron (Kytril®)	CYP3A4 NM, CYP3A5 PM - Normal exposure	no marker available	no marker available
Ondansetron (Zofran®)	CYP2D6 NM - Normal exposure	no marker available	no marker available
Palonosetron (Aloxi®)	CYP2D6 NM - Normal exposure	no marker available	no marker available
Proton pump inhibitors (PPI)			
Esomeprazole (Nexium®)	no marker available	no marker available	no marker available
Dexlansoprazole (Dexilant®)	CYP2C19 IM - Initiate therapy with standard dose but for chronic therapy (> 12 weeks) and efficacy achieved, consider reducing the daily dose by 50% and monitor for continued efficacy.[4]	no marker available	no marker available
Lansoprazole (Prevacid®)	CYP2C19 IM - Initiate therapy with standard dose but for chronic therapy (> 12 weeks) and efficacy achieved, consider reducing the daily dose by 50% and monitor for continued efficacy.[4]	no marker available	no marker available
Omeprazole (Losec®)	CYP2C19 IM - Initiate therapy with standard dose but for chronic therapy (> 12 weeks) and efficacy achieved, consider reducing the daily dose by 50% and monitor for continued efficacy.[4]	no marker available	no marker available
Pantoprazole (Pantoloc®)	CYP2C19 IM - Initiate therapy with standard dose but for chronic therapy (> 12 weeks) and efficacy achieved, consider	no marker available	no marker available

Genetic Associations Identified

Medications	Exposure	Efficacy	Adverse Drug Reactions
	reducing the daily dose by 50% and monitor for continued efficacy.[4]		

PGx ASSOCIATIONS - EXPOSURE

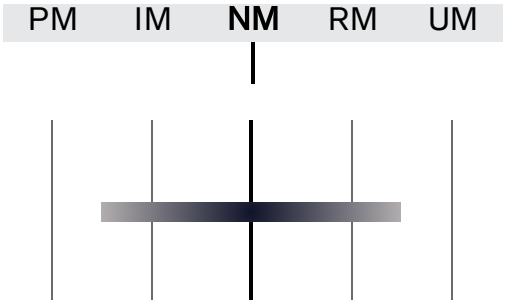
METABOLISM

The level of activity of the enzymes listed below influence your exposure to active metabolite(s).

	CYP450	POR	CES	UGT
Variants detected / tested	2/8	1/1	0/1	3/4

Enzymes	Phenotype	Genotype	Details
	PM IM **NM** RM UM		
CYTOCHROME P450 (CYP450)			
CYP3A5		*3/*3	**Poor metabolizer (PM)** Low CYP3A5 activity is the most common phenotype and has been used to establish standard doses.
CYP2C19		*1/*2	**Intermediate metabolizer (IM)** Reduced CYP2C19 activity compared to normal metabolizers.
CYP2A6		*1/*1	**Normal metabolizer (NM)** Normal CYP2A6 activity.
CYP2B6		*1/*1	**Normal metabolizer (NM)** Normal CYP2B6 activity.
CYP2C9		*1/*1	**Normal metabolizer (NM)** Normal CYP2C9 activity.

Enzymes	Phenotype	Genotype	Details
	PM IM **NM** RM UM		
CYP2D6		*2/*2	**Normal metabolizer (NM)** Normal CYP2D6 activity.
CYP3A4		*1/*1	**Normal metabolizer (NM)** Normal CYP3A4 activity.
CYP1A2		*1F/*1F	**Inducible metabolizer (Ind)** Increased CYP1A2 activity compared to normal metabolizers if the patient is exposed to CYP1A2 inducers, such as smoke.
CARBOXYLESTERASE-1 (CES1) AND CYTOCHROME P450 OXIDOREDUCTASE (POR)			
POR		A/G	**Intermediate activity (IA)** Reduced POR activity compared to normal phenotypes (POR participates in CYP2B6 activation).
CES1		C/C	**Normal metabolizer (NM)** Normal CES1 activity.
UDP-GLUCURONOSYLTRANSFERASES (UGT)			
UGT1A1		*1/*28	**Intermediate metabolizer (IM)** Reduced UGT1A1 activity compared to normal metabolizers.
UGT2B15		*1/*2	**Intermediate metabolizer (IM)** Reduced UGT2B15 activity compared to normal metabolizers.
UGT1A4		*1/*1	**Normal metabolizer (NM)** Normal UGT1A4 activity.

Enzymes	Phenotype	Genotype	Details
UGT2B7		*1/*2	**Variable metabolizer activity** The function of the *2 allele of UGT2B7 is substrate-dependent. Thus, compared to normal metabolizers, UGT2B7 activity can be increased or reduced depending on the medication substrate.

PGx ASSOCIATIONS - EXPOSURE

DISTRIBUTION

The level of activity of the efflux pumps listed below influence your exposure to medications at the site of action (e.g., central nervous system).

	ABCB1	ABCG2
Variant(s) detected / tested	1/1	0/1

Efflux Pump	Phenotype	Genotype	Details
	Poor activity / Intermediate activity / **Normal activity**		
EFFLUX PUMPS (P-GLYCOPROTEIN, MULTIDRUG RESISTANCE PROTEIN)			
ABCB1		AAT/AAT	**Poor activity (PA)** Reduced efflux pump activity may result in higher substrate concentrations, increasing the likelihood of response but also increasing the risk of adverse drug reactions.
ABCG2		G/G	**Normal activity (NA)** Normal efflux pump activity may result in normal or lower concentrations of substrates at the site of action.

PGx ASSOCIATIONS - EFFICACY

	The variants listed below have been associated with a higher likelihood of a poorer response to medications, compared to non-carriers.
	Poorer response more likely
Variant(s) detected / tested	11/18

Poorer response more likely

Gene	Reference SNP cluster ID	Variant detected	Associated medication(s)
ANKK1	rs1800497	yes	naltrexone
BDNF	rs6265	yes	citalopram, escitalopram, sertraline, fluoxetine, fluvoxamine, paroxetine
FKBP5	rs4713916	yes	citalopram, desvenlafaxine, duloxetine, escitalopram, sertraline, fluoxetine, fluvoxamine, mirtazapine, paroxetine, venlafaxine
GNB3	rs5443	yes	clonidine
GRIK4	rs1954787	yes	citalopram, desvenlafaxine, duloxetine, escitalopram, fluoxetine, fluvoxamine, paroxetine, sertraline, venlafaxine
HTR2A	rs2770296	yes	bupropion
HTR2A	rs6311	yes	citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine
HTR7	rs7905446	yes	citalopram, escitalopram, sertraline, fluoxetine, fluvoxamine, paroxetine
OPRM1	rs1799971	yes	naloxone
SLC6A2	rs2242446	yes	venlafaxine
TPH2	rs1487278	yes	amitriptyline, clomipramine, desipramine, doxepin, imipramine, mirtazapine, nortriptyline, trimipramine
ANKK1	rs1800497	no	bupropion
BDNF	rs6265	no	esketamine, ketamine
COMT	rs4680	no	venlafaxine (AA)

Gene	Reference SNP cluster ID	Variant detected	Associated medication(s)
DRD3	rs963468	no	duloxetine
GRIK1	rs2832407	no	topiramate
OPRM1	rs1799971	no	codeine, hydrocodone, hydromorphone, morphine, tramadol
SLC6A4	5-HTTLPR	no	citalopram, escitalopram, sertraline, fluoxetine, fluvoxamine, paroxetine

PGx ASSOCIATIONS - ADVERSE DRUG REACTIONS

	The variants listed below have been associated with a higher likelihood of specific adverse drug reactions, compared to non-carriers.
	Increased risk of adverse drug reactions
Variant(s) detected / tested	3/7

Increased risk of adverse drug reactions

Gene	Reference SNP cluster ID	Variant detected	Associated medication(s)
ANKK1	rs1800497	yes	weight gain: valproic acid
CNR1	rs806380	yes	cannabis use disorder: THC
SLC6A2	rs28386840	yes	hypertension: esketamine
FAAH	rs324420	no	gastrointestinal side effects (nausea, vomiting): morphine (A allele); cannabis use disorder: THC (AA)
HLA-A	*31:01	no	cutaneous adverse reactions: carbamazepine
HLA-B	*15:02	no	cutaneous adverse reactions: carbamazepine, oxcarbazepine, phenytoin
HTR2A	rs6311	no	gastrointestinal side effects (nausea, vomiting): citalopram, escitalopram, sertraline

TEST METHODOLOGY AND LIMITATIONS

The Biron pharmacogenomic test for psychiatry and pain management is a MALDI-TOF-based single nucleotide primer extension genotyping test; laboratory developed and validated test (LDT), not approved by Health Canada. Nucleic acid amplification techniques may be subject to general interference by factors such as reaction inhibitors and low quality or quantity of extracted DNA. Factors influencing the amount and quality of extracted DNA include but are not limited to patient oral hygiene, collection technique and presence of dietary or microbial source of nucleic acids and nuclease. When present, these interferents typically yield no result rather than an inaccurate one. Risk of suboptimal DNA quantity or quality is significantly reduced by automated DNA extraction which uses chemistry without PCR inhibitors (magnetic beads) and systematic dilution, quantitation and normalization of DNA before nucleic acid amplification. Very infrequent variants or polymorphisms occurring in primer-binding regions may also affect testing and could produce an erroneous result or assay failure. The test does not detect all known and unknown variations in the genes tested, nor does absence of a detectable variant (typically reported as *1 for metabolic enzymes) rule out the presence of other, non-detected variants. The test detects CYP2D6 deletion and duplication but cannot differentiate duplication in the presence of deletion. CYP2D6 deletion and duplication assays can translate into equivocal phenotype results where a range of enzyme activity level must be reported. Test results and clinical interpretation may be inaccurate for individuals who have undergone or are receiving non-autologous blood transfusions, tissue, and/or organ transplant therapies.

DISCLAIMER

Biron Health Group developed this pharmacogenomic report. This test does not diagnose any disorder, condition or disease. The interpretations and recommendations provided in this report are intended as a clinical support tool (DST) to be used solely by a healthcare professional. Treatment decisions for the patient remain the sole responsibility of the treating healthcare provider. The interpretations of the results provided by this report were determined by Biron's data curation protocol, which were established as per the current available scientific evidence available at the time this report version was created. As more evidence becomes available in the future, these interpretations may change. Some variants tested may not be used to provide report interpretations due to a lack of clear gene-drug association as determined by Biron's data curation protocol. The presence of a notification within the "Exposure", "Efficacy" or "Adverse Drug Reactions" categories for a given drug indicates that an associated genetic variant was detected. The lack of a notification within these categories for a given drug does not eliminate the requirement for dose adjustments for optimal dosage, does not guarantee effective drug therapy and does not eliminate the risks of adverse drug reactions. Commercial names are indicated as examples and do not consist an exhaustive list.

REFERENCES

For the full list of references, contact pgxinfo@biron.com

Reference(s) cited in this report:

1. *Lee CR, et al. Clinical Pharmacogenetics Implementation Consortium Guideline for CYP2C19 Genotype and Clopidogrel Therapy: 2022 Update. Clin Pharmacol Ther (2022).*
2. *Bousman CA, et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6, CYP2C19, CYP2B6, SLC6A4, and HTR2A Genotypes and Serotonin Reuptake Inhibitor Antidepressants. Clin Pharmacol Ther (2023).*
3. *Brouwer J, et al. Dutch Pharmacogenetics Working Group (DPWG) guideline for the gene-drug interaction between CYP2C19 and CYP2D6 and SSRIs. Eur J Hum Genet (2021).*
4. *Lima JJ, et al. Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2C19 and Proton*

Pump Inhibitor Dosing. Clin Pharmacol Ther (2021).