John Doe
DOB: 02/13/1990
Gender: Male
Ethnicity: Caucasian

Ordering Provider
David Sample, MD
Psychmed Clinic
Date Ordered: 11/26/2024

Sample
Whole Blood
Barcode: S202454817778
Date Collected: 11/29/2024
Date Received: 11/30/2024

Test
BrightKaire
Report Version: 1.3
Report Date: 01/03/2025

BrightKaire Report

This report consists of the BrightKaire Xcell results and the BrightKaire Pharmacogenetics (PGx) results.

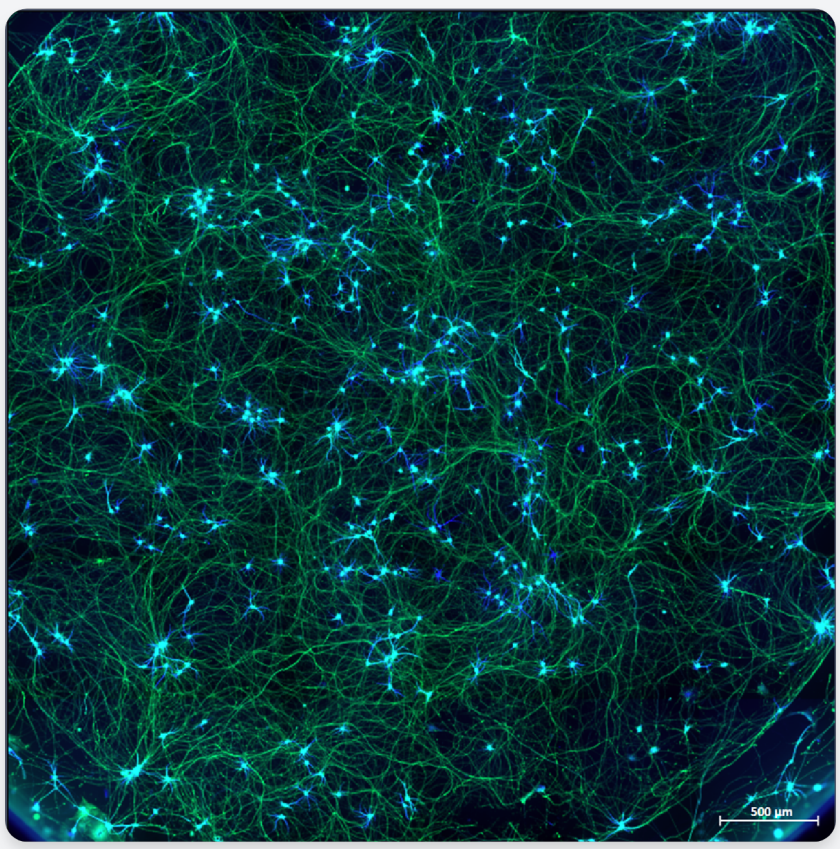
The BrightKaire Xcell results provide a profile of biological, pharmacogenetic, and clinical dimensions of your patient.

Section A provides metrics of neuronal plasticity induced by individual antidepressants on your patient's derived-neurons.

Section B focuses on patient scores on depression questionnaires and potential association with overall likelihood of drug response.

The BrightKaire PGx results assess interactions between your patient's genes and various drugs, supporting the clinician in making informed evidence-based treatment decisions.

The information provided in this report is intended as a guide only. The final choice of medications and/or dosage is at the discretion of the treating clinician and should account for all patient related information.



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BrightKaire Xcell Results

A. Neuroplasticity-based Drug Ranking

Drug Name (Brand)	PGx	Class	Score
Duloxetine (Cymbalta®)	ⓘ	SNRI	
Esketamine (Spravato®)	✓	Other	
Vortioxetine (Trintellix®)	↓	Other	
Sertraline (Zoloft®)	ⓘ	SSRI	
Fluoxetine (Prozac®)	⚠	SSRI	
Bupropion / Dextromethorphan (Auvelity®)	✓	Other	
Trazodone (Desyrel®)	✓	Other	
Venlafaxine (Effexor®)	⚠	SNRI	
Desvenlafaxine (Pristiq®)	✓	SNRI	
Buproprion (Wellbutrin®)	ⓘ	NDRI	
Vilazodone (Viibryd®)	✓	Other	
Amitriptyline (Elavil®)	↓	TCA	
Citalopram (Celexa®)	ⓘ	SSRI	
Mirtazapine (Remeron®)	ⓘ	Other	
Escitalopram (Lexapro®)	ⓘ	SSRI	
Paroxetine (Paxil®)	↓	SSRI	
Selegiline (Emsam®)	✓	MAOI	
Nortriptyline (Pamelor®)	↓	TCA	

Research demonstrates that neuroplasticity may be associated with depression and with the response to antidepressants (e.g. Duman et al., Nature Medicine, 2016; Harmer et al., Lancet Psychiatry, 2017; Magraggia et al. Neurobiol Lean Mem, 2021).

Selective Serotonin Reuptake Inhibitors | Norepinephrine-dopamine Reuptake Inhibitors | Selective Norepinephrine Reuptake Inhibitors

Tricyclic Antidepressants | Monoamine Oxidase Inhibitors | Other Antidepressants

✓ Standard dose ↑ Increase standard dose ↓ Decrease standard dose ⓘ More info ⚠ Warnings

The icons depicted above indicate the presence of pharmacogenetic information for certain drugs and correspond to the PGx results in this report. These icons appear only for drugs for which there is known pharmacogenetic data. This data can be used to personalize drug therapy based on an individual's genetic makeup.

B. Clinical Assessment

10/14/2024

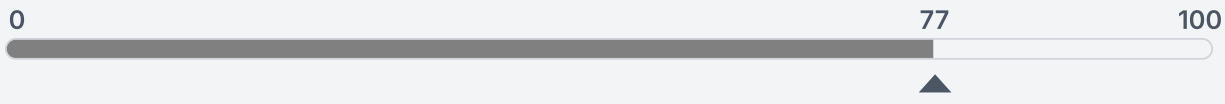
QIDS-SR-16

The QIDS-SR-16 (Quick Inventory of Depressive Symptomatology – Self-Report) is a self-report questionnaire used to assess the severity of depressive symptoms.

25
Total Score

Q-LES-Q-SF

The Q-LES-Q-SF (Quality of Life Enjoyment and Satisfaction Questionnaire) is a self-report questionnaire used to assess the impact of mental health conditions (such as depression and anxiety) and treatments on daily life.

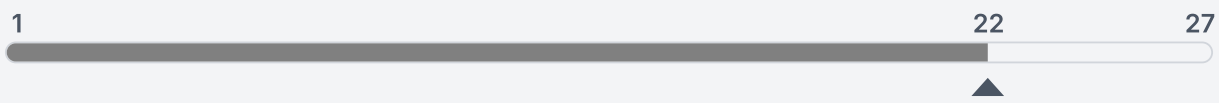


77
Total Score

11/27/2024

QIDS-SR-16

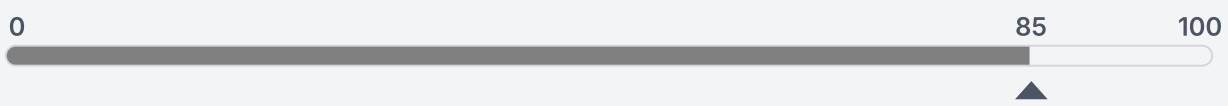
The QIDS-SR-16 (Quick Inventory of Depressive Symptomatology – Self-Report) is a self-report questionnaire used to assess the severity of depressive symptoms.



22
Total Score

Q-LES-Q-SF

The Q-LES-Q-SF (Quality of Life Enjoyment and Satisfaction Questionnaire) is a self-report questionnaire used to assess the impact of mental health conditions (such as depression and anxiety) and treatments on daily life.



85
Total Score

BrightKaire Pharmacogenetics (PGx) Results

The BrightKaire PGx report provides patient-specific drug information and is divided into four sections. Section A provides the drug impact overview, which allows the physician to determine if there are specific recommendation for the patient for any of the listed drugs. Any clinical information provided by the physician and/or by the patient is noted in Section B, followed by the patient genotype results in Section C. Detailed information on gene-drug interactions for the patient can be found in Section D, alongside the references for the interactions and any interpretation or recommendation for those interactions that are included in drug guidelines.

The results are categorized based on the supporting evidence:

1. **TIER 1** CPIC/DPWG/FDA drug label recommendations
2. **TIER 2** FDA pharmacogenetic interaction table/PharmGKB level 2
3. **TIER 3** Emerging evidence: PharmGKB level 3

A. Drug Impact Overview

This section presents a breakdown of medication options tailored to the patient's specific genetic profile, based on their BrightKaire PGx test. Healthcare providers can use these results to support informed treatment decisions, with detailed information provided in the subsequent parts of this report. The interpretation provided in this report is intended as a guide only. The final choice of medications and/or dosage is at the discretion of the treating physician and should account for all patient-related information.

Use as directed
No significant gene-drug interaction was identified impacting medication administration.

Dosage considerations
Evidence demonstrates a gene-drug interaction that may warrant a dose change. Refer to Gene-Drug Interactions table for detailed information and references.

Other considerations & warnings
An identified gene-drug interaction is associated with efficacy considerations, contraindications, or warnings. Refer to Gene-Drug Interactions table for detailed information and references.

Use as Directed	Dosage Considerations	Other Considerations & Warnings
ANTIDEPRESSANTS		
Selective Serotonin Reuptake Inhibitors (SSRIs)		
Citalopram (Celexa®) ⓘ 3 Escitalopram (Lexapro®) ⓘ 3 Sertraline (Zoloft®) ⓘ 3	Fluvoxamine (Luvox®) ↓ 1 Paroxetine (Paxil®) ↓ 1	Fluoxetine (Prozac®) ⚠ 1
Norepinephrine-dopamine Reuptake Inhibitors (NDRI)		
	Bupropion (Wellbutrin®) ⓘ 2	
Selective Norepinephrine Reuptake Inhibitors (SNRIs)		
Desvenlafaxine (Pristiq®) Levomilnacipran (Fetzima®) Milnacipran (Savella®)	Duloxetine (Cymbalta®) ⓘ 2	Venlafaxine (Effexor®) ⚠ 1
Tricyclic Antidepressants (TCAs)		
Amoxapine (Asendin®) Protriptyline (Vivactil®) Tianeptine (Stablon®)	Amitriptyline (Elavil®) ↓ 1 Clomipramine (Anafranil®) ↓ 1 Desipramine (Norpramin®) ↓ 1 Doxepin (Sinequan®) ↓ 1 Imipramine (Tofranil®) ↓ 1 Nortriptyline (Pamelor®) ↓ 1 Trimipramine (Surmontil®) ↓ 1	
Monoamine Oxidase Inhibitors (MAOIs)		
Isocarboxazid (Marplan®) Phenelzine (Nardil®) Selegiline (Emsam®) Tranylcypromine (Parnate®)		
Other Antidepressants		
Brexanolone (Zulresso®) Esketamine (Spravato®) Maprotiline (Ludiomil®) Nefazodone (Serzone®) Trazodone (Desyrel®) Vilazodone (Viibryd®)	Mirtazapine (Remeron®) ⓘ 3	

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Use as Directed	Dosage Considerations	Other Considerations & Warnings
ANTIDEPRESSANTS		
Other Antidepressants		
	Vortioxetine (Trintellix®) ↓ 1	
ANXIOLYTICS		
Alprazolam (Xanax®) Buspirone (Buspar®) Chlordiazepoxide (Librium®) Clonazepam (Klonopin®) Clorazepate (Tranxene®) Diazepam (Valium®) Hydroxyzine (Vistaril®) Propranolol (Inderal®)	Lorazepam (Ativan®) ⓘ 3 Oxazepam (Serax®) ⓘ 3	
ANTIPSYCHOTICS		
Conventional Antipsychotics		
Chlorpromazine (Thorazine®) Fluphenazine (Prolixin®) Loxapine (Loxitane®) Perphenazine (Trilafon®) Thiothixene (Navane®)	Haloperidol (Haldol®) ↓ 1	
Atypical Antipsychotics		
Asenapine (Saphris®) Brexpiprazole (Rexulti®) Cariprazine (Vraylar®) Lumateperone (Caplyta®) Lurasidone (Latuda®) Olanzapine (Zyprexa®) ⓘ 3 Paliperidone (Invega®) Pimavanserin (Nuplazid®) Quetiapine (Seroquel®) Ziprasidone (Geodon®)	Aripiprazole (Abilify®) ↓ 1 Clozapine (Clozaril®) ↓ 1 Iloperidone (Fanapt®) ↓ 1 Risperidone (Risperdal®) ↓ 1	

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Use as Directed	Dosage Considerations	Other Considerations & Warnings
ANTIPSYCHOTICS		
Other Antipsychotics		
Trifluoperazine (Stelazine®)		Thioridazine (Mellaril®) ⚠ 1
ANTICONVULSANTS		
Brivaracetam (Briviact®) Carbamazepine (Tegretol®) Clobazam (Onfi®) Epidiolex (Epidiolex®) Felbamate (Felbatol®) Gabapentin (Neurontin®) Lacosamide (Vimpat®) Levetiracetam (Keppra®) Lithium (Lithobid®) Oxcarbazepine (Trileptal®) Perampanel (Fycompa®) Phenobarbital (Luminal®) Pregabalin (Lyrica®) Topiramate (Topamax®) Valproic (acid Depakote®) Zonisamide (Zonegran®)	Fosphenytoin (Cerebyx®) ⓘ 1 Lamotrigine (Lamictal®) ⓘ 3 Phenytoin (Dilantin®) ⓘ 1	
ADHD		
Dexmethylphenidate (Focalin®) Dextroamphetamine/Amphetamine (Adderall®) Guanfacine (Intuniv®) Lisdexamfetamine (Vyvanse®) Methylphenidate (Ritalin®) Viloxazine (Qelbree®)	Atomoxetine (Strattera®) ↑ 1	

Standard dose | Increase standard dose | Decrease standard dose | ⓘ More info | ⚠ Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Use as Directed	Dosage Considerations	Other Considerations & Warnings
PAIN MEDICATION		
Acetaminophen (Tylenol®) Celecoxib (Celebrex®) Diclofenac (Voltaren®) Flurbiprofen (Ansaid®) Ibuprofen (Advil®) Lornoxicam (Xefo®) Morphine (MS Contin®) Naloxone (Narcan®)	Dextropropoxyphene (Darvon®) ⓘ 3 Fentanyl (Duragesic®) ⓘ 3 Meloxicam (Mobic®) ↓ 1 Methadone (Methadose®) ⓘ 2 Oxycodone (OxyContin®) ⓘ 3 Sufentanil (Sufenta®) ⓘ 3	Codeine ⓘ 1 Dexmedetomidine (Precedex®) ⓘ 3 Hydrocodone (Zohydro®) ⓘ 1 Piroxicam (Feldene®) ⚠ 1 Tenoxicam (Mobiflex®) ⚠ 1 Tramadol (Ultram®) ⓘ 1
SLEEP MEDICATION AND ANESTHETICS		
Armodafinil (Nuvigil®) Daridorexant (Quviviq®) Eszopiclone (Lunesta®) Lemborexant (Dayvigo®) Midazolam (Versed®) Modafinil (Provigil®) Ramelteon (Rozerem®) Suvorexant (Belsomra®) Temazepam (Restoril®) Triazolam (Halcion®) Zaleplon (Sonata®) Zolpidem (Ambien®)	Ketamine (Ketalar®) ⓘ 3	
CNS DISEASES TREATMENT		
Dextromethorphan/Quinidine (Nuedexta®) Donepezil (Aricept®) Entacapone (Comtan®) ⓘ 3	Deutetrabenazine (Austedo®) ⓘ 1 Pimozide (Orap®) ↓ 1 Siponimod (Mayzent®) ⓘ 1 Tetrabenazine (Xenazine®) ⓘ 1	

Standard dose | Increase standard dose | Decrease standard dose | ⓘ More info | ⚠ Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Use as Directed	Dosage Considerations	Other Considerations & Warnings
CNS DISEASES TREATMENT		
	Valbenazine (Ingrezza®) ⓘ 1	
STATINS		
Lovastatin (Mevacor®) Pitavastatin (Livalo®) Rosuvastatin (Crestor®) Simvastatin (Zocor®)	Fluvastatin (Lescol®) ⓘ 1	Atorvastatin (Lipitor®) ⚠ 3 Pravastatin (Pravachol®) ⚠ 3

Standard dose | Increase standard dose | Decrease standard dose | ⓘ More info | ⚠ Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

B. Clinical Information

This section contains clinical information provided by the physician and/or by the patient.

Medication(s) under consideration

None shared with NeuroKaire.

Current medication(s)

None shared with NeuroKaire.

Prior medication(s)

None shared with NeuroKaire.

C. Genotype Results

This section provides patient genotypes for all tested genes and variants. Associated phenotypes are provided where applicable.

Pharmacokinetic Genes

Gene	Genotype	Phenotype
ABCB1 rs2032583		Normal Function
ABCG2 rs2231142		Decreased Function
ADRA2A rs1800544		Decreased Function
CYP2B6		Normal Metabolizer
CYP3A5		Poor Metabolizer
HLA-A rs1061235		Average Risk

Pharmacodynamic/Immunology Genes

Gene	Genotype
CYP2C19	
CYP2D6	
CYP3A4	
CES1 rs7164787	
HLA-A rs1061235	

D. Gene-Drug Interactions

This section contains a list of gene-drug interactions specific to this patient. Drugs are listed in categories and classes and are ordered alphabetically. The publicly available source for each interaction is listed as well.

Drug	Genotype	Interpretation / Recommendation	Source
ANTIDEPRESSANTS			
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Citalopram (Celexa®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 37032427
	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192
	BDNF rs6265 C/C	Standard use.	PGKB ID 1043858606
	CACNA1C rs1006737 G/G	Standard use.	PGKB ID 1444704763
	HTR2A rs7997012 G/G	Standard use.	PGKB ID 637880425
Escitalopram (Lexapro®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 37032427
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192
Fluoxetine (Prozac®)	CYP2D6 *4/*15	Adverse events.	FDA drug label recommendation
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192
Fluvoxamine (Luvox®)	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
ANTIDEPRESSANTS			
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Fluvoxamine (Luvox®)	CYP2D6 *10/*15	Initiate therapy with recommended starting dose.	CPIC; PMID 37032427
	CYP2D6 *4/*15	Consider a 25-50% lower starting dose and slower titration. Consider alternative drug not predominantly metabolized by CYP2D6.	CPIC; PMID 37032427
	COMT rs4680 A/G	Standard use.	PGKB ID 1043880039
Paroxetine (Paxil®)	CYP2D6 *10/*15	Consider lower starting dose and slower titration.	CPIC; PMID 37032427
	CYP2D6 *4/*15	Consider a 50% reduction in starting dose, slower titration and 50% lower maintenance dose.	CPIC; PMID 37032427
	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192
	BDNF rs6265 C/C	Standard use.	PGKB ID 982040494
	COMT rs4680 A/G	Standard use.	PGKB ID 1444706787
Sertraline (Zoloft®)	CYP2B6 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 37032427
	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414
	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953192

Standard dose · Increase standard dose · Decrease standard dose · More info · Warnings

Evidence tiers: 1 Guidlines · 2 FDA PGx Table/PharmGKB Level 2 · 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
ANTIDEPRESSANTS			
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Sertraline (Zoloft®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 37032427
Norepinephrine-dopamine Reuptake Inhibitors (NDRI)			
Bupropion (Wellbutrin®)	CYP2B6 *1/*1	Dose considerations. (2)	PGKB level 2A ID 1445421156
Selective Norepinephrine Reuptake Inhibitors (SNRIs)			
Duloxetine (Cymbalta®)	CYP2D6 *4/*15	Dose considerations. (2)	FDA table of pharmacogenomic interactions
Milnacipran (Savella®)	ADRA2A rs1800544 C/G	Standard use.	PGKB ID 1447953199
Venlafaxine (Effexor®)	CYP2D6 *4/*15	Consider an alternative not predominantly metabolized by CYP2D6. (1)	CPIC; PMID 37032427
	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414
	COMT rs4680 A/G	Standard use (Depressive Disorders). (3)	PGKB ID 1043880165
	HTR2A rs7997012 G/G	Standard use.	PGKB ID 982038273
Tricyclic Antidepressants (TCAs)			
Amitriptyline (Elavil®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 27997040
	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring. (1)	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring. (1)	CPIC; PMID 27997040
	ABCB1 rs2032583 A/A	Standard use.	PGKB ID 619523414

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
ANTIDEPRESSANTS			
Tricyclic Antidepressants (TCAs)			
Clomipramine (Anafranil®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 27997040
	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
Desipramine (Norpramin®)	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
Doxepin (Sinequan®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 27997040
	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
Imipramine (Tofranil®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose.	CPIC; PMID 27997040
	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040
Nortriptyline (Pamelor®)	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring.	CPIC; PMID 27997040

Standard dose · Increase standard dose · Decrease standard dose · More info · Warnings

Evidence tiers: 1 Guidlines · 2 FDA PGx Table/PharmGKB Level 2 · 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
ANTIDEPRESSANTS			
Tricyclic Antidepressants (TCAs)			
Nortriptyline (Pamelor®)	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring. ⚠ 1	CPIC; PMID 27997040
Trimipramine (Surmontil®)	CYP2C19 *1/*1	Initiate therapy with recommended starting dose. ✓	CPIC; PMID 27997040
	CYP2D6 *10/*15	Consider 25% reduction of starting dose. Utilize therapeutic drug monitoring. ↓ 1	CPIC; PMID 27997040
	CYP2D6 *4/*15	Avoid use. If warranted, consider a 50% reduction of starting dose. Utilize therapeutic drug monitoring. ⚠ 1	CPIC; PMID 27997040
Other Antidepressants			
Mirtazapine (Remeron®)	CYP2B6 *1/*1	Dose considerations. ⓘ 3	PGKB ID 1183614989
Vortioxetine (Trintellix®)	CYP2D6 *10/*15	Initiate therapy with recommended starting dose. ✓	CPIC; PMID 37032427
	CYP2D6 *4/*15	Initiate 50% of starting dose and titrate to maximum recommended dose or consider alternative not predominantly metabolized by CYP2D6. ↓ 1	CPIC; PMID 37032427
ANXIOLYTICS			
Lorazepam (Ativan®)	UGT2B15 *1/*5 (rs1902023 C/A, rs4148269 T/G)	Dose considerations. ⓘ 3	PGKB ID 1450826374
Oxazepam (Serax®)	UGT2B15 *1/*5 (rs1902023 C/A, rs4148269 T/G)	Dose considerations. ⓘ 3	PGKB ID 655387798
ANTIPSYCHOTICS			
Conventional Antipsychotics			
Haloperidol (Haldol®)	CYP2D6 *10/*15	Standard use. ✓	DPWG; PMID 37002327
	CYP2D6 *4/*15	Use 60% of normal dose. ↓ 1	DPWG; PMID 37002327
	COMT rs4680 A/G	Adverse events. ⚠ 3	PGKB ID 1444673123

✓ Standard dose ↑ Increase standard dose ↓ Decrease standard dose ⓘ More info ⚠ Warnings

Evidence tiers: 1 Guidlines 2 FDA PGx Table/PharmGKB Level 2 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
ANTIPSYCHOTICS			
Atypical Antipsychotics			
Aripiprazole (Abilify®)	CYP2D6 *10/*15	Standard use.	DPWG; PMID 37002327
	CYP2D6 *4/*15	Adverse reaction risk requires dose adjustment. Refer to FDA labeling.	DPWG; PMID 37002327
Clozapine (Clozaril®)	CYP2D6 *4/*15	May be necessary to reduce dose.	FDA drug label recommendation
	COMT rs4680 A/G	Standard use.	PGKB ID 1445402111
	HTR2C rs3813929 T	Standard use.	PGKB ID 1451256466
Iloperidone (Fanapt®)	CYP2D6 *4/*15	Reduce dose by one-half.	FDA drug label recommendation
Olanzapine (Zyprexa®)	BDNF rs6265 C/C	Standard use.	PGKB ID 1446896644
	HTR2A rs7997012 G/G	Standard use.	PGKB ID 655385613
	HTR2C rs3813929 T	Standard use.	PGKB ID 1451256440
	TPMT *1/*1	Standard use.	PGKB ID 1444607507
Quetiapine (Seroquel®)	CYP3A4 *1/*1	Standard use.	DPWG; PMID:37002327
Risperidone (Risperdal®)	CYP2D6 *10/*15	Standard use.	DPWG; PMID 37002327

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

brightkaire

John Doe **Sample barcode: S202454817778** **BrightKaire PGx**

Drug	Genotype	Interpretation / Recommendation	Source
ANTIPSYCHOTICS			
Atypical Antipsychotics			
Risperidone (Risperdal®)	CYP2D6 *4/*15	Use 67% of normal dose. If side effects, reduce further to 50% of normal dose.	DPWG; PMID 37002327
	HTR2C rs3813929 T	Standard use.	PGKB ID 1451256448
Other Antipsychotics			
Thioridazine (Mellaril®)	CYP2D6 *4/*15	Contraindicated. Results in higher systemic concentrations and adverse reaction risk.	FDA drug label recommendation
ANTICONVULSANTS			
Carbamazepine (Tegretol®)	HLA-A *31:01 Negative	Standard use.	CPIC; PMID 29392710
Fosphenytoin (Cerebyx®)	CYP2C9 *1/*2	Dose considerations.	CPIC; PMID 25099164
Lamotrigine (Lamictal®)	ABCG2 rs2231142 G/G	Standard use.	PGKB ID 1448100487
	UGT1A4 *1/*3b	Dose considerations.	PGKB ID 1184986623
Oxcarbazepine (Trileptal®)	HLA-A *31:01 Negative	Standard use.	PGKB ID 1451184626
Phenytoin (Dilantin®)	CYP2C9 *1/*2	Dose considerations.	CPIC; PMID 25099164
ADHD			
Atomoxetine (Strattera®)	CYP2D6 *10/*15	Initiate with a dose of 40mg/day and increase to 80mg/day after 3 days. If no clinical response and in the absence of adverse events after 2 weeks consider increasing dose to 100mg/day. If no clinical response after 2 weeks, consider obtaining a peak plasma concentration. If <200ng/ml, consider a proportional increase in dose to approach 400ng/ml. If unacceptable side effects at any time consider a reduction in dose.	CPIC; PMID 30801677
	CYP2D6 *4/*15	Initiate with a dose of 40mg/day and increase to 80mg/day after 3 days. If no clinical response and in the absence of adverse events after 2 weeks consider increasing dose to 100mg/day. If no clinical response after 2 weeks, consider obtaining a peak plasma concentration. If <200ng/ml, consider a proportional increase in dose to approach 400ng/ml. If unacceptable side effects at any time consider a reduction in dose.	CPIC; PMID 30801677
Methylphenidate (Ritalin®)	CES1 rs71647871 C/C	Standard use.	PGKB ID 981202090; PGKB ID 1451346385

Standard dose · Increase standard dose · Decrease standard dose · More info · Warnings

Evidence tiers: 1 Guidlines · 2 FDA PGx Table/PharmGKB Level 2 · 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
PAIN MEDICATION			
Acetaminophen (Tylenol®)	UGT2B15 *1/*5 (rs1902023 C/A, rs4148269 T/G)	Standard use.	PGKB ID 1450374101
Celecoxib (Celebrex®)	CYP2C9 *1/*2	Initiate therapy with recommended starting dose.	CPIC; PMID 32189324
Codeine	CYP2D6 *10/*15	Use recommended dose. If no response, consider a non-tramadol opioid.	CPIC; PMID 33387367
	CYP2D6 *4/*15	Avoid codein due to possibility of diminished analgesia. If warranted, consider a non-tramadol opioid.	CPIC; PMID 33387367
Dexmedetomidine (Precedex®)	ADRA2A rs1800544 C/G	Response considerations.	PGKB ID 1183490962
Dextropropoxyphene (Darvon®)	CYP3A5 *3/*3	Dose considerations.	PGKB ID 1450812594
Fentanyl (Duragesic®)	CYP3A4 *1/*1	Standard use.	PGKB ID 1450931850
	CYP3A5 *3/*3	Dose considerations.	PGKB ID 1449713943
Flurbiprofen (Ansaid®)	CYP2C9 *1/*2	Initiate therapy with recommended starting dose.	CPIC; PMID 32189324
Hydrocodone (Zohydro®)	CYP2D6 *10/*15	Use recommended dose. If no response and opioid use is warranted, consider a non-tramadol or non-codeine opioid.	CPIC; PMID 33387367
	CYP2D6 *4/*15	Use recommended dose. If no response, consider a non-codeine opioid.	CPIC; PMID 33387367
Ibuprofen (Advil®)	CYP2C9 *1/*2	Initiate therapy with recommended starting dose.	CPIC; PMID 32189324

Standard dose · Increase standard dose · Decrease standard dose · More info · Warnings

Evidence tiers: 1 Guidlines · 2 FDA PGx Table/PharmGKB Level 2 · 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
PAIN MEDICATION			
Lornoxicam (Xefo®)	CYP2C9 *1/*2	Initiate therapy with recommended starting dose.	CPIC; PMID 32189324
Meloxicam (Mobic®)	CYP2C9 *1/*2	Initiate therapy with 50% of the lowest recommended starting dose. Titrate dose upward to clinical effect or 50% of the maximum recommended dose with caution. Alternatively choose alternative medication.	CPIC; PMID 35152405
Methadone (Methadose®)	CYP2B6 *1/*1	Dose considerations.	PGKB level 2A ID 1448104189
Morphine (MS Contin®)	OPRM1 rs1799971 A/A	Standard use.	PGKB ID 1451350944
Naloxone (Narcan®)	OPRM1 rs1799971 A/A	Standard use.	PGKB ID 655385241
Oxycodone (OxyContin®)	CYP3A4 *1/*1	Standard use.	PGKB ID 1451567040
	CYP3A5 *3/*3	Dose considerations.	PGKB ID 1449003986
Piroxicam (Feldene®)	CYP2C9 *1/*2	Choose other medication.	CPIC; PMID 32189324
Sufentanil (Sufenta®)	CYP3A5 *3/*3	Dose considerations.	PGKB ID 1451135188
Tenoxicam (Mobiflex®)	CYP2C9 *1/*2	Choose other medication.	CPIC; PMID 32189324
Tramadol (Ultram®)	CYP2D6 *10/*15	Use recommended dose. If no response, consider a non-codeine opioid.	CPIC; PMID 33387367
	CYP2D6 *4/*15	Avoid codein due to possibility of diminished analgesia. If warranted, consider a non-codeine opioid.	CPIC; PMID 33387367

Standard dose · Increase standard dose · Decrease standard dose · More info · Warnings

Evidence tiers: 1 Guidlines · 2 FDA PGx Table/PharmGKB Level 2 · 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
SLEEP MEDICATION AND ANESTHETICS			
Ketamine (Ketalar®)	CYP2B6 *1/*1	Dose considerations. ⓘ 3	PGKB ID 1446899303
CNS DISEASES TREATMENT			
Deutetrabenazine (Austedo®)	CYP2D6 *4/*15	The total daily dosage of austedo should not exceed 36 mg (maximum single dose of 18 mg). ⓘ 1	FDA drug label recommendation
Entacapone (Comtan®)	COMT rs4680 A/G	Standard use. ⓘ 3	PGKB ID 1444704400
Pimozide (Orap®)	CYP2D6 *10/*15	Standard use. ✓	DPWG; PMID 37002327
	CYP2D6 *4/*15	Dosages should not exceed 4mg/day in adults and should not be increased earlier than 14 days. ↓ 1	DPWG; PMID 37002327
Siponimod (Mayzent®)	CYP2C9 *1/*2	Dose considerations. ⓘ 1	FDA drug label recommendation
Tetrabenazine (Xenazine®)	CYP2D6 *10/*15	The maximum daily dose is 100 mg with a maximum single dose of 37.5 mg. ⓘ 1	FDA drug label recommendation
	CYP2D6 *4/*15	The maximum daily dose in pms is 50 mg with a maximum single dose of 25 mg. ⓘ 1	FDA drug label recommendation
Valbenazine (Ingrezza®)	CYP2D6 *4/*15	Recommended dosage is 40mg once daily. ⓘ 1	FDA drug label recommendation
STATINS			
Atorvastatin (Lipitor®)	SLCO1B1 *1/*1	Standard use. ✓	CPIC; PMID 35152405
	CYP3A5 *3/*3	Adverse events. ⚠ 3	PGKB ID 1183491278
Fluvastatin (Lescol®)	CYP2C9 *1/*2	Prescribe ≤40mg per day as a starting dose and adjust doses of fluvastatin based on disease-specific guidelines. Otherwise choose alternative medication or combination. ⓘ 1	CPIC; PMID 32189324

✓ Standard dose ↑ Increase standard dose ↓ Decrease standard dose ⓘ More info ⚠ Warnings

Evidence tiers: 1 Guidlines 2 FDA PGx Table/PharmGKB Level 2 3 Emerging Evidence

Drug	Genotype	Interpretation / Recommendation	Source
STATINS			
Fluvastatin (Lescol®)	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405
Lovastatin (Mevacor®)	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405
Pitavastatin (Livalo®)	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405
Pravastatin (Pravachol®)	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405
	MTHFR rs1801133 A/G	Adverse events. 3	PGKB ID 1183491775
Rosuvastatin (Crestor®)	ABCG2 rs2231142 G/G	Standard use.	CPIC; PMID 35152405
	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405
Simvastatin (Zocor®)	SLCO1B1 *1/*1	Standard use.	CPIC; PMID 35152405

Standard dose | Increase standard dose | Decrease standard dose | More info | Warnings

Evidence tiers: 1 Guidlines | 2 FDA PGx Table/PharmGKB Level 2 | 3 Emerging Evidence

Reference Information Disclaimer

The interpretations/recommendations noted in this report are based on publicly available information from CPIC or DPWG guidelines, FDA label recommendations, FDA table of pharmacogenetic associations and peer-reviewed publications also annotated in PharmGKB. The source and level of evidence for each interpretation/recommendation is annotated and an associated link provided. Before using this information in consideration of medication choice it is important to review and consider the evidence base. These references are not comprehensive, nor exhaustive, additional unknown associations can occur, and additional patient context may be relevant to consider. The results do not take into account interactions between drugs nor combination drugs, co-morbidities or combinatorial gene-drug interactions. Additional considerations beyond the patient's genotype and the pharmacogenetic analysis affect drug response, and treatment decisions, patient care and clinical monitoring should be based on the independent judgment of the physician using all information related to the patient. NeuroKaire is not liable for medical judgment in connection with test results. The test results and information in this report are current as of the date of the report, and updated reports will not be provided. Our team is available to discuss test results, however genetic counseling is not provided by NeuroKaire. The physician or patient are encouraged to contact a genetic counselor to discuss test results and implications.

Methods

BrightKaire PGx uses DNA extracted from whole blood samples for microarray analysis of selected targeted variants using the genome-wide genotyping array Infinium Global Diversity Array (GDA) with Enhanced PGx Array version 8.1.0 by Illumina on Illumina's iScan instrument with DRAGEN pipeline analysis. Variant calling, secondary bioinformatic processes, variant annotation and interpretation are performed using GenetikaPlus US Inc in house bioinformatics pipeline V1.0 leveraging PharmCAT annotation tool version 2.9.0.

Wild type designations (*1) are applied when variants are not detected at the queried locations, and variants reported are based solely on the queried locations. Therefore, this test does not exclude the possibility of alternative diplotypes if those include unqueried locations.

In some instances, diplotypes cannot be differentiated without additional testing. In these cases, the report will list all possible diplotypes.

In rare cases, the test will not be able to report on specific genotypes (e.g. CYP2D6 *3 or *9) due to missing calls for variants key for determining the specific genotype. In such cases this is clearly noted in the genotype results section.

This test does not detect structural variants such as hybrid, tandem alleles and others. The reported CNVs are not confirmed by orthogonal analysis.

HTR2C is X-linked it will be reported as a single nucleotide in males.

DNA extraction, variant calling, secondary bioinformatic processes, variant annotation and interpretation are performed at GenetikaPlus US Inc CLIA laboratory #31D2303234 located at 78 John Miller Way, Suite 420, Kearny Point, NJ. Microarray analysis is performed at TruDiagnostic CLIA laboratory #18D2183496 located at 881 Corporate Drive, Lexington, KY 40503.

List of Drugs

Alprazolam, Amitriptyline, Amoxapine, Aripiprazole, Armodafinil, Asenapine, Atomoxetine, Atorvastatin, Brexanolone, Brexpiprazole, Bupropion, Buspirone, Carbamazepine, Cariprazine,Celecoxib, Chlordiazepoxide, Chlorpromazine, Citalopram, Clobazam, Clomipramine, Clonazepam, Clorazepate, Clozapine, Codeine, Daridorexant,Desipramine,Desvenlafaxine, Deutetrabenazine, Dexmethylphenidate,Dextroamphetamine/Amphetamine, Dextromethorphan/ Quinidine, Diazepam, Diclofenac,Doxepin,Duloxetine, Epidiolex, Escitalopram, Esketamine, Eszopiclone, Felbamate, Fentanyl,Fluoxetine,Fluphenazine, Flurbiprofen,Fluvastatin, Fluvoxamine, Gabapentin, Guanfacine,Haloperidol,Hydrocodone,Hydoxyzine,Iloperidone, Imipramine, Isocarboxazid, Lacosamide, Lamotrigine, Lemborexant,Levetiracetam,Levomilnacipran, Lisdexamfetamine, Lithium, Lorazepam, Loxapine, Lovastatin, Lumateperone, Lurasidone, Maprotiline, Meloxicam, Methadone, Methylphenidate, Milnacipran, Mirtazapine, Modafinil,Nefazodone,Nortriptyline, Olanzapine, Oxazepam, Oxcarbazepine, Oxycodone,Paliperidone,Paroxetine, Perampanel, Perphenazine, Phenelzine, Phenobarbital, Phenytoin, Pimavanserin, Pimozide, Piroxicam, Pitavastatin, Pravastatin, Pregabalin, Propranolol, Protriptyline, Quetiapine, Ramelteon, Risperidone, Rosuvastatin, Selegiline, Sertraline, Simvastatin,Suvorexant, Temazepam, Tetrabenazine, Thioridazine, Thiothixene, Topiramate, Tramadol, Tranylcypromine, Trazodone, Triazolam, Trifluoperazine, Trimipramine, Valbenazine, Valproicacid, Venlafaxine, Vilazodone, Viloxazine,Vortioxetine, Zaleplon, Ziprasidone, Zolpidem, Zonisamide

List of Genes/Variants Tested

Gene	Variant/Star Allele Tested
HLA-A	
BDNF	
OPRM1	
ABCB1	
COMT	
HTR2C	
ABCG2	
MTHFR	
HTR2A	
CES1A1	
ADRA2A	
CYP2B6	
CYP2C19	
CYP2C9	
CYP2D6	

List of Genes/Variants Tested

Gene	Variant/Star Allele Tested
CYP1A2	
CYP3A4	
CYP3A5	
CYP4F2	
UGT1A4	
UGT2B15	
TPMT	
SLCO1B1	
DPYD	

CYP2D6*4 was not queried for this patient due to a missing call in one or more variants required for this star allele determination. Missing calls occur occasionally due to technical issues that are not known to reflect patient-specific biology.

Pharmacogenetics Report Disclaimer

Errors in testing (both false positives and false negatives) may occur for reasons that include but are not limited to specimen issues (e.g. inaccurately marked samples causing sample mix-up, DNA quality and quantity), rare genetic variants interfering with analysis, assay technical limitations, biological factors (e.g. recent blood transfusions, circulating hematolymphoid neoplasm, or history of bone marrow transplantation), and other technical issues.

This analysis will not detect novel pharmacogenetic variants, nor does it test for any possible DNA variants associated with drug response or toxicity since some of the variants are not included in the current panel or are unknown to be associated with drug response/toxicity at this time. It also does not test for all known pharmacogenetic variants associated with response to all known medications or medications included in this test.

If a specific pharmacogenetic variant is detected, the patient may be at risk for adverse drug response(s) and/or lack of treatment efficacy associated with that variant. If no variant is found, the patient may be at reduced risk for the adverse drug response(s) or lack of therapeutic efficacy tested for in the current panel. However, further testing may be necessary, since negative test results may reduce, but do not eliminate, the chance that the patient is at risk of having predisposition to adverse drug response(s) or not achieving treatment efficiency. In addition, other variant(s) or factors that are not included in our services may impact an individual's risk of adverse rug response(s) or lead to lack of treatment efficiency. Thus, this report does not provide definitive conclusions regarding the predicted drug response(s) and treatment benefits or risks. In consequence, a negative result on this test is risk reducing but not risk eliminating, and does not guarantee outcome. Thus, this report should be interpreted as only one part of a patient's complete clinical profile.

Disclaimer

This report reflects the analysis of an extracted DNA sample; and it does not constitute medical advice. This is not a diagnostic test, and thus it provides information on selected pharmacogenetics variants for selected medication, but it does not test for every possible drug response and toxicity associated variant. Any questions or concerns regarding the contents of this report or any prevention, cure, mitigation, or treatment of a medical condition or disease should be directed to a qualified clinical professional. This test was developed, and its performance characteristics determined by GenetikaPlus US Inc and Trudiagnostic laboratories. It has not been cleared or approved by the FDA. The FDA does not require this test to go through premarket FDA review. This test is used for clinical purposes. It should not be regarded as investigational or for research. This laboratory is certified under the Clinical Laboratory Improvement Amendments (CLIA) as qualified to perform high complexity clinical laboratory testing.

Recommendations

Review these results with your medical practitioner for interpretation and further clinical management purposes. Genetic consulting is recommended.