ARUP LABORATORIES
800-522-2787 | aruplab.com
500 Chipeta Way, Salt Lake City, UT 84108-1221
Jonathan R. Genzen, MD, PhD, Chief Medical Officer

Patient Report |**FINAL**

Client: Example Client ABC123
123 Test Drive
Salt Lake City, UT 84108
UNITED STATES

Physician: Doctor, Example

Patient: Patient, Example

DOB	[redacted]
Gender:	[redacted]
Patient Identifiers:	01234567890ABCD, 012345
Visit Number (FIN):	01234567890ABCD
Collection Date:	00/00/0000 00:00

Cytochrome P450 Genotyping Panel

ARUP test code 3001524

CYP PANEL Specimen	Whole Blood	
CYP2C19 Genotype	*17/*35	
CYP2C19 Phenotype	**Intermediate**	*
CYP2C8 Genotype	*3/*4	
CYP2C8 Phenotype	**See Note**	*
CYP2C9 Genotype	*4/*4	
CYP2C9 Phenotype	**Intermediate**	*
CYP2C Cluster Geno	**Homozygous**	*
CYP2C Cluster Pheno	**See Note**	*
CYP2D6 Genotype	*2/*5	
CYP2D6 Phenotype	**Intermediate**	*
CYP3A4 Genotype	*1/*22	

H=High, L=Low, *=Abnormal, C=Critical

CYP3A4 Phenotype	**Intermediate**	*
CYP3A5 Genotype	*1/*3	
CYP3A5 Phenotype	**Intermediate**	*
CYP2B6 Genotype	*1/*18	
CYP2B6 Phenotype	**Intermediate**	*
CYP PANEL Interpretation	See Note	

The following CYP2C19 allele(s) were detected: *17/*35. This result predicts the intermediate metabolizer phenotype.

The following CYP2C8 allele(s) were detected: *3/*4. The metabolizer phenotype is drug-dependent.

The following CYP2C9 allele(s) were detected: *4/*4. This result predicts the intermediate metabolizer phenotype, with an activity score of 1 of 2.

Two copies of the 2C cluster rs12777823 were detected. This variant is associated with reduced warfarin dose requirement in some individuals of African ancestry.

The following CYP2D6 allele(s) were detected: *2/*5. This result predicts the intermediate metabolizer phenotype with an activity score estimated at 1 of 2.

The following CYP3A4 allele(s) were detected: *1/*22. This result predicts the intermediate metabolizer phenotype.

The following CYP3A5 allele(s) were detected: *1/*3. This result predicts the intermediate metabolizer phenotype.

The following CYP2B6 alleles were detected: *1/*18. This result predicts the intermediate metabolizer phenotype.

Recommendation: Guidelines for genotype-based dosing are published by the Clinical Pharmacogenetics Implementation Consortium (CPIC) and can be found at: https://cpicpgx.org/ and https://www.pharmgkb.org/.

This result has been reviewed and approved by [redacted]

BACKGROUND INFORMATION: Cytochrome P450 Genotyping Panel

Characteristics: The cytochrome P450 (CYP) isozymes 2B6, 2C19, 2C8, 2C9, 2D6, and the CYP3A subfamily are involved in the metabolism of many drugs. Variants in the genes that code for CYP2B6, CYP2C19, CYP2C8, CYP2C9, CYP2D6, CYP3A4, CYP3A5, and CYP2C cluster (rs12777823) loci influence pharmacokinetics of respective substrates, and may predict or explain nonstandard dose requirements, therapeutic failure, or adverse reactions.

Inheritance: Autosomal codominant.
Cause: Gene variants affect enzyme function.
Variants Tested:
(Variants are numbered according to the following transcripts: CYP2C19 NM_000769, CYP2C8 NM_000770, CYP2C9 NM_000771, 2C cluster rs12777823,
CYP2D6 M33388 sequence, CYP3A4 NM_017460 and CYP3A5 NM_000777, CYP2B6 NM_000767)

*1: Indicative of no detected targeted variants and an assumption of functional allele.

CYP2C19*2: rs4244285, c.681G>A; rs12769205, c.332-23A>G
CYP2C19*3: rs4986893, c.636G>A
CYP2C19*4A: rs28399504, c.1A>G
CYP2C19*4B: rs28399504, c.1A>G; rs12248560, c.-806C>T
CYP2C19*5: rs56337013, c.1297C>T
CYP2C19*6: rs72552267, c.395G>A
CYP2C19*7: rs72558186, c.819+2T>A
CYP2C19*8: rs41291556, c.358T>C
CYP2C19*9: rs17884712, c.431G>A
CYP2C19*17: rs12248560, c.-806C>T
CYP2C19*35: rs12769205, c.332-23A>G

CYP2C8*2: rs11572103, c.805A>T
CYP2C8*3: rs10509681, c.1196A>G
CYP2C8*4: rs1058930, c.792C>G

CYP2C rs12777823, g.96405502G>A

CYP2C9*2: rs1799853, c.430C>T
CYP2C9*3: rs1057910, c.1075A>C
CYP2C9*4: rs56165452, c.1076T>C
CYP2C9*5: rs28371686, c.1080C>G
CYP2C9*6: rs9332131, c.818delA
CYP2C9*8: rs7900194, c.449G>A
CYP2C9*11: rs28371685, c.1003C>T
CYP2C9*12: rs9332239, c.1465C>T

CYP2D6*2: rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*2A: rs1080985, g.-1584C>G; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*3: rs35742686, g.2549delA
CYP2D6*4: rs1065852, g.100C>T; rs3892097, g.1846G>A; rs1135840, g.4180G>C
CYP2D6*5: gene deletion
CYP2D6*6: rs5030655, g.1707delT
CYP2D6*7: rs5030867, g.2935A>C
CYP2D6*8: rs5030865, g.1758G>T; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*9: rs5030656, g.2615_2617delAAG
CYP2D6*10: rs1065852, g.100C>T; rs1135840, g.4180G>C
CYP2D6*11: rs1080985, g.-1584C>G; rs201377835, g.883G>C; rs16947, g.2850C>T;
rs1135840, g.4180G>C
CYP2D6*13: a CYP2D7-derived exon 1 conversion
CYP2D6*14: rs5030865, g.1758G>A; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*15: rs774671100, g.137_138insT
CYP2D6*17: rs28371706, g.1023C>T; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*29: rs59421388, g.3183G>A; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*31: rs267608319, g.4042G>A; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*35: rs769258, g.31G>A; rs1080985, g.-1584C>G; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*36: a CYP2D6*10 carrying a CYP2D7-derived exon 9 conversion
CYP2D6*36-*10: a CYP2D6*36 and a CYP2D6*10 in tandem
CYP2D6*40: rs28371706, g.1023C>T; rs72549356, g.1863_1864insTTTCGCCCCTTTCGCCCC; rs16947, g.2850C>T; rs1135840,

g.4180G>C
CYP2D6*41: rs28371725, g.2988G>A; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*42: rs72549346, g.3260_3261insTG; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*49: rs1135822, g.1611T>A; rs1065852, g.100C>T; rs1135840, g.4180G>C
CYP2D6*56: rs72549347, g.3201C>T; rs1135840, g.4180G>C
CYP2D6*59: rs79292917, g.2939G>A; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*69: rs28371725, g.2988G>A; rs1065852, g.100C>T; rs16947, g.2850C>T; rs1135840, g.4180G>C
CYP2D6*114: rs5030865, g.1758G>A; rs1065852, g.100C>T; rs16947, g.2850C>T; rs1135840, g.4180G>C
DUP: complete gene duplications

CYP2B6*4: rs2279343, c.785A>G
CYP2B6*6: rs3745274, c.516G>T; rs2279343, c.785A>G
CYP2B6*7: rs3745274, c.516G>T; rs2279343, c.785A>G; rs3211371, c.1459C>T
CYP2B6*9: rs3745274, c.516G>T
CYP2B6*18: rs28399499, c.983T>C
CYP2B6*22: rs34223104, c.-82T>C
CYP2B6*36: rs34223104, c.-82T>C; rs3745274, c.516G>T; rs2279343, c.785A>G

CYP3A4*22: rs35599367, c.522-191C>T

CYP3A5*3: rs776746, c.219-237A>G
CYP3A5*6: rs10264272, c.624G>A
CYP3A5*7: rs41303343, c.1035dupT

Methodology: Polymerase chain reaction (PCR) and fluorescence monitoring. Sequencing is only performed if needed to characterize a duplicated CYP2D6 gene.

Analytic Sensitivity and Specificity: Greater than 99 percent.

Limitations: Only the targeted variants will be detected by this panel, and assumptions about phase and content are made to assign alleles. Publicly available sources such as the www.pharmvar.org or www.pharmgkb.org provide guidance on phenotype predictions and allele frequencies. A combination of the CYP2D6*5 (gene deletion) and a CYP2D6 gene duplication cannot be specifically identified; however, this combination is not expected to adversely affect the phenotype prediction. The assay used to detect CYP2D6*40 allele cannot distinguish between insertions of 1 or 2 copies; it also cannot distinguish between heterozygous and homozygous mutant samples due to unavoidable cross-reactivity with the wild-type sequence. Additional assays will be used to help differentiate the CYP2D6*40 allele from other CYP2D6 star alleles. Diagnostic errors can occur due to rare sequence variations. Risk of therapeutic failure or adverse reactions with gene substrates may be affected by genetic and nongenetic factors that are not detected by this test. This result does not replace the need for therapeutic drug or clinical monitoring.

Please note the information contained in this report does not contain medication recommendations, and should not be interpreted as recommending any specific medications. Any dosage adjustments or other changes to medications should be evaluated in consultation with a medical provider.

This test was developed and its performance characteristics determined by ARUP Laboratories. It has not been cleared or approved by the U.S. Food and Drug Administration. This test was performed in a CLIA-certified laboratory and is intended for clinical purposes.

Counseling and informed consent are recommended for genetic testing. Consent forms are available online.

EER CYPP450 Panel	See Note Authorized individuals can access the ARUP Enhanced Report with an ARUP Connect account using the following link. Your local lab can assist you in obtaining the patient report if you don't have a Connect account. [redacted]

VERIFIED/REPORTED DATES

Procedure	Accession	Collected	Received	Verified/Reported
CYP PANEL Specimen	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C19 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C19 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C8 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C8 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C9 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C9 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C Cluster Geno	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2C Cluster Pheno	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2D6 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2D6 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP3A4 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP3A4 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP3A5 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP3A5 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2B6 Genotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP2B6 Phenotype	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
CYP PANEL Interpretation	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
EER CYPP450 Panel	25-085-101773	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00

END OF CHART