

9/16/2011 Beta is now in LIVE mode to test the migration. If you see any errors, please file a JIRA.

From Knowledge Acquisition to Clinical Applications

Find Data By Type

Genomic Variations

VKORC1, G3673A
Causative allele for the low dose phenotype
Related drug: Warfarin
rs9923231

- [Annotated SNPs by gene](#)
- [Annotated SNPs by drug](#)
- [Annotated SNPs by disease](#)
- [Genes with Haplotype Translations](#)

find variations [examples](#)
hint: enter a gene, rsid, drug, disease

Clinical Interpretations

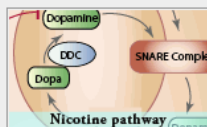


Azothioprine dosing

- [Clinical variant annotations](#)
- [Dosing guidelines](#)
- [Drug labels](#)
- [Genetic tests for PGx](#)

find interpretations [examples](#)
hint: enter a gene, rsid, drug, disease

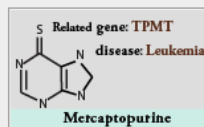
Pathways



- [Pharmacokinetic pathways](#)
- [Pharmacodynamic pathways](#)
- [All pathways](#)
- [Pathways by therapeutic categories](#)

find pathways [examples](#)
hint: enter a gene, drug, disease

Drugs & Small Molecules

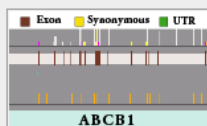


Related gene: TPMT
disease: Leukemia
Mercaptopurine

- [Drugs with genetic information](#)
- [Drugs with data](#)
- [Drugs by therapeutic categories](#)

find drugs [examples](#)
hint: enter a gene, rsid, drug, disease

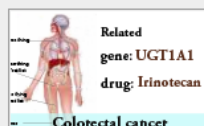
Genes



- [Important PGx genes VIP](#)
- [Pharmacokinetic genes](#)
- [Pharmacodynamic genes](#)

find genes [examples](#)
hint: enter a gene, rsid, drug, disease

Diseases



Related gene: UGT1A1
drug: Irinotecan
Colorectal cancer

- [Diseases with genetic information](#)
- [Diseases with curated information](#)
- [All diseases](#)

find diseases [examples](#)
hint: enter a gene, rsid, drug, disease

Tutorial

Curators' Favorite Papers

No current papers of interest.

See the [archives](#) for more.



PGx in the News

• [Do gene maps for whole families offer future medical hope? - BioNews](#)

• [Genetics offers new possibilities for diabetes management - Endocrine Today](#)

• [Transgenic, Inc. \(OTC:TBIO\) Jumps Up After the Announcement of a Presentation - HotStocked](#)

• [Moustache Season Is Open - Register Today for November 2011 - MarketWatch \(press release\)](#)

See [more news](#).
 [Subscribe to RSS feed.](#)

Welcome to the PharmGKB Tutorial

PharmGKB (<http://www.pharmgkb.org>)

A comprehensive resource for pharmacogenomics

Curate knowledge about the impact of genetic variation on drug response with focuses on:

- Clinical interpretation of variants associated with drug response
- Drug dosing guidelines and genetic tests
- Drug-centered pathways
- Important PGx gene summaries
- Relationships among genes, drugs and diseases

Welcome to the PharmGKB Tutorial

Beta update: The clinical interpretations search box should now be functional. Enter a search term to find all relevant clinical data we have.

Also, gene and drug pages are a little slow. Page optimization is happening now and should be completed soon.

From Knowledge Acquisition to Clinical Applications

Find Data By Type

Genomic Variations

VKORC1, G3673A
Causative allele for the low dose phenotype
Related drug: Warfarin
rs9923231

- [Annotated SNPs by gene](#)
- [Annotated SNPs by drug](#)
- [Annotated SNPs by disease](#)
- [Genes with Haplotype Translations](#)

find variants [examples](#)

hint: enter a gene, rsid, drug, disease

Clinical Interpretations



Azothioprine dosing

- [Clinical variant annotations](#)
- [Dosing guidelines](#)
- [Drug labels](#)
- [Genetic tests for PGx](#)

find interpretations [examples](#)

hint: enter a gene, rsid, drug, disease

Pathways

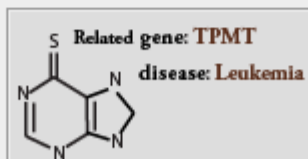


- [Pharmacokinetic pathways](#)
- [Pharmacodynamic pathways](#)
- [All pathways](#)
- [Pathways by therapeutic categories](#)

find pathways [examples](#)

hint: enter a gene, drug, disease

Drugs & Small Molecules



Related gene: **TPMT**
disease: **Leukemia**
Mercaptopurine

- [Drugs with genetic information](#)
- [Drugs with data](#)
- [Drugs by therapeutic categories](#)

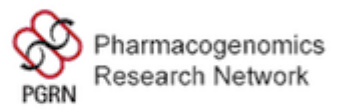
find drugs [examples](#)

hint: enter a gene, rsid, drug, disease

Tutorial

Curators' Favorite Papers

No current papers of interest.
See the [archives](#) for more.



PGx in the News

See [more news](#).
 [Subscribe to RSS feed.](#)

Specific Search

warfarin ?

Click for general search

Home Search Download Help Consortia My PharmGKB

Search for warfarin

Database Search Website Search

Checkbox to filter results

Limit results to: Genes Variants Drugs Diseases Pathways Publications
 Dosing Guidelines Drug Labels Clinical Annotations Genetic Tests

Results 1 - 20 of top 500, sorted by relevance

DG DL CA VA VIP LA DS	Drug: warfarin [genetics] Alternate names: Athrombin, Athrombin-K, Athrombine-K, Brumolin, Co-Rax, Coumadin, Coumafen, Coumafene, Coumaphen, Coumaphene, Coumarins, Coumefene, D-Con, Dethmor, Dethnel, Dicusat E, Frass-Ratron, Jantoven, Kumader, Kumadu...
DS	Pathway: Warfarin Pathway, Pharmacokinetics [APPROVE] [NEEDS GPML]
DS	Pathway: Warfarin Pathway, Pharmacodynamics [APPROVE] [NEEDS GPML]
DG DL CA VA VIP LA DS	Gene: VKORC1 [VIP annotation] [genetics] Name: vitamin K epoxide reductase complex, subunit 1 Alternate symbols: EDTP308, FLJ00289, IMAGE3455200, M...
LA	Publication: In silico pharmacogenetics of warfarin Erin, Cheung Paul, Fitch Bill, Clark Douglas, Wu S, Cheng Janet, Nguyen Anh, Jiang Sharon, Shafer S Article: 16680137
LA	Publication: Genetic modulation of oral anticoagulation D'Andrea G, Brancaccio V, Ciampa A, Grandone B
LA	Publication: Estimation of the Warfarin Dose with International Warfarin Pharmacogenetics Consorti

- DG** Dosing Guideline information is available
- DL** Drug Label information is available
- CA** High-level Clinical Annotation is available
- VA** Variant Annotation is available
- VIP** VIP information is available
- LA** Literature annotations are available
- DS** Dataset is available

Find Data By Type

Genomic Variations

VKORC1, G3673A

Causative allele for the low dose phenotype

Related drug: Warfarin

rs9923231

- [Annotated SNPs by gene](#)
- [Annotated SNPs by drug](#)
- [Annotated SNPs by disease](#)
- [Genes with Haplotype](#)

Tran

Click for variants



[examples](#)

hint: enter a gene, rsid, drug, disease

Clinical Interpretations



Azathioprine dosing

- [Clinical variant annotations](#)
- [Dosing guidelines](#)
- [Drug labels](#)
- [Genetic tests for PGx](#)



[examples](#)

hint: enter a gene, rsid, drug, disease

Pathways



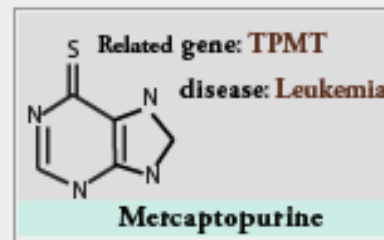
- [Pharmacokinetic pathways](#)
- [Pharmacodynamic pathways](#)
- [All pathways](#)
- [Pathways by therapeutic categories](#)



[examples](#)

hint: enter a gene, drug, disease

Drugs & Small Molecules



- [Drugs with genetic information](#)
- [Drugs with data](#)
- [Drugs by therapeutic categories](#)



[examples](#)

hint: enter a gene, rsid, drug, disease

Genetic Variations Associated with Warfarin Response

Search Variants for



[view legend](#)

Results 1 - 20 of 31, sorted by

<p>CA VA</p>	<p>Variant: rs1057910 @ chr10:96741053 Gene: CYP2C9 Drugs: acenocoumarol, celecoxib, fluvastatin, glibenclamide, gliclazide, glimepiride, glipizide, losartan, metformin, phenytoin, ritonavir, urea derivatives, tipranavir, tolbutamide, warfarin Diseases: Diabetes Mellitus, Diabetes Mellitus, Type 2</p>	
<p>CA VA</p>	<p>Variant: rs10871454 @ chr16:31048079 Gene: STX4 Drug: warfarin</p>	
<p>VA</p>	<p>Variant: rs12714145 @ chr2:85787341 Gene: GGCX Drug: warfarin</p>	
<p>CA VA</p>	<p>Variant: rs1799853 @ chr10:96702047 Gene: CYP2C9 Drugs: fluvastatin, glibenclamide, gliclazide, glimiperide, glipizide, losartan, metformin, phenytoin, ritonavir, urea derivatives, tipranavir, tolbutamide, warfarin Diseases: Diabetes Mellitus, Diabetes Mellitus, Type 2</p>	
<p>CA VA</p>	<p>Variant: rs2108622 @ chr19:15990431 Gene: CYP4F2 Drugs: acenocoumarol, warfarin Diseases: Arteriosclerosis, Heart Diseases, Hemorrhage, Intracranial Hemorrhages, Myocardial Infarction, Peripheral Vascular Diseases, Pulmonary Embolism, Stroke, Thromboembolism, venous thromboembolism, Venous Thrombosis</p>	
<p>CA VA</p>	<p>Variant: rs2234922 @ chr1:226026406 Gene: EPHX1 Drugs: carbamazepine, phenytoin, warfarin Diseases: Craniofacial Abnormalities, Epilepsy</p>	

- DG Dosing Guideline information is available
- DL Drug Label information is available
- CA High-level Clinical Annotation is available
- VA Variant Annotation is available
- VIP VIP information is available
- LA Literature annotations are available
- DS Dataset is available

Find Data By Type

Genomic Variations

VKORC1, G3673A

Causative allele for the low dose phenotype

Related drug: Warfarin

rs9923231

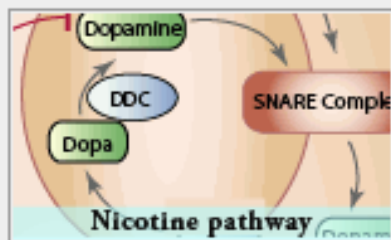
- [Annotated SNPs by gene](#)
- [Annotated SNPs by drug](#)
- [Annotated SNPs by disease](#)
- [Genes with Haplotype Translations](#)



[examples](#)

hint: enter a gene, rsid, drug, disease

Pathways



- [Pharmacokinetic pathways](#)
- [Pharmacodynamic pathways](#)
- [All pathways](#)
- [Pathways by therapeutic categories](#)



[examples](#)

hint: enter a gene, drug, disease

Clinical Interpretations



- [Clinical variant annotations](#)
- [Dosing guidelines](#)
- [Drug labels](#)
- [Genetic tests for DGCs](#)

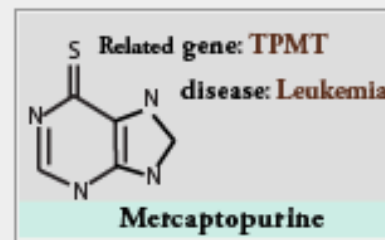
Click for clinical info



[examples](#)

hint: enter a gene, rsid, drug, disease

Drugs & Small Molecules



- [Drugs with genetic information](#)
- [Drugs with data](#)
- [Drugs by therapeutic categories](#)



[examples](#)

hint: enter a gene, rsid, drug, disease

Clinical Information Associated with Warfarin Response

Search Clinical Information for



[view legend](#)

Drug Label: [FDA Label for warfarin](#)

Genes: [CYP2C9](#), [VKORC1](#)

Drug: [warfarin](#)

Click for warfarin dosing guideline

Dosing Guideline: [CPIC Dosing Guideline for warfarin](#)

Genes: [CYP2C9](#), [VKORC1](#)

Drug: [warfarin](#)

Genetic Test: [TrimGen Corporation eQ-PCR LC Warfarin Genotyping Kit](#)

Genes: [CYP2C9](#), [VKORC1](#)

Drug: [warfarin](#)

Clinical Annotation: [Clinical Annotation for rs9923231](#)

Drug: [warfarin](#)

Clinical Annotation: [Clinical Annotation for rs1057910](#)

Gene: [CYP2C9](#)

Drug: [warfarin](#)

Dosing Guideline: [Dutch Pharmacogenetics Working Group Guideline for acenocoumarol](#)

Gene: [VKORC1](#)

Drug: [acenocoumarol](#)

Dosing Guideline: [Dutch Pharmacogenetics Working Group Guideline for phenprocoumon](#)

Gene: [VKORC1](#)

Drug: [phenprocoumon](#)

Clinical PGx

PGx Research

Click for FDA drug label

Downloads/LinkOuts

Dosing Guidelines

Drug Labels

Clinical Annotations

Genetic Tests

CPIC Dosing Guideline - [warfarin](#)

Guidelines regarding the use of pharmacogenomic tests in dosing for warfarin have been published in Clinical Pharmacology and Therapeutics by the [Clinical Pharmacogenetics Implementation Consortium \(CPIC\)](#).

Clinical Pharmacogenetics Implementation Consortium (CPIC) Guidelines for CYP2C9 and VKORC1 Genotypes and Warfarin Dosing. Julie A. Johnson, Li Gong, Michelle Whirl-Carrillo, Brian F. Gage, Stuart A. Scott, C., Michael Stein, Jeffrey L. Anderson, Stephen E. Kimmel, Ming Ta Michael Lee, Munir Pirmohamed, Mia Wadelius, Teri E. Klein, and Russ B. Altman.

Download: [article](#) and [supplement](#)

Pharmacogenetic algorithm-based warfarin dosing

Excerpt from the warfarin dosing guidelines:

Numerous studies have derived warfarin dosing algorithms that use both genetic and non-genetic factors to predict warfarin dose [Article:[18305455](#), [19228618](#), [18574025](#)]. Two algorithms perform well in estimating stable warfarin dose across different ethnic populations [Article:[18305455](#), [19228618](#)], and were created using more than 5000 subjects. Dosing algorithms using genetics outperform non-genetic clinical algorithms and fixed-dose approaches in dose prediction [Article:[18305455](#), [19228618](#)].

The best way to estimate the anticipated stable dose of warfarin is to use the algorithms available on <http://www.warfarindosing.org> (offering both high-performing algorithms [Article:[18305455](#), [19228618](#)]). Additionally, the dosing algorithm published by the International Warfarin Pharmacogenetics Consortium (IWPC) is also online at <http://www.pharmgkb.org/do/serve?objId=PA162372936&objCls=Dataset#tabview=tab2>. The two algorithms provide very similar dose recommendations.

Download: [IWPC Pharmacogenetic Dosing Algorithm](#)

Approach to pharmacogenetic-based warfarin dosing without access to dosing algorithms

Excerpt from the warfarin dosing guidelines:

In 2007 the FDA modified the warfarin label stating that *CYP2C9* and *VKORC1* genotypes may be useful in determining the optimal initial dose of warfarin [Article:[17906972](#)]. The label was further updated in 2010 to include a table (**Table 1**) describing recommendations for initial dosing ranges for patients with different combinations of *CYP2C9* and *VKORC1* genotypes.

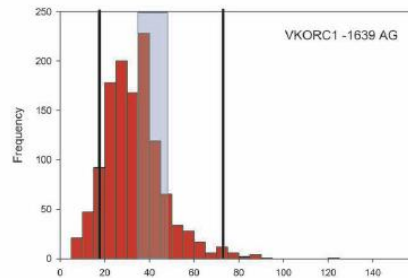
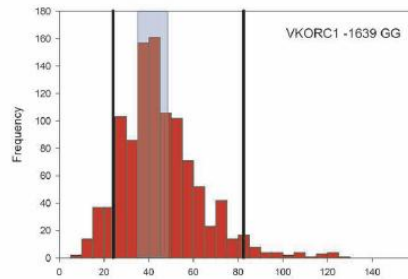


Table 1: Recommended daily warfarin doses (mg/day) to achieve a therapeutic INR based on *CYP2C9* and *VKORC1* genotype using the warfarin product insert approved by the Food and Drug Administration in the United States:

VKORC1 Genotype (-1639G>A, rs9923231)	CYP2C9*1/*1	CYP2C9*1/*2	CYP2C9*1/*3	CYP2C9*2/*2	CYP2C9*2/*3	CYP2C9*3/*3
GG	5-7	5-7	3-4	3-4	3-4	0.5-2
GA	5-7	3-4	3-4	3-4	0.5-2	0.5-2
AA	3-4	3-4	0.5-2	0.5-2	0.5-2	0.5-2

Reproduced from updated warfarin (Coumadin®) product label.

Supplemental Table S1. Genotypes that constitute the * alleles for *CYP2C9*

Allele	Constituted by genotypes at:	Amino acid changes	Enzymatic Activity
*1	reference allele at all positions		Normal
*2	C>T at rs1799853	R144C	Decreased
*3	A>C at rs1057910	I359L	Decreased

Clinical PGx

Click for FDA drug label

Click for clinical annotations

Dosing Guidelines

Drug Labels

Clinical Annotations

Genetic Tests

Information regarding PGx on FDA drug labels is derived from the FDA's [Table of Pharmacogenomic Biomarkers in Drug Labels](#). Excerpts from the label and downloadable highlighted label PDFs are manually curated by PharmGKB

FDA Label - [warfarin](#), [CYP2C9](#), [VKORC1](#)

The FDA recommends genetic testing prior to initiating treatment with warfarin.

Excerpt from the warfarin drug label:

The patient's CYP2C9 and VKORC1 genotype information, when available, can assist in selection of the starting dose. Table 5 describes the range of stable maintenance doses observed in multiple patients having different combinations of CYP2C9 and VKORC1 gene variants. Consider these ranges in choosing the initial dose.

The VKORC1:G-1639A polymorphism is associated with lower dose requirements for warfarin in Caucasian and Asian patients. Increased bleeding risk and lower initial warfarin dose requirements have been associated with the CYP2C9*2 and CYP2C9*3 alleles. Approximately 30% of the variance in warfarin dose could be attributed to genetic variation in VKORC1, and about 40% of dose variance could be explained taking into consideration both VKORC1 and CYP2C9 genetic polymorphisms. Accounting for genetic variation in both VKORC1 and CYP2C9, age, height, body weight, interacting drugs, and indication for warfarin therapy explained about 55% of the variability in warfarin dose.

For the complete drug label text with sections containing pharmacogenetic information highlighted, see the [warfarin drug label](#). Pharmacogenomics-related dosing information is found in Table 5 on page 27.

Clinical PGx

PGx Research

Overview

Properties

Pathways

Is Related To

Downloads/LinkOuts

Dosing Guidelines

Drug Labels

Clinical Annotations

Genetic Tests

Click to see clinical annotation
and variant specific info

... (continually curated by PharmGKB) are shown below. To see more Clinical Variants with lower levels of

Position	Gene ?	Relevance ?	Strength of Evidence ?	Genetic Test ?	Dosing Guideline ?
rs1057910	CYP2C9		1	Yes	Yes
rs9923231	PRSS53 VKORC1		1	Yes	Yes

Show lower-evidence Clinical Annotations

[Download a summary of all Clinical Annotations available.](#)

Disclaimer: The PharmGKB's clinical annotations reflect expert consensus based on clinical evidence and peer-reviewed literature available at the time they are written and are intended only to assist clinicians in decision-making and to identify questions for further research. New evidence may have emerged since the time an annotation was submitted to the PharmGKB. The annotations are limited in scope and are not applicable to interventions or diseases that are not specifically identified.

The annotations do not account for individual variations among patients, and cannot be considered inclusive of all proper methods of care or exclusive of other treatments. It remains the responsibility of the health-care provider to determine the best course of treatment for a patient. Adherence to any guideline is voluntary, with the ultimate determination regarding its application to be made solely by the clinician and the patient. PharmGKB assumes no responsibility for any injury or damage to persons or property arising out of or related to any use of the PharmGKB clinical annotations, or for any errors or omissions.

? = Mouse-over for quick help

VARIANT:
rs1057910 at chr10:96741053 in CYP2C9 (VIP)

Alleles

A/C

Amino Acid Translation

Ile358Leu

Alternate Names:

c.1075A>C, g.47545517A>C, g.47639A>C, g.96731043A>C, p.Ile359Leu

Haplotypes

This variant is used to determine: CYP2C9*3, CYP2C9*18

Clinical PGx | PGx Research | VIP | Downloads

User login required to view full clinical annotation

Clinical Annotations

To see the clinical annotation for this variant please [register or sign in.](#)

Sign In

PharmGKB accounts are required for both Pooled and summary data can be viewed. You are being asked to sign in with your U

User Id

Password

Sign In

[Have you registered?](#)

[Did you forget your password?](#)

VARIANT:
rs1057910 at chr10:96741053 in CYP2C9 (VIP)

Alleles
A/C

Amino Acid Translation
Ile358Leu

Alternate Names:
c.1075A>C, g.47545517A>C, g.47639A>C, g.96731043A>C, p.Ile358Leu

Haplotypes
This variant is used

Click for article-level variant annotation

- Clinical PGx
- PGx Research
- VIP
- Downloads/LinkOuts

Clinical Annotations

PharmGKB clinical annotations provide information about variant-drug pairs based on a summary of the individual variant annotations in the database. Therefore, each clinical annotation could represent information from a single paper or multiple papers. The rating system used to assign "Strength of Evidence" levels is described [here](#). Manually curated by PharmGKB.

All alleles are displayed on the positive chromosomal strand.

Strength of Evidence: Level 1

Drugs: [warfarin](#)

AA	Patients with the AA genotype: 1) may require an increased dose of warfarin as compared to patients with the AC or CC genotype 2) may have a decreased risk for adverse events as compared to patients with the AC or CC genotype. Patients with the AA genotype may still be at risk for adverse events when taking warfarin based on their genotype. Other genetic and clinical factors may also influence a patient's risk for adverse events.
AC	Patients with the AC genotype: 1) may require a decreased dose of warfarin as compared to patients with the AA genotype 2) may have an increased risk for adverse events as compared to patients with the AA genotype.
CC	Patients with the CC genotype: 1) may require a decreased dose of warfarin as compared to patients with the AA genotype 2) may have an increased risk for adverse events as compared to patients with the AA genotype.

Race: Unknown
Type: Dosage, Toxicity/ADR

Click for CYP2C9 gene page and PGx gene summary

VARIANT:

rs1057910 at chr10:96741053 in [CYP2C9 \(VIP\)](#)

Alleles

A/C

Amino Acid Translation

Ile359Leu

Alternate Names:

A>C, CYP2C9*3, CYP2C9*3:Ile359Leu, CYP2C9: I359L, CYP2C9:359Ile>Leu, CYP2C9:Ile359Leu, c.1075A>C, c.1075A>C, g.47545517A>C, g.47639A>C, g.96731043A>C, mRNA 11A>C, p.Ile359Leu, p.Ile359Leu

Haplotypes

This variant is used to determine: [CYP2C9*3](#), [CYP2C9*18](#)

Clinical PGx

PGx Research

VIP

Downloads/LinkOuts

Variant Annotations

PharmGKB variant annotations provide information about variant-drug pairs based on individual PubMed publications. Therefore, each annotation represents information from a single paper and the goal is to report the information that the author states, not an interpretation of the paper. Manually curated by PharmGKB.

Genotype AA is associated with increased dose of warfarin in people with a stable therapeutic international normalized ratio between two and three as compared to genotypes CC + AC. [other]

[stat_test: AN

Click to go to the original article

Associated Drug: wa

Evidence: [21383771](#)

Study Size (cases/controls)	Allele Frequency	OMB Race Category ?	Population Characteristics	Association P-value
248 /		Asian	Disease: Stable INR 2-3	1.61E-4

Paper Discusses:

PD

PGx Gene Summary (VIP)

Annotated PGx Gene Information for CYP2C9

Citation: Cytochrome P450 2C9-CYP2C9. Van Booven D, Marsh S, McLeod H, Carrillo MW, Sangkuhl K, Klein TE, Altman RB. *Pharmacogenet Genomics*. 2010 Apr;20(4):277-81. PMID: [20150829](#)

PharmGKB VIP Submitted by: Dere (PharmGKB)

PharmGKB Submission date: Janua

PharmGKB VIP Updated: November

PharmGKB VIP Reviewed: Novembe

- Jump To:
- [Important Variants](#)
- [Important Haplotypes](#)
- [All Annotated Genes](#)

There are **Two Important Haplotypes** for CYP2C9.

1. CYP2C9*2:
2. CYP2C9*3:

CYP2C9*2

Gene HGNC Name:	CYP2C9
Haplotype Significance:	CYP2C9*2 is defined by the 144Arg>Cys SNP. Variant frequencies are 10-20% for Ca considerably less in the African (0-6%) and Asian (1-3%) populations. The variant was [8004131] as having impaired the ability to metabolize warfarin. It is also thought to al cytochrome P450 oxidoreductase [9241660] .
Does this haplotype span more than one gene?	Unknown
Definitive Publication or Website:	http://www.imm.ki.se/CYPalleles
Drugs:	NSAIDs (16118328), COX-2 inhibitors (12893985), tolbutamide (15637526) , glipizide (warfarin (8004131), phenytoin (11434505)
Phenotypes/Diseases:	N/A
Phenotype Data Sets:	WUSTL warfarin dosing data, group A , Hot flashes in tamoxifen patients , CYP2C9 var CYP2C9 variants and naproxen metabolism , CYP2C9 variants and piroxicam metabol variants and flurbiprofen metabolism , Effects of dapsone on CYP2C9 variants and nap in tamoxifen study-set 2 , Meperidine N-demethylation by human CYP450 isoforms , P binding globulin in tamoxifen patients
Key Haplotypes:	CYP2C9*2
Key PubMed IDs:	9241660 , 8004131
How many SNPs, indels, repeats define this haplotype?	CYP2C9 144Arg>Cys

Gene HGNC Name:	CYP2C9
Gene Common Name:	CYP2C9

Clinical PGx

PGx Research

Overview

Properties

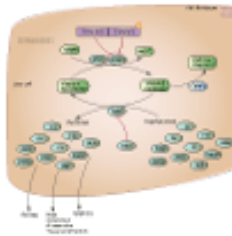
Pathways

Is Related To

Downloads/LinkOuts

PharmGKB Curated Pathways

Pathways created internally by PharmGKB based primarily on literature evidence.



1. [Warfarin Pathway, Pharmacodynamics](#)

Simplified diagram of the target of warfarin action and downstream genes and effects.



2. [Warfarin Pathway, Pharmacokinetics](#)

Representation of the candidate genes involved in transport, metabolism and clearance of warfarin.

External Pathways

Links to non-PharmGKB pathways.

PharmGKB contains no links to external pathways for this drug. To report a pathway, [click here](#).

Overview

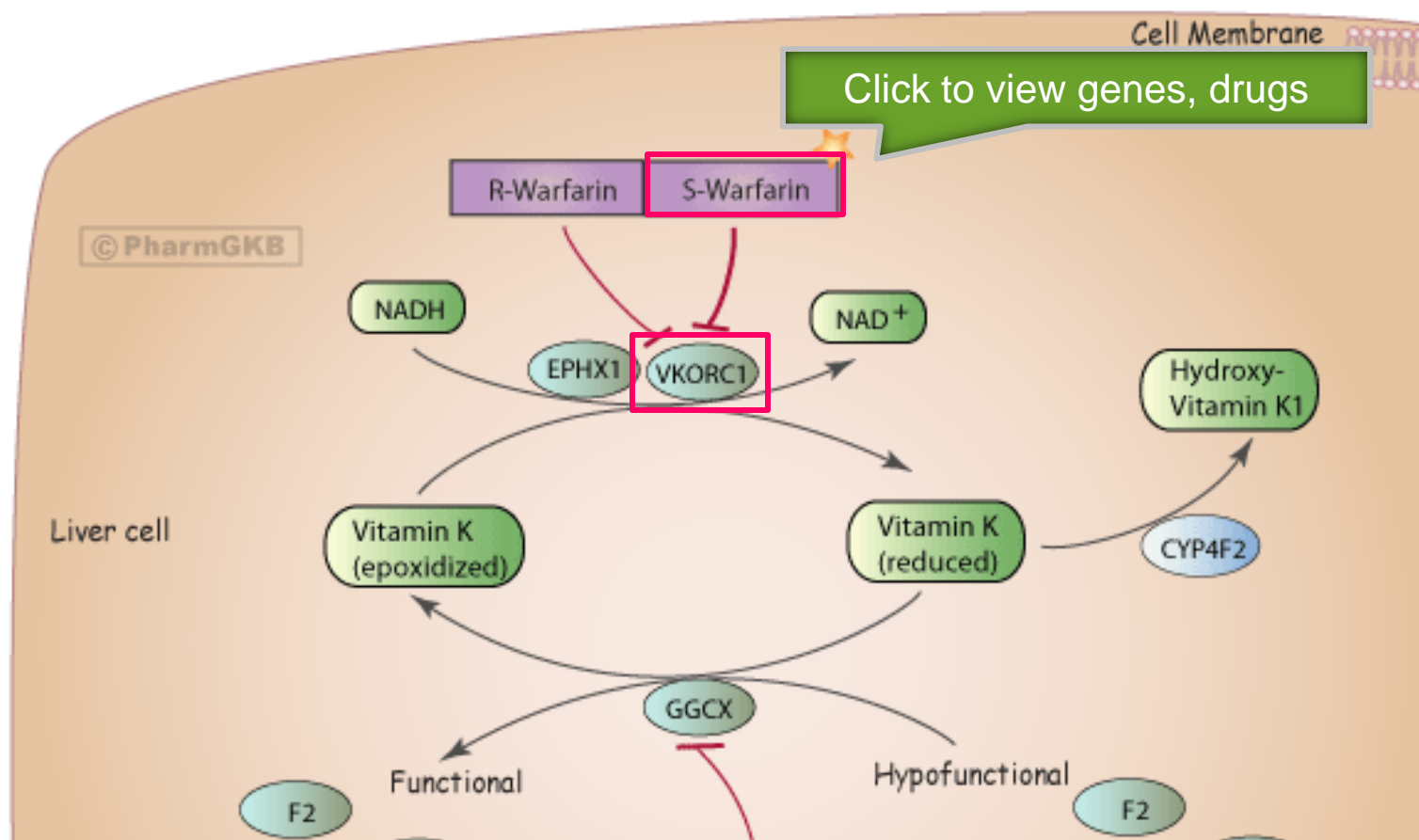
Components

Related Pathways

Downloads/LinkOuts

Pharmacodynamics

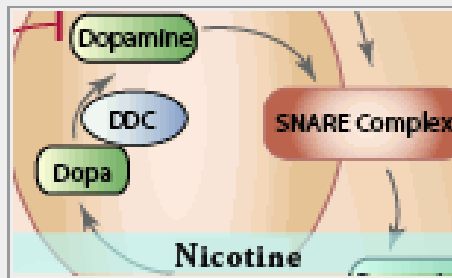
Simplified diagram of the target of warfarin action and downstream genes and effects.



Browse Pharmacokinetic Pathways

[view legend](#)

Pathways





- [Pathways by therapeutic categories](#)
- [Pharmacokinetic pathways](#)
- [Pharmacodynamic pathways](#)
- [All pathways](#)



[examples](#)

hint: enter a gene, drug, disease

Pathway: Anti-diabetic drug pathway (Nateglinide PK)
Pathway: Anti-diabetic drug pathway (Repaglinide PK)
Pathway: Anti-estrogen Pathway (Estrogen metabolism)
Pathway: Anti-estrogen Pathway (Summary)
Pathway: Anti-estrogen Pathway (Tamoxifen PK)
Pathway: Antimalarial drug amodiaquine (PK) pathway
Pathway: Antiplatelet Drug Clopidogrel Pathway (PK)
Pathway: Artemisinin and derivatives pathway (PK)
Pathway: Benzodiazepine PK Pathway
Pathway: Busulfan Pathway
Pathway: Celecoxib Pathway
Pathway: Citalopram Pathway (PK)
 Pathway: Codeine and Morphine Pathway (PK)
 Pathway: Cyclophosphamide Pathway (PD)
 Pathway: Cyclophosphamide Pathway (PK)
Pathway: Doxorubicin (PK)
Pathway: Erlotinib Pathway (PK)

Click for related genes, drugs and diseases

Clinical PGx

PGx Research

Overview

Properties

Pathways

Is Related To

Downloads/LinkOuts

Related Genes and Targets

Related Drugs and Interactions

Related Diseases

Genes that are associated with this drug in PharmGKB's database based on (1) variant annotations, (2) literature review, (3) path automatically retrieved from DrugBank, depending on the "evidence" and "source" listed below.

Curated Information [?]

[view legend](#)

Gene	Relationship	Evidence
ABCB1	PD PK	Publications
ACE	PD	Publications
ADRB2	PD	Publications
APOE	PD PK	Publications
ARSE	PD	Publications
BGLAP		Publications
CACNA1C		Variants
CALU	PD PK	Publications , Variants

Downloads and Web Services

All downloaded data is available for individual research purposes only, and may NOT be redistributed.

Downloads / PharmGKB Accession Ids

- Genes: [genes.zip](#) (1 MB, last updated on 9/6/11)
- [Gene Sequence Data](#)
- Drugs: [drugs.zip](#) (343 KB, last updated on 9/6/11)
- Diseases: [diseases.zip](#) (262 KB, last updated on 9/6/11)
- Relationships: [relationships.zip](#) (322 KB, last updated on 9/6/11)
- Variant & Clinical Annotations: Please read and agree to the [PharmGKB Data Usage Agreement](#) to receive variant and clinical annotations, these files may not be redistributed.
- Pathways (in [BioPAX](#) format): [pathways-biopax.zip](#) (802 KB, last updated on 9/6/11)
- Pathways (in tsv format): [pathways-tsv.zip](#) (147 KB, last updated on 9/6/11)
- Coriell Samples: [coriell.zip](#) (22 KB, last updated on 9/6/11)
- [Anonymous PDR Samples](#) [[text](#)] [[excel](#)]

Web Services

A selected subset of data from PharmGKB is accessible via a SOAP interface:

1. Search Service
 - [WSDL](#)
 - [API](#)
2. Variant Cross-Reference Service
 - [WSDL](#)
 - [API](#)
3. PharmGKB Data Service
 - [WSDL](#)

Thanks to funding from
NIH U01GM61374

www.pharmgkb.org