

CYP2C19 Drug Metabolism

The CYP2C19 enzyme helps process (or "metabolize") certain medications. Specific DNA variants can affect how well this enzyme works. Do not use this report to start, stop, or change any course of treatment. Medications should always be taken as directed.

- Overview
- Scientific Details
- Frequently Asked Questions

Jamie, you have a variant associated with altered function of the CYP2C19 enzyme.

People with your genetic result are predicted to be **CYP2C19 intermediate metabolizers** and may process some medications slightly slower than normal. However, since many factors impact how medications are processed, the variant detected may have no noticeable effects on how you process medications.

1 variant detected

Predicted CYP2C19 intermediate metabolizer

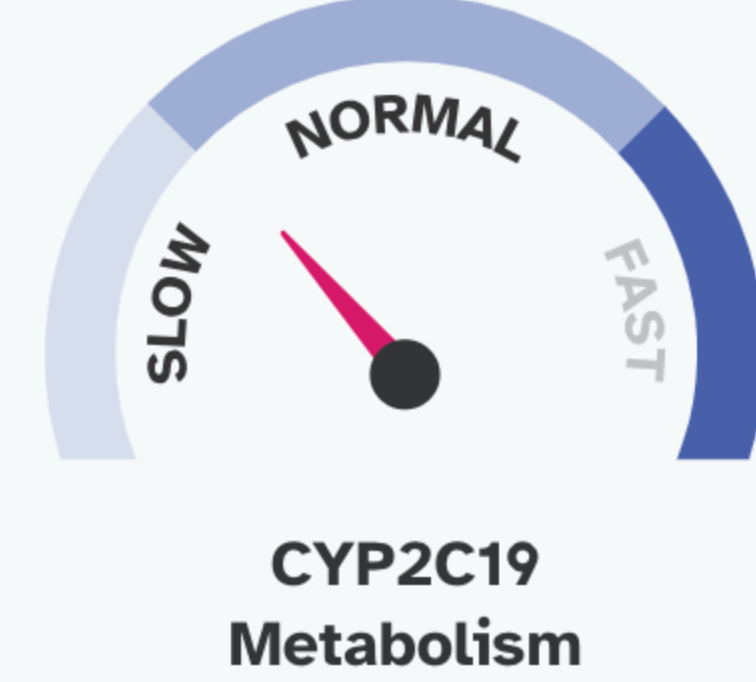
VARIANT(S) DETECTED	OVERALL FUNCTIONAL EFFECT
*2 (one copy)	Decreased enzyme function

Predicted CYP2C19 intermediate metabolizer

People who are predicted to be CYP2C19 intermediate metabolizers may process some medications slightly slower than normal, but most medications won't be affected.

Depending on the medication, being a CYP2C19 intermediate metabolizer may lead to higher or lower than normal medication levels in the body, or have no noticeable effects.

Talk to a healthcare professional if you would like to learn more about how DNA variants may affect processing of certain medications, or if you are concerned about your results.



Your Medication Insights

Learn more about how your genetic result may impact your body's response to citalopram and clopidogrel. In some cases, Medication Insight reports are not available for certain genetic results. [If your report is not available, see the Frequently Asked Questions page for more information.](#)

Be aware that your genetic result may impact individual medications differently. Talk to your healthcare provider about how your result may affect other medications processed in part by the CYP2C19 enzyme.

Do not use this report to start, stop, or change any course of treatment. Medications should always be taken as directed.

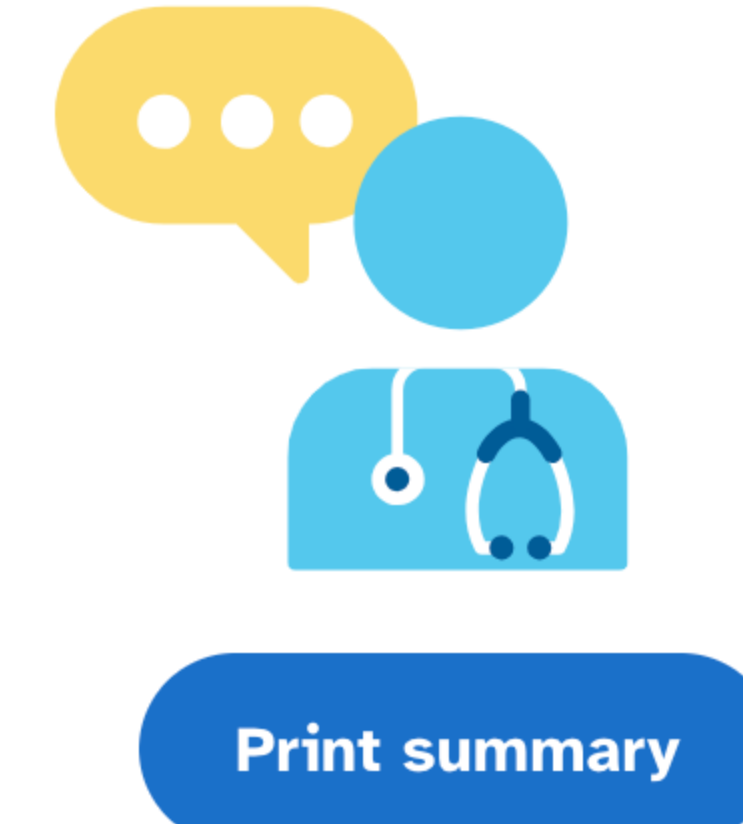
- Citalopram (Celexa®)** Likely typical response >
- Clopidogrel (Plavix®)** Likely less effective >
- Other medications** Learn more >

Test Limitations

- Does not** diagnose any health conditions, provide medical advice, or determine whether a medication is indicated for you.
- Does not** account for lifestyle or other health factors that may affect an individual's ability to process medications.
- Does not** include all possible DNA variants in the CYP2C19 gene or in other genes that may affect how your body processes medications.
- Only** provides Medication Insight reports about citalopram and clopidogrel for certain genetic results.

Share a summary of your Pharmacogenetics reports with a healthcare professional.

Please talk to a healthcare professional if you are interested in learning more about how DNA variants may impact processing of some medications, or if you have concerns about your results. Your healthcare provider could consider both genetic and non-genetic factors when choosing an appropriate course of treatment.



Print summary

How To Use This Test

This test does not diagnose any health conditions, provide medical advice, or determine whether a medication is indicated for you.

Do not use this result to start, stop, or change any course of treatment. Medications should always be taken as directed. Making changes can lead to harmful side effects or reduce intended benefits of the medication.

- [Review the Pharmacogenetics tutorial](#)
- [See Scientific Details for complete Indications for Use statement and full list of Warnings and Limitations](#)
- [See Frequently Asked Questions](#)

Intended Uses

- Tests for three DNA variants in the CYP2C19 gene: *2 (c.681G>A), *3 (c.636G>A), and *17 (c.-806C>T). These variants are associated with altered CYP2C19 enzyme function.
- Provides information about how these specific DNA variants may affect the function of the CYP2C19 enzyme.
- For certain genetic results, provides information about how these specific DNA variants may affect response to citalopram and clopidogrel.

Limitations

- Does **not** test for all possible DNA variants in the CYP2C19 gene that may affect CYP2C19 enzyme function. Having a variant not included in this test may change a person's predicted CYP2C19 metabolizer profile.
- Does **not** test for DNA variants in other genes that may affect other proteins involved in the processing of medications.
- Does **not** account for lifestyle or other health factors that may affect an individual's ability to process medications.
- Only** provides Medication Insight reports about citalopram and clopidogrel for certain genetic results.

Ethnicity Considerations

- The DNA variants included in this test are found in many ethnicities. See Scientific Details for more information.

Both genetic and non-genetic factors influence how your body processes medications.

Healthcare professionals could consider these factors and more when choosing an appropriate course of treatment.

- Drug-drug interactions**
- Other DNA variants**
- Other health conditions**
- Following medication instructions**
- Body weight**
- Age**

Examples of medications metabolized in part by the CYP2C19 enzyme

Cardiology	clopidogrel
Gastroenterology	omeprazole
	pantoprazole
Infectious Disease	voriconazole
Neurology	brivacetam
	clobazam
Psychiatry	citalopram
	doxepin
	escitalopram

Precautions

- The medications listed here are processed in part by the CYP2C19 enzyme. However, it is not known if the DNA variants included in this report affect the processing of these medications similarly in all individuals. This is because the processing of medications is influenced by many genetic and non-genetic factors, including the activity of other enzymes.
- Do not use this result to start, stop, or change any course of treatment.** These medications should always be taken as directed. Making changes on your own can lead to side effects or possible serious events such as a heart attack, or reduce intended benefits of the medication.

Consider sharing this result with a healthcare professional.



Please talk to a healthcare professional if you are interested in learning more about how DNA variants may impact medication processing, or if you have concerns about your results.

Print summary



See our Frequently Asked Questions for more information.

FAQs



Give the gift of DNA discovery.

Gift a kit

Refer friends, earn rewards.

Get reward

ANCESTRY

- Ancestry Overview
- All Ancestry Reports
- My Health Action Plan
- DNA Relatives
- Order Your DNA Book

HEALTH & TRAITS

- Health & Traits Overview
- All Health & Traits Reports
- My Health Action Plan
- Health Predisposition
- Pharmacogenetics
- Carrier Status
- Wellness
- Traits

RESEARCH

- Research Overview
- Surveys and Studies
- Edit Answers
- Publications

FAMILY & FRIENDS

- View all DNA Relatives
- Family Tree
- Your Connections
- GrandTree
- Advanced DNA Comparison

CYP2C19 Drug Metabolism

The CYP2C19 enzyme helps process (or "metabolize") certain medications. Specific DNA variants can affect how well this enzyme works. Do not use this report to start, stop, or change any course of treatment. Medications should always be taken as directed.

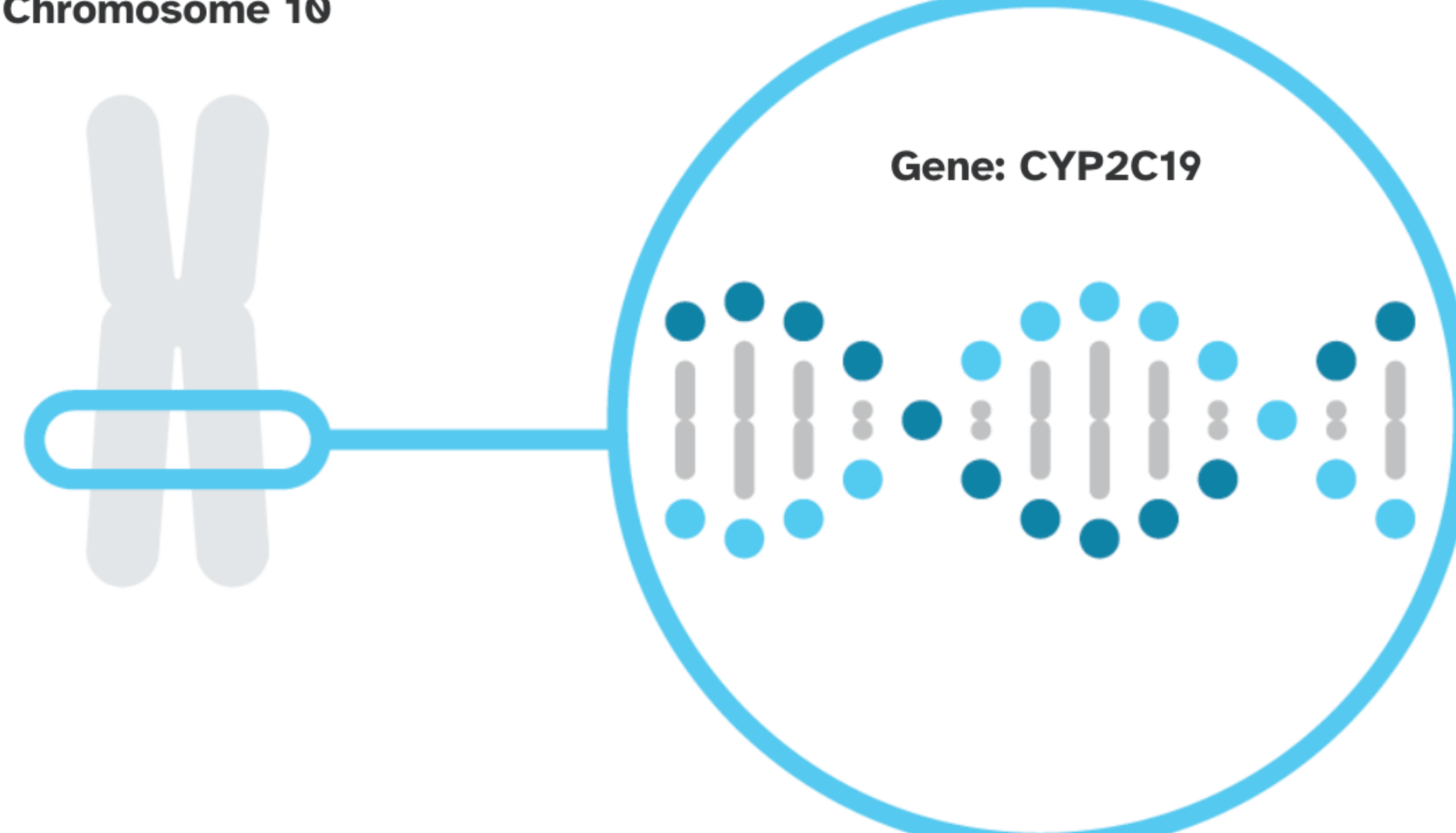
[Overview](#) [Scientific Details](#) [Frequently Asked Questions](#)

Specific variants in the CYP2C19 gene can alter the body's ability to metabolize certain medications.

CYP2C19

The CYP2C19 gene contains instructions for making the CYP2C19 enzyme. This enzyme plays a key role in metabolizing certain medications. Specific DNA variants can lead to increased, decreased, or no CYP2C19 enzyme activity, which can influence the body's ability to metabolize certain medications. Keep in mind that other factors besides your genetics can also affect how your body processes medications.

Chromosome 10



You have one of the genetic variants we tested.

People with this result are predicted to be CYP2C19 intermediate metabolizers.

Variants Detected		View All Tested Markers	
Marker Tested	Genotype*	Additional Information	
*2 Gene: CYP2C19 Marker: rs4244285	A Variant copy from one of your parents	G Typical copy from your other parent	<ul style="list-style-type: none"> Biological explanation Typical vs. variant DNA sequence(s) Percent of 23andMe customers with variant References [3]

* The percent of 23andMe customers with a variant may not be representative of the general population.

This test cannot distinguish which copy you received from which parent. This test also cannot determine whether multiple variants, if detected, were inherited from only one parent or from both parents. This may impact how these variants are passed down.

23andMe always reports genotypes based on the 'positive' strand of the human genome reference sequence (build 37). Other sources sometimes report genotypes using the opposite strand.

Test Interpretation

DNA variants in the CYP2C19 gene can affect the function of the CYP2C19 enzyme. This altered enzyme function can influence the body's ability to metabolize certain medications. However, the metabolism of most medications isn't affected by variants in the CYP2C19 gene. Since many other genetic as well as non-genetic factors influence how the body processes medications, having a variant detected may have no noticeable effects on how medications are processed.

The predicted metabolizer profiles listed in the table are based on the standardized terms proposed by Caudle et al. (2017). In some cases when one or more tested variants could not be determined, metabolizer profile may not be assigned.

Do not use this information to start, stop, or change any course of treatment. Medications should always be taken as directed. Making changes on your own can lead to side effects or possible serious events such as a heart attack, or can reduce intended benefits of the medication.

[References \[1 \]](#)

CYP2C19*2 and *3 are no-function variants and CYP2C19*17 is an increased-function variant. The *1 (normal function) genotype is assigned based on the absence of the three variants included in this test. Predicted normal metabolizers may still have a variant that is not included in this test, which could affect their CYP2C19 enzyme function or the function of other proteins important for drug processing.

Predicted CYP2C19 metabolizer profile	Genotype information
CYP2C19 ultrarapid metabolizer	Two copies of an increased-function variant (e.g., *17/*17)
CYP2C19 rapid metabolizer	One increased-function variant (e.g., *1/*17)
CYP2C19 normal metabolizer	No variants detected. This is designated as the *1/*1 genotype. ⓘ
CYP2C19 intermediate metabolizer	One no-function variant, or one no-function variant plus one increased-function variant (e.g., *1/*2, *2/*17) ⓘ
CYP2C19 poor metabolizer	Two no-function variants (e.g., *2/*2, *2/*3) ⓘ

Test Details

Indications for Use

The 23andMe Personal Genome Service (PGS) is a qualitative genotyping assessment system applied to genomic DNA isolated from human saliva to simultaneously detect, report, and interpret genetic variants in a broad multigene test. The assessment system is intended to enable users to access information about their genetics that could aid discussions with a healthcare professional.

The 23andMe Personal Genome Service Pharmacogenetics Report for CYP2C19 is indicated for reporting of the *2, *3, and *17 variants in the CYP2C19 gene. This report is for over-the-counter use by adults over the age of 18, and provides genetic information about processing of therapeutics to inform discussions with a healthcare professional. This report describes if a person has CYP2C19 variants associated with metabolism of some therapeutics and provides interpretive drug information regarding the potential effect of the identified metabolizer phenotype on citalopram and clopidogrel therapy. This test is not a substitute for visits to a healthcare professional. The information provided by this report should not be used to start, stop, or change any course of treatment unless directed by a healthcare professional.

Special Considerations

- There are currently no published guidelines recommending CYP2C19 genetic testing prior to prescribing a medication. However, several clinical organizations support continued efforts to incorporate pharmacogenetic information into clinical decision making.
- Unless noted in your report, CYP2C19 test results do not require confirmatory testing and may be used by your healthcare provider.

Test Performance Summary

Clinical Performance

[2, 3]

The *2 and *3 variants account for 95-100% of the known CYP2C19 no-function alleles found in most populations, except for the Hispanic and Latino population, where the coverage is about 86%. The *17 variant is currently the only known CYP2C19 increased-function allele.

Analytical Performance

Accuracy was determined by comparing results from this test with results from sequencing. Greater than 99% of test results were correct. While unlikely, this test may provide false positive or false negative results. For more details on the analytical performance of this test, refer to the package insert.

Warnings and Limitations

- This test does not include all variants in the CYP2C19 gene that could influence drug processing.*
- This test does not include variants in other genes that could influence drug processing.
- This test does not diagnose any health conditions, provide medical advice, or determine whether a medication is indicated for you.
- This test only provides Medication Insight reports about citalopram and clopidogrel for certain genetic results.
- The *3/*17 genotype result should be confirmed by an independent genetic test prescribed by your own healthcare provider before taking any medical action. For all other genotypes that result in a predicted metabolizer profile, confirmation is not required and test results may be used by your physician.

See the [Package Insert](#) for more details on use and performance of this test.

* Variants not included in this test may be rare, may not be available on our genotyping platform, or may not pass our testing standards.

References

- Caudle KE et al. (2017). "Standardizing terms for clinical pharmacogenetic test results: consensus terms from the Clinical Pharmacogenetics Implementation Consortium (CPIC)." *Genet Med.* 19(2):215-223. ^
- Pratt VM et al. (2018). "Recommendations for Clinical CYP2C19 Genotyping Allele Selection: A Report of the Association for Molecular Pathology." *J Mol Diagn.* 20(3):269-276. ^
- Whirl-Carrillo M et al. (2012). "Pharmacogenomics knowledge for personalized medicine." *Clin Pharmacol Ther.* 92(4):414-7. ^

Change Log

Your report may occasionally be updated based on new information. This Change Log describes updates and revisions to this report.

Date	Change
May 19, 2021	For certain genetic results, Medication Insight reports were added for citalopram and clopidogrel. Confirmatory testing requirements were removed for certain CYP2C19 genotypes.
March 2, 2020	CYP2C19 Drug Metabolism report created.



Give the gift of DNA discovery.

Gift a kit

Refer friends, earn rewards.

Get reward

ANCESTRY

[Ancestry Overview](#)
[All Ancestry Reports](#)
[Ancestry Composition](#)
[DNA Relatives](#)
[Order Your DNA Book](#)

HEALTH & TRAITS

[Health & Traits Overview](#)
[All Health & Traits Reports](#)
[My Health Action Plan](#)
[Health Predisposition](#)
[Pharmacogenetics](#)
[Carrier Status](#)
[Wellness](#)
[Traits](#)

RESEARCH

[Research Overview](#)
[Surveys and Studies](#)
[Edit Answers](#)
[Publications](#)

FAMILY & FRIENDS

[View all DNA Relatives](#)
[Family Tree](#)
[Your Connections](#)
[GrandTree](#)
[Advanced DNA Comparison](#)

CYP2C19 Drug Metabolism

The CYP2C19 enzyme helps process (or "metabolize") certain medications. Specific DNA variants can affect how well this enzyme works. Do not use this report to start, stop, or change any course of treatment. Medications should always be taken as directed.

[Overview](#)[Scientific Details](#)[Frequently Asked Questions](#)

CYP2C19 Drug Metabolism

What does this test do?

What does this test **not** do?

What should I do if I'm taking any medication?

What is pharmacogenetics?

What are the advantages of sharing my results with a healthcare professional?

What are some non-genetic factors that can affect how the body processes medications?

My genetic profile says that I am predicted to be a **CYP2C19 intermediate metabolizer**. What does this mean?

Have more questions? [Check out our Customer Care Help Center.](#)



Give the gift of DNA discovery.

[Gift a kit](#)

Refer friends, earn rewards.

[Get reward](#)

ANCESTRY

[Ancestry Overview](#)[All Ancestry Reports](#)[Ancestry Composition](#)[DNA Relatives](#)[Order Your DNA Book](#)

HEALTH & TRAITS

[Health & Traits Overview](#)[All Health & Traits Reports](#)[My Health Action Plan](#)[Health Predisposition](#)[Pharmacogenetics](#)[Carrier Status](#)[Wellness](#)[Traits](#)

RESEARCH

[Research Overview](#)[Surveys and Studies](#)[Edit Answers](#)[Publications](#)

FAMILY & FRIENDS

[View all DNA Relatives](#)[Family Tree](#)[Your Connections](#)[GrandTree](#)[Advanced DNA Comparison](#)