

# Can at-home DNA tests predict response to medications? Pharmacists explain risks and benefits of pharmacogenetic testing

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Have you ever wondered why certain medications don't seem to work as

well for you as they do for others? This variability in drug response is what pharmacogenomic testing hopes to explain by looking at the genes within your DNA.

[Pharmacogenomics, or PGx](#), is the study of how [genes](#) affect your response to medications. [Genes are segments of DNA](#) that serve as an [instruction manual](#) for cells to make proteins. Some of these proteins break down or transport certain medications through the body. Others are proteins that medications target to generate a desired effect.

[As pharmacists who see patients who](#) have stopped multiple medications because of side effects or ineffectiveness, we believe pharmacogenomic testing has the potential to help guide health care professionals to more precise dosing and prescribing.

## **How do PGx tests work?**

[PGx tests](#) look for variations within the genes of your DNA to predict drug response. For instance, the presence of one genetic variant might predict that the specific protein it codes for is unable to break down a particular medication. This could potentially lead to increased drug levels in your body and an increased risk of side effects. The presence of another genetic variant might predict the opposite: It might predict that the protein it codes for is breaking down a medication more rapidly than expected, which may decrease the drug's effectiveness.

For example, [citalopram is an antidepressant](#) broken down by a protein called CYP2C19. Patients with genetic variants that code for a version of this protein with a reduced ability to break down the drug may have an increased risk of side effects.

Currently, there are over 80 medications with [prescribing recommendations](#) based on PGx results, including treatments for

depression, cancer and heart disease. There are commercially available PGx tests that patients can have sent directly to their doorstep with or without the involvement of a health care professional. These direct-to-consumer PGx tests collect DNA from either a saliva sample or cheek swab that is then sent to the laboratory. Results can take anywhere from a few days to a few weeks depending on the company.

Some companies [require a consultation](#) with a [health care provider](#), often a pharmacist or genetic counselor, who can facilitate a test order and discuss any medication changes once the results come back.

### **Limitations of PGx testing**

PGx testing will not be able to predict how you will respond to all medications for several reasons.

First, most PGx tests [do not look for every possible variant](#) of every gene in the human genome. Instead, they look only at a limited number of genes and variants strongly linked to specific drugs. PGx tests can predict how you will respond only to medications associated with the genes it tests for.

Some drugs are broken down in very complicated pathways entailing multiple proteins and byproducts, and the usefulness of PGx testing for them remains unclear. For example, the [antidepressant bupropion](#) has three major pathways involved in its breakdown and forms three active byproducts that can interact with other drugs or body processes. This makes predicting how you will respond to the drug much more challenging because there is more than one variable involved. In many cases, there also isn't conclusive data to confidently predict the general function of a protein and how it would affect your response to a drug.

The applicability of PGx test results is additionally limited by a lack of

diversity of study participants. Typically, populations of European ancestry are overrepresented in clinical trials. An ongoing research initiative by the National Institutes of Health called the [All of Us Research Program](#) aims to address this issue by collecting genetic samples from people of diverse backgrounds.

Another limitation of direct-to-consumer PGx tests is that they can predict drug response based only on your genetics. [Lifestyle and environmental factors](#) such as your age, liver or kidney function, tobacco use, drug interactions and other diseases can heavily influence how you may respond to medication. For example, [leafy greens](#) with high amounts of vitamin K can [lower the effectiveness](#) of the blood thinner warfarin. But PGx tests don't take these factors into account.

Finally, your PGx results may predict that you may respond to medications differently, but this does not guarantee that the medication won't have its intended effect. In other words, PGx testing is predictive rather than deterministic.

### **Risks of PGx testing**

PGx testing carries the risk of not telling the whole story of [drug response](#). If variations within the gene are not found, the testing company often assumes the proteins those genes code for function normally. Because of this assumption, someone carrying a rare or unknown variant may receive inaccurate results.

It may be tempting for some people to see their results and want to change their dose or discontinue their medications. However, this can be dangerous. Abruptly stopping some medications may cause withdrawal effects. Never change the way you take your medications without consulting your pharmacist and physician first.

Sharing your PGx test results with all the clinicians involved in your care can help prevent medication failure and improve safety. Pharmacists are increasingly trained in pharmacogenomics and can serve as a resource to address medication-related questions or concerns.

PGx tests that are not authorized by the Food and Drug Administration cannot be clinically interpreted and therefore cannot be used to inform prescribing. Results from these tests should not be added to your medical record.

## **Benefits of PGx testing**

Direct-to-consumer PGx testing can empower patients to advocate for themselves and be an active participant in their health care by increasing access to and knowledge of their genetic information.

Patients' knowledge of their PGx genetic profile has the potential to improve treatment safety. For example, a 2023 study of over 6,000 patients in Europe found that those who used their PGx results to guide [medication](#) therapy were [30% less likely](#) to experience adverse [drug](#) reactions.

Most PGx test results stay valid throughout a patient's life, and [retesting is not needed](#) unless additional genes or variants need to be evaluated. As more research on gene variants is conducted, prescribing recommendations may be updated.

Overall, genetic information from direct-to-consumer PGx tests can help you collaborate with health care professionals to select more effective medications with a lower risk of side effects.

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