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May 28, 2025

Pharmacogenetics – How to Identify the Right Medication and Dosage for You

What is Pharmacogenetics?

According to the Ontario Pharmacists Association, pharmacogenetics is, *“the study of how genes affect an individual’s response to drugs. Using a combination of pharmacology (the study of medications) and genomics (the study of genes and inherited traits), pharmacogenetics allows healthcare professionals to personalize medication usage so that patients achieve the best possible outcomes, while minimizing side effects and safety risks.”*

Your genes give instructions to your body’s cells and help build protein molecules known as enzymes. Enzymes have countless functions, including the metabolism of medications. Drugs are usually produced and prescribed using a “one size fits all” approach. However, people are not built in a “one size fits all” mold. We all have a unique genetic makeup that affects how we absorb a drug, how well our body uses the drug, how we metabolize the drug, and our response to the drug. For example, two people could take a medication for a similar condition. One person may experience significant side effects from taking the drug as they metabolize it slowly and it stays in their system longer. The other person may not have any side effects, and may not even receive any therapeutic benefit from the drug because of how their body processes the medication.

Since a medication can have varied effects on each person, it can be difficult to forecast whether a specific drug will assist the individual, have no effect, or cause an adverse drug reaction. Pharmacogenetic testing

enables health care providers to have more accuracy and confidence in determining which drugs and doses may be the most effective for their patients before treatment even begins. This way, patients can feel better as quickly as possible and minimize the trial and error of trying multiple treatments in order to find the right one.

Your DNA is fixed and does not change, so even though you may not be taking a medication at this point, you can take a test and those results can be used at any time in the future should you be prescribed medication for a health condition. This proactive measure can help narrow down the medication and dosage that is more likely to work for you.

[This video](#) from SickKids provides a nice visual explanation.

How Can You be Tested?

In a pharmacogenetic test, you provide a small sample of saliva, blood, or a cheek swab (usually the latter is done with a take-home kit).

The sample is then sent to a lab where technicians analyze specific genes related to drug metabolism and response. These genes can determine how quickly a drug is broken down by the body, how the body responds to the drug, and the likelihood of side effects.

These results are reported to the patient's healthcare provider, who will interpret the information in the context of the patient's overall health and treatment goals.

The results from a pharmacogenetic test are typically broken down into categories that are used to help determine which medications are most likely to be effective and safe for the individual based on the presence of specific gene variants known to produce an altered response to one or more commonly used drugs.

Drugs are placed into categories: green is good, yellow is cautionary, and red is to be avoided.

What are the Benefits of Pharmacogenetics?

The benefits of pharmacogenetics include:

- Improving your safety, as healthcare providers may be able to avoid prescribing medications that cause harmful side effects and/or overdose in certain individuals.
- Improving efficiency and healthcare costs by narrowing down which medications a person may or may not respond to, which enables providers to prescribe the most beneficial medication first rather than putting the patient through a trial-and-error process. This also reduces the waste of medications that are not effective or cause adverse reactions.
- Targeted drug development: some conditions are caused by specific changes (variants) in a gene. Pharmacogenomics can help researchers discover new medications that directly target the gene change.

What are the Potential Limitations of Pharmacogenomics?

While your genetic makeup is important in determining the best treatment for many conditions, it doesn't completely explain how your body processes medications. Healthcare providers still need to consider other factors when choosing an appropriate medication therapy, such as:

- How your current medications may affect the breakdown of other medications.
- Some health conditions can influence the way your body processes medications.
- Your lifestyle, including what you eat, how often you exercise, and tobacco and alcohol consumption can affect medication breakdown.

As well, pharmacogenomic tests are not available for all medications and target a specific selection of health conditions. However, more research will hopefully expand testing to more conditions, more medications, and even further matching of drugs to our DNA for even better results. The following conditions are currently targeted by pharmacogenetics:

- **Mental Health:** Depression, anxiety, bipolar disorder, schizophrenia, and other psychiatric conditions.
- **Cancer:** Certain cancers, including breast cancer, where specific targeted therapies may be more effective based on genetic markers.
- **Cardiovascular Disease:** Heart disease, where genetic variations can affect the effectiveness of medications like warfarin and clopidogrel.
- **Infectious Diseases:** HIV, where genetic factors can influence the effectiveness of antiretroviral drugs.
- **Other Conditions:** Pain management, epilepsy, autoimmune disorders, neurological disorders, gastroenterology, and more.

How Do I Access Pharmacogenetic Testing?

Ask your family physician if pharmacogenetic testing is right for you. It is a tax-deductible expense under the Income Tax Act and, for some members, may be claimed under your health care spending accounts. Many private organizations offer this service. In a review of three sites, I found the average cost to range between \$500 - \$700. Your physician can order a test, or you can order the test yourself without a prescription.

Pharmacogenetics may also be available to those members who find themselves on long-term disability and who are struggling with their medication. Our LTD vendor may fund this testing to help you progress your recovery.

For more detailed information, review the [Guidance for Patients](#) on the BC Government website. The first section provides a good explanation of the topic, followed by more policy-related information that you may find interesting.

Sources

<https://cpnds.ubc.ca/>

<https://www.opatoday.com/pharmacogenetics/>

<https://www.mayo.edu/research/centers-programs/center-individualized-medicine/patient-care/pharmacogenomics>

<https://my.clevelandclinic.org/health/articles/pharmacogenomics>

A handwritten signature in black ink, appearing to be 'R. Jones' or similar, with a stylized, cursive script.

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Member Health & Well-Being, Director

If you would like to contribute or have ideas about what you would like to see in the ReFresh series, we would love to hear from you: contact rochelle@bcpypa.bc.ca.