

PHARMACOGENOMICS (PGx) TESTING

The PGx test is your one test for life. The test will cover your metabolic response to medications at all stages in life, and can be referred back to at any time regardless of your age or health status.

Pharmacogenomics is the analysis of how genes affect a person's response to drugs. Most drugs are broken down (metabolised) in the body by drug-metabolising enzymes (DMEs). Specific genes code for these enzymes, and variations in these genes can cause significant differences to drug-metabolising enzymes, drug transporters and drug targets.

As everyone has a unique genetic makeup, this can affect how you will respond or react to certain medications. A medication or dose that works for one person may be ineffective or cause harmful side effects in another. Through pharmacogenomics testing, individualised medicine treatment plans can be developed based on each patient's genetic makeup, to determine optimal drugs and dosages, and limit harmful side effects.

What are the potential benefits of PGx testing?

Using the results from PGx testing, health care providers can individualize drug therapy selection and dosages for patients based on their genetic makeup. Testing patients prior to beginning treatment may help determine their response to certain drug classes and help avoid drugs that may be ineffective or cause harmful side effects. For patients currently on treatment, it may identify new treatment options or identify why current treatments aren't working.

Advantages of PGx testing may include

- Decreasing and potentially eliminating the need for a "trial and error" approach to find effective therapy and dosages
- Decreasing the number of adverse drug reactions a patient experiences
- Saving patients time and money on ineffective medications
- Decreasing the amount of time patients are on medication
- Improving patient quality of life by finding effect treatments faster



What will the results from PGx tell me?

How you process different types of drugs

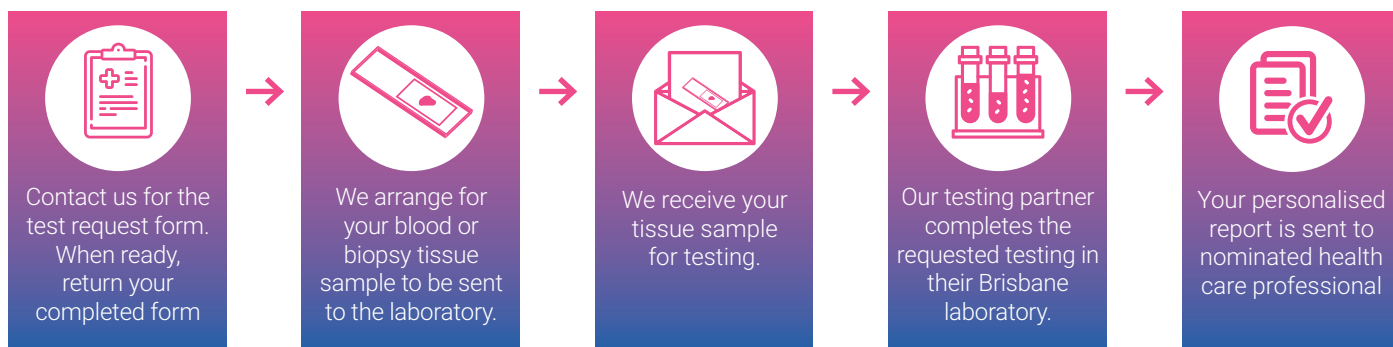
- Variations in genes influence how quickly or how thoroughly individuals metabolise specific drugs. Individuals may be classed as a poor, intermediate, normal or ultra-rapid metabolizer for certain drugs.
- More than 75% of people have variations in drug metabolism that fall outside of what is regarded as "normal" metabolizers. In some cases, these differences can cause significant side effects or mean the medication is ineffective. In severe cases, side effects may be life threatening.

Likelihood to respond to a given medication

- In a patient classified as a "poor" metabolizer, some drugs will not be processed effectively by the body, resulting in no response or minimal response which may require the selection of alternative medication
- In patients who are classified as an "ultra-rapid" metabolizer, the drug is processed and removed from the body rapidly. This may mean that the drug is less effective at the standard dose, requiring a higher dose to be effective.

Risk of an adverse drug response (side effects)

- In a patient classified as a "poor" metabolizer, drugs may be eliminated slowly and accumulate in the body, requiring a lower than normal dose to avoid adverse reactions.
- For patients who are classified as an "ultra-rapid" metabolizer, some drugs may be processed quickly leading to rapid onset of the drug's effect and increased side effects, requiring a reduction in the drug dosage to achieve the desired outcome.



Who Should Have PGx Testing done?

PGx testing is available to everyone but may be most useful for patients who are currently on or about to begin taking medications for any of the conditions covered. It may also be useful for people who have tried numerous drugs to find one that may effectively treat their symptoms.

PGx is particularly relevant in psychiatry where antidepressants are essential components in treatment. 30-50% of patients do not respond to their first antidepressant, and lengthy trials are often required before the optimal treatment type and dose is identified. Patients who have had genetically-guided prescribing may have a greater chance of remission compared to patients without genetic prescribing.

Our PGx panel also covers over 60 common oncology drugs. For cancer patients who are about to commence treatment, this may help identify which drugs are likely to be effective. For cancer patients who are currently on treatment, PGx testing may identify new treatment options, or identify if or why current medications aren't effective.

What Medications are Covered by PGx Testing?

Our Pharmacogenomics Panel uses next generation sequencing to analyse genes related to 40 known drug-metabolizing enzymes (DMEs). Testing of these genes can provide metabolic information on a wide range of drug classes, including:

Conditions	Drug Classes	Common Drugs
Pain Management	Anti-inflammatory, Analgesic, Antipyretic, Opioids, Gout, Antirheumatic	Ibuprofen, Codeine, Morphine
Cardiovascular Medications	Antiarrhythmic, Antihypertensive, Cardiac Stimulant, Vasodilator, Angina medications, Dyslipidemia, Anticoagulant, Antiplatelet	Warfarin, Aspirin, Amiodarone (Cordarone®), Captopril (Capoten®), Atorvastatin (Lipitor®)
Internal Medicine	Respiratory Function, Antiemetic, Peptic Ulcer disease, Obesity, Diabetes, Migraine, Antihistamine, Hyperparathyroidism, Dermatology	Esomeprazole (Nexium®)
Psychiatry	Antidepressants, Antipsychotics	Fluoxetine (Prozac®), Sertraline (Zoloft®)
Neurology	ADHD related drugs, Epilepsy, Sedatives, Anticonvulsants, Muscle relaxants, Alzheimer's and Parkinson's related drugs	Diazepam (Valium®), Pregabalin (Lyrica®), Methylphenidate (Ritalin®)
Infectiology	Antibiotics, Antifungal, Antiviral, Antiretroviral	Erythromycin, Proguanil (Malarone®)
Oncology, Hematology	Antineoplastic, Antineoplastic Targeted Therapy	Tamoxifen (Nolvadex®), Paclitaxel (Taxol®), Fluorouracil (Adrucil®)
Organ Transplantation	Immunosuppressive, Immunomodulation	Cyclosporine, Pomalidomide (Pomalyst®)
Anaesthesiology	Anaesthetic, Muscle Relaxant	Midazolam
Urology	Incontinence, Erectile Dysfunction, Benign Prostatic Hypertrophy	Sildenafil (Viagra®)
Endocrinology	Contraceptives, Androgens, Antiandrogens, Glucocorticoid, Thyroid	Testosterone, Oestrogens, Progestogens

For a full list of conditions and drug classes covered, or to find out if the medications you are currently taking are covered in the PGx panel, please contact CG Genomics Oncology.

Limitations of Testing

The PGx report provides information on how your body will metabolise drugs, which may be helpful in choosing medications. It is however, only one component of how a person may react to any particular drug. Drug reactions may be caused by other mechanisms apart from the known effect of the drug itself. These include hypersensitivity reactions (allergies), intolerance and drug interactions. The PGx report can be used as an aid in choosing medications but must be used in conjunction with previous medical history and other medical information available to your health care practitioner.