The field of pharmacogenomics promises to offer personalized treatment based on your genetic profile.

By Mayo Clinic staff

Modern medications save millions of lives a year. Yet any one medication might not work for you, even if it works for other people. Or it might cause severe side effects for you but not for someone else. Why do medications act differently on different people?

Your age, lifestyle and overall health all influence your response to medications. But your genes also play a role. Scientists are working to match specific gene variations with responses to particular medications. With that information, doctors would be better able to tailor treatments to individuals.

That's what pharmacogenomics is all about. Part of an emerging field called personalized medicine, pharmacogenomics offers the promise of predicting whether a medication is likely to help or hurt you before you ever take it.

Genetics 101

Genes are segments of DNA, which are found in all of your cells. DNA is essentially a chemical operating system for your body, instructing it how to behave and interact on a cellular level. A basic gene can have many different forms. For instance, consider the gene that determines hair color. Normal variations of that gene determine specific hair color, such as brown or blond.

Similarly, your genes can determine how you react to a medication. You may have a genetic variation that makes the drug stay in your body longer than usual, causing serious side effects. Or you may have a variation that makes the medication less potent.

The promise of pharmacogenomics

Say you're diagnosed with a certain disease, such as breast cancer, for which you must take medication. You and your doctor choose a medication based on standard drug therapy and dosing guidelines. Your doctor also takes into account such factors as your weight, age, medical history and perhaps how your biological (blood) relatives reacted to the same medication.

Despite all of that, neither you nor your doctor knows how you'll actually react to the medication. You may experience terrible side effects — or none at all. The medication may put your cancer into remission — or it may have no effect. Consequently, you may have to return to your doctor many times to adjust the dosage or to switch medications. This is how medication choices generally work today — it's often a matter of trial and error.

However a few tests are now available that can help predict whether individuals with cancer or other diseases are likely to have good responses — or bad reactions — to certain medications. Some people, because of their genetic makeup, aren't able to break down these medications fast enough. The medications can then build up in the body and cause severe side effects. Conversely, some people break down these medications too quickly — before they have a chance to work.

With the test doctors are now able to know in advance how you will react and adjust some medicines to fit your genetic profile.

http://www.mayoclinic.com/health/personalized-medicine/CA00078