

Hungry genes?

Diets tailored to your genetic profile are being sold as the ultimate in healthy eating. But does the science add up, asks **Bijal Trivedi**

IT SOUNDS like the ultimate in personalised medicine: a tailor-made diet that controls your weight, optimises your health and reduces your risk of heart disease, cancer and diabetes. All you have to do to get one is hand over a couple of hundred dollars, take a simple genetic test, and wait for a personalised nutrition plan based on your genes to drop through your door.

Diet plans like this are widely available from private clinics, over the internet and, in the US, even in some supermarkets. Advocates claim they take the uncertainty out of grocery shopping and provide a guaranteed route to long-term health and fitness. Critics say the tests are at best misleading and at worst potentially harmful. I was simply curious. With my family history of heart disease, I wanted to know whether a diet tailored to my DNA could help me override my genes.

In theory, yes. All other things being equal, genetics is the reason why one person can eat a poor diet without serious health repercussions while in another person the same diet leads to high blood pressure, cancer or heart disease. This is the basis of nutrigenomics – the science of how the chemicals in food alter the regulation of genes and proteins, and how variations in certain genes might predispose people to troublesome gene-nutrient interactions and ultimately disease. Nutrigenomics is a relatively new science with genuine promise, but it has yet to yield many results of practical value. Even so, no sooner had nutrigenomics got off the ground than eager hiotech companies began mining the results of newly published papers and translating them into over-the-counter tests. So does the science support such tests?

Each person has around 25,000 genes, many of which have several common variants. Some are linked to an increased risk of disease.

The tests look at a handful of such genes to identify which variants the individual carries. If they have “bad” variants, the company offers advice on how nutritional and lifestyle changes could help counteract genetic flaws.

In 2001 the UK-based company Sciona broke new ground with the first such “nutrigenetic” testing service to provide personalised dietary and lifestyle advice. Nutrigenetics is the application of nutrigenomics – which looks at the genome in general – to the individual. However, the test soon drew criticism from the UK’s Human Genetics Commission, and prompted the HGC’s 2003 report “Genes Direct”, which assessed genetics-testing kits sold directly to the public. The watchdog group GeneWatch UK also criticised the tests and called on major UK retailers to boycott the products.

The UK retail market soon collapsed, and Sciona focused on marketing the product to private health clinics, dietitians and nutritionists instead. The company relocated to Boulder, Colorado, in 2005, and began selling tests in the US via websites and genetic-testing companies; last year it sold about 18,000. Other companies sprang up offering the Sciona test, or something similar, for \$100 to \$1000.

The nutrigenetics industry has recently come under renewed fire, this time in the US. An investigation conducted by the US Government Accountability Office in July suggested that the type of nutrigenetic testing offered by four companies – Sciona, Genelex, Market America and Suracell – “misled consumers by making predictions that are medically unproven and so ambiguous that they do not provide meaningful information”. The GAO report also criticised some companies for selling supplements supposedly tailored to a customer’s genetic needs. These “nutraceuticals” cost anywhere





from \$1200 to \$1800 per year, yet according to the report they differed little from multivitamins available at the local pharmacy.

Despite this, I wanted to know whether I had gene variants that could increase my risk of broken bones, heart disease or cancer, and was intrigued by what the nutritional advice might be. Sciona provided me with its "Cellf" test, which is the most widely sold test of its kind, available at many online drugstores and shopping sites and sold by two of the four companies scrutinised by the GAO investigation. It looks at 19 genes that the company believes provide insights into heart and bone health, the body's antioxidant and detoxification ability, plus insulin sensitivity and inflammatory response. Market America also sells a test of the same genes, but under another name. I swabbed the inside of my cheek, completed a food and lifestyle questionnaire, and slipped both in the mail.

The good and the bad

Six weeks later I received my results. First, the good news. For the two genes related to antioxidant ability, which help destroy DNA-damaging free radicals, I have no "bad" variants. Of the three genes involved in detoxification I have versions that efficiently rid my body of noxious compounds.

Now the not-so-good news. My number one priority, according to the report, is bone health. The test screened for a total of seven variants, spread over four genes, each linked to bone problems. I tested positive for four potentially damaging variants. Two hinder absorption of calcium and vitamin D – ingredients critical for bone building – and the other two disrupt the process of dissolving old bone and creating new bone. It sounds to me like I'm a prime candidate for osteoporosis.

Sciona's advice: increase daily intake of vitamin D to 20 micrograms and omega-3 fatty acids to 3 grams, and exercise for 45 to 60 minutes at least five times per week. I get a pat on the back for getting enough calcium, my moderate caffeine consumption, and for my healthy body mass index.

Next: heart health. The test reveals that I have variants in several genes that alter my body's ability to metabolise B vitamins – like folic acid, B₆ and B₁₂. These vitamins are important for maintaining low levels of homocysteine – high levels of which are a risk factor for cardiovascular disease. Also, my variants of the inflammatory-response genes can lead to "reactions that are too strong or inappropriate in their timing", according to Sciona, which could damage my cardiovascular system. I also have potentially problematic variants in genes that metabolise cholesterol and triglycerides, and another