



# *Epigenetics*

## *Changing Your Own Genetic Destiny*

Understanding One's Genetic Strengths and Weaknesses  
Empowers One to use Epigenetic Strategies to Prevent  
Disease and Realise Genetic Potential.



*“Relying on the wisdom and holistic approach of Traditional Chinese Medicine, Western Natural Therapies, and a 6000 year unbroken history of Herbal Medicine, I offer a healing system that focuses on the cause of disease, not merely the suppression of symptoms.*

*My goal is to discover the individuality of your health problem, treat its cause, and stimulate your body to heal itself as soon as possible”.*

## ***Dennis Vander Kraats***

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• Australian Traditional-Medicine Society (A.T.M.S.)

### ***Personal History***

Dennis Vander Kraats was born in Toronto, Canada and grew up with a passion for distance running. He represented Canada nationally and internationally on a number of occasions, including the 1979 World Cross Country Championships. His success in athletics earned him a scholarship from the prestigious University of Notre Dame (USA).

After arriving in Australia, Dennis and his wife Marion successfully operated a health food store and this stimulated Dennis’s desire to further his knowledge of natural therapies.

After eight more years of study, Dennis graduated from the Melbourne College of Naturopathy and Homoeopathy, the Nanjing College of Acupuncture, and the Australian Acupuncture College (Victorian University of Technology) to become a qualified Naturopath and Acupuncturist.

Dennis is now in private practice, and the director of Vander Kraats & Associates, evidence based natural medicine in Western Australia.

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# *Epigenetics: The New Science*

In recent years there has been a revolutionary paradigm shift in the understanding of the function and role of genetics on human development. The emerging new science of epigenetics has revealed the profound influence, previously understated , that the environment has on who we are. And more importantly, who we can be.

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## *Gene Switches*

The notion that our DNA code is the sole determining factor of our physical destiny has been superseded by the construct that many of our genes have switches. These gene “switches” come in the form of “on and off switches” as well as “dimmer switches”. These switches are activated by the interaction between the genes and the environment.

A more technical definition of epigenetics is the differing expressions of the genes caused by environmental influences without actually changing the DNA code. Imagine that the genes are like the members of an orchestra and that the epigenetics influence is the “conductor”. The genes are capable of playing many “symphonies” depending on the directions of the conductor.



## *The Environment*

The term “environment” has a much broader meaning in this context. Environmental influence on the genes can be in the form of food, drugs, herbs, chemicals, radiation, emotions, and lifestyle. In one sense, our genetic heritage is part of our environment. Science has shown that epigenetic influences can be transgenerational. In other words,

changes to gene activity due to our epigenetic influences in our parent’s environment can be passed on to the children.

## *Nutrigenomics*

Nutrigenomics more specifically describes study of the interaction between our genes and nutritional substances and lifestyle.

## *Pharmacogenomics... Transgenerational Side Effects?*

Pharmacogenomics refers to the study of the epigenetic changes to genes as a side effect of pharmaceutical drugs. The understanding that drugs could have epigenetic side effects is frightening. Drugs trials in the past have studied side effect whilst patients are taking the drugs. Long term studies of epigenetic side effects of drugs (if undertaken!), including transgenerational studies, could force people to reassess the risks and benefits of medication. Imagine the implications if one's children suffer from drug induced epigenetic illnesses due to the parents' drug therapy protocol?

## *Striving For Your Genetic Potential*

Technology is now available to test a number of important genes which have a profound influence on one's health. Unlike some genetic testing which focuses on gene-disease causation (for example testing for a gene which relates to a specific disease such as breast cancer), the genes we test relate to physiological processes such as immunity, inflammation, fat metabolism, cardiovascular processes, bone health, and the ability to detox and prevent oxidative stress. These physiological processes can lead to disease, but more importantly respond to epigenetic influences which can prevent disease and enhance well-being.

**The good news is that epigenetic alterations of gene behavior are generally reversible.**



## ***Realise Your Strengths and Enhance Your Weaknesses With Personalised Genetic Profiling***

Genetic testing is accurate, safe, affordable, and virtually non-invasive. A pain free swab is taken from the inside the mouth, in the pouch between the teeth and cheek, where a sample of the body's cells are taken. Forty genes are then tested and an extensive report is provided with analysis of one's own unique genetic profile of strengths and weaknesses. As mentioned, gene expression and subsequent health improvement or deterioration are influenced by epigenetic influences, but the individual's DNA code itself never changes. Therefore, only one test is required (for the genes tested) during one's lifetime.

### ***Anonymity Assured***

Since this type of gene testing measures physiological processes and not diseases, this information cannot be used to discriminate in the workplace or affect insurance risks.

Anonymity is assured since no personal information, such as names, addresses, etc are listed on the report. An ID number, not a name is assigned to each individual profile and only your practitioner and the lab will know the identity of the results.

### ***Liberation, Not Determination***

When we understand the power we have to influence our gene expression, the old attitudes, that we are chained to and doomed to our genetic heritage are superseded with empowerment and liberation. Our personalised unique genetic profile justifiably motivates us to take more responsibility in the choices we make which affect our health.



## ***Truly Holistic and Preventative Medicine***

By learning our genetic weaknesses in the processes that lead to disease, we can intervene and take a truly preventative medicine role before the disease manifests.

Genetic testing allows us to treat not just symptoms, but systems. Most symptoms that one experiences are merely “the tip of the iceberg”. The holistic approach delves beneath the surface to treat the systems that cause the symptoms.



## ***Laser Target Your Treatment***

Armed with the profound information that genetic testing provides, a specific treatment protocol based on the individuality of your test results will be formulated and implemented.

No longer will there be guessing about which supplements will suit you and no longer will you have to have a shopping bag full of pills. A “gene smart” diet is a truly health enhancing diet.

The weaknesses that are measured in genes are referred to as variants. The genetic variants that are tested are grouped according to their primary biochemical effect they have on the body.

Forty genes are tested and you will receive a comprehensive analysis in written form.

## ***What Do I Do Next?***

Once you have completed and signed the DNA consent form, we'll take a non-invasive DNA sample that will be tested in a NATA accredited laboratory. A swab is gently taken from the inside of your mouth, between your jaw and cheek. There is no need for blood and you will experience no pain. The cells that are taken will provide a profound insight into your genetic profile based on 40 most potent genes in relation to:

## ***The Six Systems That Are Tested***

1. Inflammation and Immune System,
  - a. Pro-inflammatory proteins
  - b. Acute phase inflammation
  
2. Cell Defence,
  - a. Cellular anti-oxidant defence
  - b. Detoxification (Phase 1 and 2 liver detox)
  
3. Cardiovascular Health,
  - a. Homocysteine metabolism
  - b. Blood pressure regulation
  - c. Blood coagulation
  
4. Fat Metabolism,
  - a. Fat metabolism
  - b. Energy metabolism and thermogenesis
  - c. Cholesterol regulation
  - d. Leptin insulin signalling pathway
  
5. Taste, and
  
6. Bone Health.

### ***1. Inflammation and Immune System Genes That Affect Your Inflammation and Immune Response***

Inflammation is our body's protective mechanism which protects us against infections and the effects of injury. Under normal circumstances inflammation helps our body to heal itself. For example, if you strain a muscle by over-exerting yourself during sports, the resulting inflammation, characterised by swelling, pain and stiffness, is part of the healing process to remove damaged

muscle cells and help the healing process by replacing those cells with new cells. Normally the inflammation decreases within a few days and healing/recovery process begins.

Chronic inflammation, on the other hand, is totally different, in that it does not go away quickly, and in fact some people finish up with permanent stiffness, swelling or pain. Extensive scientific research has found that chronic inflammation is the fundamental cause of most chronic diseases, such as coronary heart disease, cancer, diabetes and arthritis to name a few, and affects millions of people world-wide.

Chronic inflammation is the consequence of an injury to the body, combined with genetic variants and nutrient deficiencies or imbalances.

In addition, we become more susceptible to inflammation as we age, but this can be reversible given the right interventions.

## ***2. Cell Defense and Detoxification Genes That Affect Your Nutrition and Detoxification (Cell Defense)***

It is now widely accepted in the medical and scientific communities that oxidative stress of cells in our bodies by 'Free Radicals' is one of the major causes of many degenerative diseases, such as cardiovascular disease, diabetes, cancer and also has an adverse effect on the ageing process.

### **WHAT ARE FREE RADICALS\*?**

Free Radicals are damaged, very unstable and highly reactive molecules which are capable of destroying entire cells and reprogramming DNA.

Free Radicals can actually fast forward the ageing process.

Sources of Free Radicals include:

- Alcohol and/or coffee,
- Smoking and/or passive smoke,
- Sunlight and/or UV rays,
- Deep fried and/or burnt food,
- Strenuous exercise and/or workouts,
- Stress,
- Pollution, chemicals and/or toxins,
- Medications, and
- Food preservatives and/or additives.

The effects of Free Radical damage are not immediate and can take several years to become evident.

Our overall health and well-being are influenced, not only by the nutrient intake through our diet, but also by our body's ability to remove waste products and toxins, referred to as 'xenobiotics' from our body by a process known as detoxification.

\*The correct scientific term for free radicals is Reactive Oxygen Specific (ROS) or Reactive Nitrogen Species (RNS)

### **Examples of Xenobiotics Include:**

- Polycyclic aromatic hydrocarbons (PAH's) produced by barbecuing, frying or char grilling meat,
- Caffeine from coffee and cola drinks,
- Alcohol,
- Nicotine from tobacco smoke, and
- Chemicals such as benzene.

These waste products and toxins must be efficiently removed from our bodies otherwise they can cause significant harm. Xenobiotics are broken down and flushed from of our bodies in a two-stage detoxification process. This process occurs primarily through the liver with secondary organs also contributing such as, the kidneys, lungs, colon and skin.

The two phases of the detoxification process are:

### **Phase 1 — The xenobiotics are metabolised into free radicals**

As mentioned above, Free radicals cause oxidative stress which can damage the cells in our bodies.

Therefore, if this phase is over-active, the over-production of free radicals can have adverse effects on our health.

**Phase II — The free radicals are neutralised and made water-soluble so that they can be easily removed from the body.**

If the enzymes associated with this phase are not functioning properly, then the body's ability to remove these xenobiotics is diminished which results in an increased accumulation of toxins in the body and hence can result in many health problems, such as:

- Fatigue,
- Headaches,
- Poor concentration,
- Chronic fatigue,
- Inflammation,
- Allergic reactions,
- Muscle and joint pain, and
- Poor sleep patterns to name a few.

### ***3. Genes That Affect Your Cardiovascular Health & Fitness***

A healthy cardiovascular system with a healthy heart pumping blood through wide open, unclogged arteries and elastic arterial walls, is vital for delivering oxygen, energy and nutrients to all the body's cells, tissues and organs, as well as removing waste products.

Unfortunately cardiovascular disease is the number one cause of death in Australia, causing nearly 34% of all deaths in 2006.



There are five major risk factors and five minor risk factors for cardiovascular disease.

**The Five Major Risk Factors Are:**

1. Oxidized fat
2. Cigarette smoking,
3. Hypertension (high blood pressure),
4. Diabetes, and
5. Genetic history of heart disease before 55.

**The Five Minor Risk Factors Are:**

1. Obesity,
2. Physical inactivity,
3. Stress,
4. Specific infections, and
5. Gout.

Food is directly involved in many of the risk factors for cardiovascular disease, and since our genetic makeup is one of the major risk factors, genetic profiling can be a powerful tool for maximising fitness and health potential.

The health of our cardiovascular system is influenced by several factors, including two chemical processes in the body which can cause narrowing of the arteries, hardening of the arterial walls and reduced blood flow, namely:

- ‘Methylation’ and the formation of homocysteine, and
- ‘Oxidative stress’ and the formation of Free Radicals.

For example, high levels of Free Radicals in our bodies can damage our arteries, our DNA and the genes that keep the various cells in our bodies functioning properly.

**In addition, high homocysteine blood levels can cause:**

- Blood to become ‘stickier’ and clots can form more easily,
- Elastic fibre in arterial walls to break down causing the arteries to begin to stiffen and lose flexibility,
- Nitric Oxide level, which is critical to arterial wall flexibility, to be lowered

**Three other processes which influence the health of our cardiovascular system are:**

- Inflammation within the arterial walls,
- Blood Coagulation,
- A deficiency of Nitric Oxide supplied to the arterial walls (See below).

### **Cardiovascular Fitness**

The key to achieving the best cardiovascular fitness outcomes is to undertake regular physical activity in the three areas of: Endurance, Strength, and Flexibility. The purpose of the endurance component is to improve cardiovascular fitness and our circulatory system so that nutrients can be effectively delivered to all the body’s tissues, and waste products and toxins can be quickly eliminated.

Our genes have a major affect on a variety of processes connected with physical activity, such as our cardiovascular fitness, strength, flexibility, endurance and overall performance.

## ***4. Fat Metabolism and Insulin Sensitivity - Genes That Affect Your Body Fat Metabolism (Lipid Metabolism and Insulin Sensitivity)***

Scientific research has shown that the tendency to gain weight — and not get rid of it — is not only about our lifestyle choices but also embedded in our genes. Compared with the general population, the risk of becoming obese is two to three times higher for an individual with a family history of obesity.

Obesity is more than unhealthy — it is life threatening. Obesity also increases the risk of Type-2 diabetes, heart disease, stroke, certain forms of cancer, joint problems and a number of breathing disorders.

Having a genetic predisposition to poor body fat metabolism can explain a tendency to gain weight. However, we can't lose sight of the fact that part of the explanation is bad lifestyle choices in that: we over-eat and under-exercise.

Research has shown that the inflammatory substance  $TNF-\alpha$  which is also produced in fat tissue has been specifically associated with Type 2 Diabetes and insulin resistance as well as obesity.

## ***5. Taste Receptors. Genes That Affect Your Taste and Appetite (Satiety)***

Our dietary habits depend on a complex combination of social, environment and genetic factors. Therefore, many other factors, apart from our perception of taste and flavours, can influence our choice of foods such as age, education, metabolic rate, hormone levels and social status. Food preferences are also strongly influenced by cultural background, peer group interactions, learned experiences and simply eating for pleasure.



Despite this complex combination of factors, scientific research has shown that inherited genetic variations have a significant influence on our taste perceptions, which can potentially lead to different dietary habits and thereby influence nutrition related diseases.

Humans show significant differences in their sensitivity to bitter and sweet stimuli.

The most prominent example of this variation in taste is the perception of the bitter compound phenylthiocarbamide (PTC).

Some people, classified as 'PTC tasters' can taste minute concentrations of this substance whereas others, classified as 'PTC non-tasters', are virtually taste blind to the bitter taste of PTC even at concentrations several hundred times higher.

There is very strong molecular, genetic and functional evidence to support the view that variations in the TAS2R38 gene define the PTC taster status, and hence, our preference for food. PTC tasters are more prevalent.

Approximately 30% of Europeans are 'PTC non-tasters' and the remaining 70% 'PTC tasters'.

The 'PTC taster' status has been associated with various differences in food preferences, not only for vegetables and fruits, but also fats, alcohol and sweeteners. For example, 'PTC tasters' tend to find that certain cruciferous vegetables, such as broccoli, brussel sprouts and cabbage taste very bitter and tend to avoid eating them, whereas the 'PTC non tasters' don't notice the perceived bitter taste.

One very good example of the effect of the PTC taster status is a scientific study that looked at the behavioral outcomes of children based on their genetic sensitivity to bitter taste perception<sup>16</sup>. Children have heightened preferences for sweet tasting food and a greater rejection of bitter tasting foods. Therefore, if the child is a 'PTC taster' and the mother is a 'PTC non-taster' then the child is more likely to reject eating vegetables, such as broccoli in preference for sweet tasting foods and this can lead to different behavioral outcomes at meal times.

Leptin, mentioned in the previous section, also influences our appetite and our satiety (a feeling of being fully satisfied after eating) by sending signals to the brain that our body has had enough to eat. Therefore, circulating Leptin levels give the brain input with regard to energy storage so it can regulate appetite and metabolism.

However, some people possess a variation for the Leptin gene which leads to a constant desire for food and this can result in increased weight. Although Leptin is a circulating signal that reduces appetite, in general, obese people

have an unusually high circulating concentration of Leptin. These people are said to be resistant to the effects of Leptin. i.e. Leptin Resistant in much the same way that people with Type 2 diabetes are resistant to the effects of insulin. The high sustained concentrations of Leptin from the enlarged adipose stores result in Leptin desensitization.

The pathway of Leptin control in obese people might be flawed at some point so the body doesn't adequately receive the satiety feeling subsequent to eating.

People who have variants, for these genes are known as the 'super tasters', are genetically very sensitive to bitter tastes, not only from vegetables, such as broccoli, but may also be adverse to the taste from smoking and alcohol.

People who are referred to as 'tasters', and those who are known as 'non tasters', that is, they are the least sensitive to the above tastes. However, as we mature we can over-ride our genetic preferences for taste through complex social and environmental interactions, such as peer group pressure, and can 'acquire' certain tastes that we may naturally initially dislike.

If people have 'less beneficial' or 'least beneficial' variants for the 2 Leptin Receptor genes, they may have an increased appetite compared with those who have the reference variant, especially when overweight.

## ***6. Bone Health - Genes That Affect Your Bone Health***

The state of our bones and hence our skeletal structure is 'dynamic and ever changing', as bones are living tissue and are in a continual process of breakdown (resorption) and re-building (growth).

There are three major elements that influence the growth and hence the strength of our bones:

- The growth of collagen fibres that provide the elasticity and the resilience,
- The concentration of mineral deposits, such as Calcium and Vitamin D around the collagen fibres which make the bone hard and strong,
- The presence of any inflammation which can promote bone breakdown and loss.

Several gene variations have been identified that affect the growth and health of our bones, such as Col1A1, VDR, IL6 and TNF- $\alpha$ . Fortunately, any adverse variations in these genes can be influenced by good lifestyle choices, such as physical exercise and healthy nutrition, specifically optimal levels of Calcium and Vitamin D.

Conversely, poor lifestyle choices can increase the risk of bone diseases, especially osteoporosis, for people with certain genetic variations.

These poor lifestyle choices include:

- Poor diet,
- A sedentary lifestyle,
- Smoking,
- Alcohol abuse,
- Caffeine, and
- Long term use of certain medications.

Even though a gene is listed in one group it can have a major influence in other groups as well. For example, the primary influence of the gene, Interleukin - 6 (IL-6) is in Group 1 for inflammation and recovery, however, it also has a major influence in other groups, such as cardiovascular health, fat metabolism and bone health.



The major purpose of these groups is to help identify the focus area(s) for your fitness, health and nutrition interventions. A high number of 'less' beneficial or 'least' beneficial variants in a group is a 'Call to Action', therefore your first focus group for looking at exercise, nutrition and lifestyle interventions is the group with the highest percentage of these variants.



*Are you interested  
in discussing how you  
can change your  
genetic destiny?*

Give us a call or check out our website to book your appointment with Dennis Vander Kraats.



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