

WHAT DO YOU KNOW ABOUT YOUR GENES?

by John Appleton

Recently I met a man who had difficulty walking due to pain from arthritis. Despite ongoing 'encouragement' from his wife he told me that he didn't see any need to change his lifestyle because *'the problem is genetic so regardless of what I do, I won't see any benefit'*.

It occurred to me that there might be many others who think along similar lines and accept chronic illness and toxic drugs as a fact of life, choosing to blame their state of health on their genes which they believe they have no control over.



I think it is important therefore that we all learn a little bit about our genes, what they are how they influence our lives and what we can do to influence them.

When we think of the human body being composed of cells, approximately 70 trillion of them, do we ever consider that each and every one is a living factory that can perform trillions of actions every second? Our cells work both independently and cooperatively and are specifically suited to their roles. Skin cells for instance stack together like bricks, muscle cells are long and thin, red blood cells look like discs and nerve cells have long tail like structures.

When we 'dive' inside a cell we find a clearly defined structure called the nucleus which is a bit like the pip in a cherry. Contained inside the nucleus is the genetic code that determines who we are. If we peek inside the nucleus we will find our genetic instructions (our individual blueprint) organized on 23 pairs of chromosomes, 23 of these coming from the male sperm and 23 from the female egg. Zooming in on our 46 chromosomes we can see that they are divided into 30,000 segments called genes each of which contains a special code for making a single protein (enzyme), a chemical signal that could have either a positive or negative influence on our life. Gene comes from the Greek word 'Genea' meaning generation.

Using an even stronger looking glass we would see that each gene consists of double strands of genetic material known as DNA (Deoxyribonucleic acid). DNA was first discovered by scientists in the 1890's but it wasn't until 1953 when Drs James Watson and Francis Crick discovered that the two strands of DNA formed a double helix containing a 'readable' genetic code. Because of the way our DNA is tightly coiled and twisted it's amazing just how much can be squeezed into each cell. It might surprise you to know that if you unraveled all the DNA in your body, it would stretch to the moon and back approx 37,500 times.

If we think of our genetic blueprint as a book (a biological dictionary) the DNA forms the words in genetic instructions and each gene contains approx 700 DNA words. If all this sounds a bit mind boggling, further investigation would reveal that our DNA strands consist of four smaller chemical units known as nucleotide bases. These four chemicals form the chemical alphabet of DNA and when one considers that a single cell contains 3 billion DNA letters clearly we have a pretty detailed book of instructions.

It is very important to understand that by themselves genes are inactive, remaining 'quiet' until something prompts their activity literally turning them on and causing them to perform their function of making the specific protein (enzyme) that they are pre-programmed to do. This is known as gene expression.

So how does the process work? When a gene expresses itself in response to a chemical signal and starts making its specific protein (enzyme) we might think of it along the lines of how a factory takes and processes orders for products. When the factory (cell) receives the 'order' (a chemical signal) for a 'product' (a part of the body) the 'order' is sent to the gene responsible for producing the protein (enzyme) for that 'product'. After the protein (enzyme) is made Vitamins, Minerals and other important nutrients are needed to complete the job. This is where things can go wrong because if these essential 'ingredients' are not available in appropriate amounts, production stops and if the 'order' were for new cartilage for an arthritic hip it wouldn't be made.

Gene expression is influenced by many factors – the environment – emotions – stresses – infections - injuries and experiences, but perhaps the most important factor is nutrition. In a fascinating article I read some time ago "*You are what your mother ate*" they talked about researchers at the Duke Comprehensive Cancer Centre discovering that nutrition very early in pregnancy permanently affects gene expression in the offspring without actually changing the genes themselves.

Such is the importance of this, a new field of science called Nutrigenomics (the study of the relationships between nutrition and the response of genes). At Auckland University they have an active Nutrigenomics unit. www.nutrigenomics.org.nz.

While some of our genes are hard wired (those that determine say hair or eye colour) and we can be born with genetic disorders that can't be changed, many of our genes are in reality quite flexible and they can respond favourably or unfavourably depending on how we control the many factors that influence their 'behaviour'. If we inherit from our parents, genes that might predispose us to degenerative diseases (e.g. the APOE E4 gene which promotes the accumulation of cholesterol), it is becoming widely recognized that regardless of the genes we are born with, if a particular health issue 'runs' in the family, it doesn't necessarily mean that it will 'run' in you; unless it is triggered by the many factors that influence your life. When I was 50 I was told that I would need a hip replacement at some point (I had a lot of pain when walking). Now I am not aware that I have a hip joint. With significant lifestyle changes I have 'tamed' some of my genes and thus turned off the degenerative process.

The importance of diet cannot be over emphasized. Science writer Matt Ridley said "Nurture is reversible – nature is not" In his book '*Nature Via Nurture*' he says "*genes are designed to take their cue from nurture*". It is not difficult to see that many of the health problems that afflict western civilization are due to a confrontation between ancient genes and a modern diet of processed foods that are devoid of essential nutrients.

The bottom line is this. We can't easily limit exposure to toxic environmental chemicals, especially with city living. We can however control what we put in our mouths. It's never too late to "Feed Your Genes Right" (the title of a fascinating book by Jack Challem). In this book the author says "*when our diet is built around foodstuffs that did not exist until recently, our ancient genes receive unfamiliar chemical signals. The response of genes to unfamiliar foods is almost always abnormal*".

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