Fitting into Your Genes: How Nutrition Can Alter your Future
Part 1 of 3

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"So John, you've come to see me because you had a heart transplant and realized you'd better clean up your diet and make lifestyle modifications....," I said inquisitively, awaiting John's reply. John replied grudgingly, "My wife insisted I see you for a nutritional program even though I feel fine now since I've got a new heart!" He continued: "I know I need to eat better, but I still want to enjoy life. Frankly, I'm here only because my wife insisted on it after the transplant! Anyway, ***I think I just have bad genes*** so I don't think changing my diet can help much." Looking at John's pants, trying to break the tension, I replied humorously, "Your jeans don't look so bad to me!" We both laughed and I proceeded to engage John in discussing a plan for dietary and lifestyle modifications.

Though the name has been changed, this is an interaction I vividly recall with an actual patient of mine a few years ago! This typical 50-something year-old American man had worked hard all his life to provide for his family. He had long neglected the basic health-promoting disciplines of regular exercise, a healthful diet, stress management techniques, and adequate rest and recovery. He also mistakenly thought that spending money on nutritional supplements simply resulted in expensive urine. Typical of many of his peers John spent less effort maintaining his health than the average American woman, and took the fatalistic attitude that he just had bad genes, about which there was nothing he could do.

Was he correct? Do diet, proper supplementation, exercise and other lifestyle factors actually influence genetic factors? If so, to what extent? Can these dietary and lifestyle modifications actually change genetic influences to the extent that it can change our results if we get a genetically-associated disease, or not? In this first of three articles, I will focus on answering these questions primarily in relation to heart disease, the number one cause of death in both American men and women.

Terms to Know, and Why They are Important

Since most people reading this will not have a background in genetics and biochemistry, I first need to define a few terms.

Nutraceuticals can be defined as substances within foods which when isolated at certain

concentrations, can modify which genes are turned on, or expressed, and influence cellular functions. For example, oatmeal, bakers yeast and certain mushrooms are high in a substance called beta-glucan which has beneficial effects on activating genes which balance our immune system responses.[1] Does that mean you should start eating 5 bowls of oatmeal a day to improve immune system function? No, not necessarily. By definition, nutraceutical substances in foods are active at certain concentrations. You have to have a certain concentration at which you will get the desired effect. When eating a whole food, there are many other substances in a food with various effects. Generally, for a nutraceutical effect, you need to have a specific amount of an isolated substance at a certain concentration, taken in on a regular basis for a particular amount of time. The concentration is usually higher than that found in whole food substances. Therefore, for nutraceutical effects, a substance in the form of a nutritional supplement is taken by mouth.

Unlike pharmaceuticals, nutraceuticals tend to have a far greater range of safety. They tend to have a larger range of the dose at which they give beneficial effects (effective dose). They tend to have multiple beneficial effects, and they tend to give beneficial effects when taken simultaneously with other nutraceuticals. Nutraceuticals too are far less expensive than pharmaceuticals, particularly when used for prevention, thus avoiding more costly surgery, rehabilitation, and forced life changes. Unlike pharmaceuticals however, they are not as strictly regulated as prescriptions, and therefore there is a wide range of quality, uniformity and potency between different manufacturers.

Nutrigenomics refers to how nutrients influence genetic expression. **Genotype** refers to the genetic makeup of the person...that is the fixed genes the person was born with. You can't change your genotype, but you can change the expression of those genes through nutrient and lifestyle influences. For example, you may have a genotype that predisposes you to a heart attack, but by making positive dietary and lifestyle choices, a heart attack never occurs. Another way to look at this is that while you may have a genotypic predisposition to a heart attack, the genes for having a heart attack are not expressed because you have made good nutritional and lifestyle choices which effects their expression.

Phenotype refers to the observable appearance of a genetic trait...what you can see or can observe. For example, albinism is a genotypic trait that results in the inability to produce the pigment melanin. The phenotype is seen as white hair, and lack of pigment in the skin and eyes.

However, phenotype is often the result of combinations of genetic and environmental influences. For example, if you are genotypically predisposed to a heart attack, and if you eat bacon and cheesecake for breakfast each day, you will exhibit a phenotypic expression of elevated cholesterol, your physique will resemble the Pillsbury doughboy, and your spouse will be the recipient of a life insurance benefit sooner than either of you would like! On the other hand, if you are a genotypically predisposed person to a heart attack, and you make healthy lifestyle and dietary choices regularly, your phenotype may instead show wonderful cholesterol and other lab results, with a physique similar to a

younger version of the current Governor of California, and with the potential for a longer, healthier life.

How Nutraceutical Supplementation Can Help- What the Research Shows

According to the latest statistics from the Centers for Disease Control (CDC), and the American Heart Association, the leading cause of death among Americans, for both women and men, is heart disease. Some of us do have bad genes which predispose us to heart disease. Others do not. The good news is there are many nutritional habits we can acquire which lower the risk for all of us. Here are a few examples of discoveries within the last decade.

Most of us know that elevated cholesterol levels in the blood point to increased risk for cardiovascular disease (CVD). Most of us don't know that the same is true for high homocysteine[2] levels. Homocysteine is a sulfur-containing amino acid which can cause arteriosclerosis, and high levels can cause heart disease even if cholesterol levels are low. Homocysteine levels of course are influenced by genetics and diet. Several nutraceuticals involved in protection against elevated homocysteine are vitamins B6, B12, and folic acid.[3 4 5]

(Incidentally, elevated homocysteine in childrens blood and urine is also associated with a genetic defect associated with mental retardation, skeletal problems and optic lens dislocation, also positively influenced by B6, B12 and folic acid.[6 7 8])

The question arises as to how much vitamin B and folic acid we should take? Research supports Roger Williams'[9] hypothesis that biochemical individuality may require large variations in nutrients due to genetic variations. A landmark article by Bruce Ames[10] supports the fact that some genetic mutations may require high-dose vitamin therapy perhaps hundreds of times the normal dietary reference intake (DRI). Nutraceutical dosages for B6 which have been found to benefit elevated homocysteine and various genetically linked disorders have been between 40 to 900 milligrams (mg) per day[11]. That is 20-450 times higher than the current DRI for B6, which is 1.6 mg/day for adults. For B12, research literature has been published using 500 mg/day for positive effects on elevated homocysteine[12], which is 250 times higher than DRI for B12, at 2.4 mg/day for adults. For folic acid, research literature supports the use of between .8 mg and 20 mg/day of folic acid for decreasing homocysteine levels in various genetically linked disorders.[13 14] This is 50 times higher than the DRI for folic acid, which is .4 mg/day for adults.

Clearly, there is a discrepancy between the DRI (dietary reference intake) and what the research literature indicates are nutraceutical dosages for influencing genetically-linked disorders including heart disease. How much any one person should take depends on their genetics and their condition. The good news is that appropriate levels can be determined for an individual, given advances in testing and supplement manufacturing. Also of good news is the increasing number of reputable practitioners who specialize in consulting with individuals on dietary and supplement intake.

These are just a few examples of cardioprotective nutraceuticals and therapeutic dosages which can have positive genetic influences on disease outcomes. Many other nutraceuticals and their effects on phenotype will be explored in the Parts 2 and 3 this article. The point is that you CAN have significant influence over the expression of your genetic make-up, and lead a healthier and longer life with relatively simple and inexpensive measures from experienced practitioners.

Stay tuned for further insights in Parts 2 and 3.

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Dr. Husbands has 15 years experience as a Chiropractor with dual board certifications as a Certified Clinical Nutritionist (CCN) and in Anti-Aging Health. He has extensive post-graduate training in nutritional management of illnesses, and BioSET Allergy Elimination. He's recently returned to the San Francisco Bay Area, after practicing in Southern California for 13 years. He is also a former competitive bodybuilder and is still involved in recreational bodybuilding at 48 years-young!

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