

Fitting into Your Genes: How Nutrition Can Alter your Future

Part 2 of 3

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By: Douglas Husbands, D.C., C.C.N., A.B.A.A.H.P.

In the previous article a few of the many nutraceuticals having a significant positive influence on the reduction of genetic expression for cardiovascular disease (CVD) were reviewed. This introduction touched the surface of potential beneficial nutraceuticals for that purpose. In this second article, I will review of a broader range of nutraceutical influences on genetically-linked disorders, otherwise called nutrigenomics. The primary disorder focused upon will be CVD, the number one killer of Americans. However, as will become clear, there are many other disorders upon which nutraceuticals can have a significant impact.

Nutrigenomics and the Personalization of Healthcare

Mainstream America's increased interest in nutrition, and its influence on genetics, is illustrated in a January 17, 2005 *Newsweek* cover article titled "Diet and Genes". A major point of the article is the "one size fits all" diet concept cannot be supported by research. Similarly, as the understanding of nutrigenomics increases, sweeping declarations about specific levels of supplementation sufficient for the whole population appear less valid. The concept of a daily recommend allowance for all individuals may be a thing of the past. Research studies progressively point to the fact that many common health disorders should have each individual's nutritional factors evaluated and resolved first before resorting to pharmaceutical treatment. The era of "personalized healthcare" is becoming reality.

As the era of personalization of healthcare dawns, individualized specific nutritional supplementation and dietary interventions are coming to the forefront of public awareness, as well as the focus of much current research.

Nutrient Modifications Influencing Genetic Predispositions

Individualized nutrient modifications can significantly influence the predisposition to cardiovascular disease (CVD) and many other disorders.

Niacin is implicated as beneficial for CVD in nutraceutical dosages. Niacin is also often referred to as vitamin B3 or nicotinic acid. A particular form of nicotinic acid called nicotinamide is used by the body as a building block for essential cellular reactions. The Dietary Reference Intake (DRI) for niacin for adults is 16mg/day. A study by researchers at Duke University¹ included a group of people with CVD using high doses of niacin alone, without any pharmaceuticals. The study conclusions were that "the use of niacin to prevent or treat atherosclerotic cardiovascular disease is based on strong and consistent evidence from clinical trials". Researchers at the University of Minneapolis found significant improvements in blood lipids in patients given 1500mg and 2000mg/day of niacin², over 100 times higher than the DRI of 16mg/day. The form

of niacin used is important because niacin can give an uncomfortable "flush". For this reason, the form most commonly used in high doses is niacinamide. Due to the positive effects on homocysteine metabolism and DNA repair, niacinamide in nutraceutical dosages, along with vitamins B6, B12 and folic acid can also be helpful for genetic disorders associated with prenatal and childhood neurologic dysfunction^{3 4}, schizophrenia^{5 6 7}, type 1 and type 2 diabetes^{8 9 10} and inflammatory disorders¹¹.

Lipoic acid, also commonly referred to as alpha lipoic acid (ALA) is a nutraceutical which has gained much attention from the general public recently. Lipoic acid is a compound found naturally in the "power plants" of our cells, the mitochondria. Supplemental lipoic acid has been used therapeutically to improve energy metabolism¹² and as a powerful antioxidant¹³. One of the major theories of how aging occurs is that with aging, oxidative stress damages more and more of our cells genetic material and the cell membranes...thus the need for antioxidants to prevent and alleviate the damage. Therefore, as a very powerful antioxidant, lipoic acid is helpful. The most recent research shows that a particular form of lipoic acid, R-lipoic acid, gives a 10-fold improvement in antioxidant activity over ALA¹⁴. R- lipoic acid has recently been shown to be effective in control of atherosclerosis¹⁵ or "hardening of the arteries". Atherosclerosis is a significant risk factor in the development of CVD. No DRI for lipoic acid has been set. Therapeutic dosages of R-lipoic acid have been in the range of 50 to 100 mg/day, but due to various formulation procedures between manufacturers, a wide range of quality is present. Consulting with a qualified nutritionally- oriented healthcare practitioner is highly advised for best results.

Carnitine is an amino acid required for helping the cells use fat as an energy source. It also is essential in muscle function. There are genetic defects present in some people which hinder the functions of carnitine. The most severe of these genetic disorders result in fatty tumors building up in the heart, liver, kidneys, muscles and other tissues of infants, often resulting in infantile death^{16 17}. In some cases, high dose carnitine supplementation resulted in dramatic beneficial effects for these infants. Carnitine supplementation in adults, with regular exercise, has shown to be beneficial for assistance of cellular fatty acid metabolism^{18 19}. Improved fatty acid metabolism can have a significant beneficial impact on the CVD risk factor of fatty weight gain, often seen in aging. No DRI for carnitine has been set for adults. Therapeutic dosages vary greatly depending on the individual. As a note, many vegetarians are carnitine deficient.

S-Adenosylmethionine (SAM-e) is made in the body from the amino acid methionine and the primary energetic compound ATP. SAM-e's primary function is to donate methyl groups, essential for making dozens of important compounds in the body. In relation to the current topic, it is important to know that SAM-e is essential for healthy homocysteine metabolism²⁰. Yes, that old bugaboo, homocysteine! As previously mentioned, elevated homocysteine levels can give all sorts of health problems, including CVD. Interestingly, there is a genetic disorder in which children are born with an enzyme deficiency where SAM-e is essential to make creatine for the brain²¹. Left untreated, the child would have frequent seizures, hyperactivity, uncontrolled movement of the limbs, marked irritability and temper tantrums, and apparent mental retardation^{22 23}. (A side effect could be exhausted, frustrated and short-tempered parents of the child!) Giving creatine and SAM-e provides significant improvement for these children. So, SAM-e is not just for old fogies with high homocysteine and CVD! No DRI has been set for SAM-e. Therapeutic dose ranges for adults are between 100 mg to 400mg. For parents considering the use of SAM-e and creatine for children, consultation for proper diagnosis with a holistically oriented health care professional is essential.

Personalized Healthcare: A "Functional Health" Approach to CVD

As clearly illustrated, nutrigenomics is an essential component of personalized healthcare. As mentioned in Part 1 of this article, though you may have a genotypic predisposition to a disease, the phenotypic expression (or onset of the disease) can be influenced positively by nutritional and lifestyle factors. Personalized healthcare takes into account all aspects of one's life, influencing health and disease. Another term for the practice of personalized healthcare is "Functional Healthcare". Functional healthcare is a science-based field of healthcare that is grounded in the principles of nutritional biochemistry and patient-centered medicine. Health is viewed as a positive vitality, and the human body is considered to function as an orchestrated network of interconnected systems, rather than individual systems functioning autonomously. Cardiovascular disease (CVD) should be viewed from this perspective. CVD is not simply a malfunctioning of the heart, but a systemic problem with blood circulation that can affect many parts of the body, from cold feet and erectile dysfunction to diabetes and ultimate heart attack or stroke. A healthcare professional trained in functional healthcare is best able to provide this overall care.

In the third and final part of this series, additional nutraceuticals will be reviewed having a positive influence on CVD and other genetically-linked disorders. Additionally, lifestyle factors influencing these disorders will be reviewed.

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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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