



Help your NOS3 gene take care of your heart

Just because you carry a risk gene, it doesn't mean you will definitely develop the associated disease. Many environmental factors interact with our genes and impact biological processes in our body. As a consequence, the risk for certain diseases can vary as a result of a person's day-to-day individual environment. The NOS3 gene is a good example of this effect.

The NOS3 gene is a key player in the production of nitric oxide (NO), a signaling molecule best known for its actions as a vasodilator. Vasodilation refers to the relaxation of blood vessels which lowers blood pressure. Both high and low NO levels are associated with heightened disease risk. Reduced NO release can result in hypertension, atherosclerosis, and metabolic syndrome while heightened NO levels are associated with conditions including inflammation, acute liver dysfunction, and asthma.

There are three common risk variants of the NOS3 gene that alter the production of NO and put carriers at increased risk for disease. Risk variants 1 and 2 reduce production of the NOS3 protein while risk variant 3 causes a change in the NOS3 protein that makes it harder for it to reach its final location on the cell membrane. All three variants cause their carriers to produce less NO when needed. In the general population, 54% of African-Americans and Caucasians and 23% of Asians carry one of these variants. Dietary factors, including sodium, antioxidants, and omega-3 fatty acids, interact with the NOS3 gene and uniquely influence it depending on what risk variant a person carries.

Salt intake is of particular concern for risk variant 1 and 2 carriers. Dietary sodium regulates blood pressure through the renin-angiotensin system described in the article Hypertension and the ACE Gene. Typically, increased sodium levels lead to high blood pressure which is further aggravated by risk variant genes making it more important for these carriers to follow a low sodium diet.

Dietary antioxidants help the body by minimizing damage caused by reactive oxygen species (ROS), otherwise known as "free radicals." Since the reactions mediated by the NOS3 gene involve the production and clearance of ROS, dietary antioxidants are involved in these reactions as well. Increased intake of antioxidants is especially important for carriers of risk variants 1 and 3 to decrease risk of cardiovascular disease.

Omega-3 fatty acids most directly benefit risk variant 3 carriers. Theoretically, omega-3 improves the membrane localization of the defective variant 3 protein. It has been observed that omega-3 supplements reduce blood triglycerides profoundly in variant 3 carriers but not as significantly in non-variant 3 carriers.

Smoking is particularly harmful for carriers of any of the three NOS3 risk variants. Smoke inhalation from cigarettes, fire, burning materials and all other sources, cause a decrease in NO which, in turn, impairs the body's vasodilation response. These carriers have up to quadruple the risk for smoking-induced coronary heart disease, therefore it is strongly recommended they avoid smoking.

In addition to their effects on vasodilation, NOS3 gene variants are associated with different risks for cardiovascular disease, type 2 diabetes, obesity, dyslipidemia, and Alzheimer's disease, as well as varying responses to exercise and certain medications. A more comprehensive discussion of these topics can be found in the article Cardiovascular Disease and the NOS3 gene:
<http://www.gbhealthwatch.com/GND-Cardiovascular-Disease-NOS3.php>