Soy and the Metabolic Syndrome

Individuals with the metabolic syndrome are at greatly increased risk of developing both diabetes and cardiovascular disease.[1] The metabolic syndrome includes several different metabolic abnormalities including high blood pressure, obesity in the waist area, elevated blood triglyceride levels, decreased levels of high-density lipoprotein cholesterol (good cholesterol), and insulin resistance. Generally, individuals who have at least three of these abnormalities are classified as having the metabolic syndrome. The metabolic syndrome represents a major public health burden; in the United States, 50 million individuals are classified as having this condition.[2, 3]

Lifestyle has a major impact on the development of the metabolic syndrome. Recent research has shown for example, that sedentary behavior, as defined by television watching and playing computer games, is associated with a marked increased risk of having the metabolic syndrome whereas spending more time being physically active is associated with a decreased risk.[4] These results are not surprising given the key role that obesity has in the metabolic syndrome.

On the positive side, research also demonstrates that even in the absence of any dietary change, engaging in a modest amount of moderate-intensity (30 minutes per day of brisk walking) exercise significantly improves those abnormalities defined as comprising the metabolic syndrome.[5] And making dietary improvements can lead to even further improvements. In fact, individuals whose dietary pattern is consistent with the current U.S. Dietary Guidelines are less likely to have the metabolic syndrome.[6]

In addition to an overall healthy diet, new research suggests that eating soyfoods can reduce the risk of developing the metabolic syndrome. Of course, soyfoods are very heart healthy – they are low in saturated fat and soy protein directly lowers blood cholesterol levels.[7] Thus, because individuals with the metabolic syndrome are more likely to suffer from heart disease they would be wise to incorporate soyfoods into their diet. But the benefits of soy appear not to end there.

Research published in 2007 was the first involving soy to focus specifically on subjects with the metabolic syndrome, in this case, postmenopausal women.[8, 9] The results suggest that soyfoods may be of considerable benefit to this group. In this research, subjects consumed each of 3 different diets for 8 weeks with a washout period of 4 weeks between diets. The control diet was the Dietary Approaches to Stop Hypertension (DASH) diet.

The soy-containing diets replaced one serving of red meat in the DASH diet with one serving of either soynuts or soy flour. The DASH diet, which has been shown to markedly lower blood pressure, is a very healthy diet that contains lots of fruits and vegetables and is low in saturated fat.[10]

Compared to the control diet, the soynut-containing diet improved insulin sensitivity, lowered fasting glucose levels, and lowered low-density lipoprotein cholesterol (LDLC) levels.[9] The soyflour-containing diet also improved insulin sensitivity and lowered LDLC but to a lesser extent than the soynut diet. Finally, soynut consumption also reduced some markers of inflammation and increased plasma nitric oxide levels.[9]

These findings suggest that incorporating soyfoods into the diets of postmenopausal women with the metabolic syndrome may be of significant clinical benefit. The reduction in LDLC and inflammation and the increase in plasma nitric oxide suggest soynuts reduce risk of coronary heart disease. The improved insulin sensitivity suggests soy consumption may help to prevent individuals with the metabolic syndrome from developing outright diabetes. Much of the benefit observed in this research can be attributed to the better nutrient (lower saturated and higher polyunsaturated fat) and higher fiber content of the soy-containing diets although these differences would not account for the reduction in inflammation. Some research suggests that the isoflavones in soybeans and soyfoods exert pronounced anti-inflammatory effects.[11] Of course, soyfoods contain many potentially biologically active components as well as providing high-quality protein.

1. Lopez-Candales A. Metabolic syndrome X: a comprehensive review of the pathophysiology and recommended therapy. J Med 2001;32:283-300.

2. Ford ES. Prevalence of the metabolic syndrome in US populations. Endocrinol Metab Clin North Am 2004;33:333-50.

3. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA 2002;287:356-9.

4. Wijndaele K, Duvigneaud N, Matton L, et al. Sedentary behaviour, physical activity and a continuous metabolic syndrome risk score in adults. Eur J Clin Nutr 2007.

5. Johnson JL, Slentz CA, Houmard JA, et al. Exercise Training Amount and Intensity Effects on Metabolic Syndrome (from Studies of a Targeted Risk Reduction Intervention through Defined Exercise). Am J Cardiol 2007;100:1759-66.

6. *Fogli-Cawley JJ, Dwyer JT, Saltzman E, et al. The 2005 Dietary Guidelines for Americans and risk of the metabolic syndrome. Am J Clin Nutr 2007;86:1193-201.*
7. *Messina M, Lan SJ. Soy protein, soybean isoflavones, and coronary heart disease risk: Where do we stand? Future Lipidology 2007;2:55-74.*
8. *Azadbakht L, Kimiagar M, Mehrabi Y, Esmaillzadeh A, Hu FB, Willett WC. Soy Consumption, Markers of Inflammation, and Endothelial Function: A cross-over study in postmenopausal women with the metabolic syndrome. Diabetes Care 2007;30:967-73.*
9. *Azadbakht L, Kimiagar M, Mehrabi Y, et al. Soy inclusion in the diet improves features of the metabolic syndrome: a randomized crossover study in postmenopausal women. Am J Clin Nutr 2007;85:735-41.*
10. *Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. N Engl J Med 1997;336:1117-24.*
11. *Kao TH, Wu WM, Hung CF, Wu WB, Chen BH. Anti-inflammatory Effects of Isoflavone Powder Produced from Soybean Cake. J Agric Food Chem 2007.*