

SOY AND DIABETES

What is diabetes?

Diabetes is a condition where there is too much sugar (glucose) in the blood. It results when people either don't produce enough insulin or have high levels of insulin in their blood, which isn't working properly. Insulin is the hormone that regulates blood sugar.

There are three types of diabetes:

- ◆ Type 1 diabetes is most common in children and young adults but it can occur at any age. It occurs when the pancreas no longer produces insulin and treatment involves lifelong insulin injections.
- ◆ Type 2 diabetes is the most common form, affecting both adults and an increasing number of children and young people, particularly in populations which are sedentary and overweight. In this case the pancreas does not produce enough insulin. Type 2 diabetes affects 90 per cent of the 2.2 million diabetics in Canada.
- ◆ Gestational Diabetes occurs during pregnancy, a time when the pancreas needs to produce extra insulin to regulate blood sugar levels. In most cases, gestational diabetes goes away after the baby is born. However, women who have had gestational diabetes are at higher risk of developing type 2 diabetes later in life.

Canadians are experiencing a dramatic rise in the number of people with type 2 diabetes, due to high rates of overweight and obesity and sedentary lifestyles. Yet a healthy lifestyle can totally prevent or dramatically reduce the risk of type 2 diabetes¹. Healthy eating combined with regular physical activity and weight loss (if you are overweight), are the cornerstones to managing diabetes or keeping it at bay. A balanced approach to life also reduces the risk of long term complications of poorly controlled diabetes, such as heart and kidney diseases.

Eating more plant foods is widely recognized to be beneficial for health, and diabetes is no exception. Increasing your fibre intake (from a colourful array of fruits, vegetables, wholegrain breads and cereals as well as legumes - including soybeans - and a small handful of nuts) helps regulate blood sugar levels and reduces your cholesterol. In addition, eating more of these plant foods in their unrefined or wholegrain form, can assist with weight control and insulin resistance as these foods are more 'filling' and generally cause a slower rise in your blood sugar levels².

Eating legumes regularly, particularly soy foods may reduce the risk of developing type 2 diabetes and benefit people with existing diabetes who are also at increased risk of other chronic diseases such as heart and kidney disease.

A large study of Chinese women from Shanghai found that among post-menopausal women, a regular intake of tofu and other soy products was strongly protective against type 2 diabetes³.

Women who consumed the most soy had about a 50 per cent lower risk of having sugar detected in their urine - a powerful predictor of diabetes. The finding that soy foods may guard against type 2 diabetes is consistent with previous reports from a 20-year follow-up survey of Finnish and Dutch populations in the Seven Countries Study, which showed that a high intake of legumes protects against type 2 diabetes⁴. In a study of healthy menopausal women from Taiwan, researchers found that a supplement of soy isoflavones taken daily for six months was equally effective as estrogen replacement therapy in lowering fasting blood glucose and insulin levels⁵, meaning it improved glucose tolerance reducing the risk of diabetes in these women.

In one study of post-menopausal women with type 2 diabetes⁶, including foods rich in soy protein daily for three months was shown to reduce fasting insulin and improve insulin resistance, meaning that the women had improved their sensitivity to insulin. Also, the level of HbA1C was reduced in the blood. This tells us that the diabetes control was better in these women while they were taking the soy protein foods since HbA1C is a measure of the 'average' blood sugar levels over time. In addition, the soy protein diet reduced total and LDL ('bad') cholesterol levels by four and seven per cent, respectively.

People with type 2 diabetes have a four- to six-fold greater risk of death from heart disease and stroke⁷. Including heart-protective lifestyle strategies is therefore especially important. Men with type 2 diabetes given a soy beverage (containing soy protein, isoflavones and soy dietary fibre) twice daily for six weeks reduced their LDL ('bad') cholesterol by 10 per cent, triglycerides by 22 per cent, homocysteine by 14 per cent and ApoB100 by 30 per cent⁸. The significant improvement in these cardiovascular risk markers was seen even in people with near-normal blood fat values.

Another study of men with type 2 diabetes⁹, similarly found that soy protein added to the diet lowers LDL cholesterol and triglycerides (another fatty substance in the blood linked with heart disease). The soy protein containing diet also reduced the loss of 'albumin' (a protein) in urine by 9.5 per cent, indicating that soy is beneficial in slowing the progress of kidney disease.

In diabetic people who already have kidney disease, replacing some animal protein in the diet with soy protein, may improve kidney function even more than by restricting the amount of total protein consumed. A small study of patients from Tehran found that there was a significant reduction in protein loss in the urine and an improvement in kidney function¹⁰ when their already moderately protein restricted diets (providing 0.8 grams of protein per kilogram of body

weight) were further modified to ensure that 35 per cent of protein came from soy.

Studies in animals also support the view that soy protein may offer advantages over animal proteins for managing diabetes and its complications.

A study with diabetic mice showed that even at high levels of protein intake (24 % of calories – a level typically consumed by people who follow high protein diets) soy protein does not increase the loss of albumin in the urine, thereby reducing the strain on the kidneys in a similar way to how a low protein diet (regardless of the source of protein) protects the kidneys¹¹. These findings are encouraging since low protein diets have been commonly recommended to people with kidney disease to slow down the decline of kidney function but these diets have had poor acceptance and compliance.

Substituting soy protein for some animal protein in the diet may be one way to preserve the kidneys without having to reduce the total quantity of protein consumed, thereby improving compliance with the diet.

Another study in rats suggests that soy protein, as compared to animal protein, may increase the production of adiponectin from fat tissue. In recent years it has been shown that fat tissue in the body makes many types of proteins, which are released into the blood stream and provide various and vast reaching effects in the body. Adiponectin is one important protein since low levels in the body have been linked with insulin resistance and diabetes. It has been suggested that soy protein may be one way to increase adiponectin, which has anti-diabetic properties¹².

While further research is still needed to determine the exact role of soy protein in preventing diabetes and reducing complications in people with this condition, the nutritional profile of soy beans and soy foods reveals that they are beneficial for the whole family to enjoy. Soy foods and beverages are generally low in fat, particularly saturated fat, and are naturally cholesterol free. The protein in soy beans has been extensively studied and shown to reduce blood cholesterol levels - even in people without diabetes. Soy foods are rich in isoflavones, which act as antioxidants in the body. In common with other legumes, soy foods have a low Glycemic Index (GI), important in controlling blood sugar levels, and soy beans are rich in dietary fibre.

References for Soy and Diabetes

1. Tuomilehto J, Lindstrom J, Eriksson JG et al., Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance, *N Engl J Med* 2001;344:1343-1350.
2. Brand Miller J & Foster-Powell K, *The Glucose Revolution: GI Plus*, Hodder, Sydney 2000.

3. Yang G, Shu XO, Jin F et al., Soyfood consumption and risk of glycosuria: a cross-sectional study within the Shanghai Women's Health Study, *Eur J Clin Nutr* 2004;58:615-620.
4. Feskens EJ, Virtanen SM, Rasanen L et al., Dietary factors determining diabetes and impaired glucose tolerance. A 20-year follow-up of the Finnish and Dutch cohorts of the Seven Countries Study, *Diabetes Care* 1995;18:1104-1112.
5. Cheng SY, Shaw NS, Tsai KS et al., The hypoglycemic effects of soy isoflavones on postmenopausal women, *J Womens Health (Larchmt)* 2004;13:1080-1086.
6. Jayagopal V, Albertazzi P, Kilpatrick ES et al., Beneficial effects of soy phytoestrogen intake in postmenopausal women with type 2 diabetes, *Diabetes Care* 2002;25:1709-1714.
7. Kannel WB & McGee DL, Diabetes and cardiovascular disease. The Framingham study *JAMA* 1979;241:2035-2038.
8. Hermansen K, Sondergaard M, Hoie L et al., Beneficial effects of a soy-based dietary supplement on lipid levels and cardiovascular risk markers in type 2 diabetic subjects, *Diabetes Care* 2001;24:228-233.
9. Teixeira SR, Tappenden KA, Carson L et al., Isolated soy protein consumption reduces urinary albumin excretion and improves the serum lipid profile in men with type 2 diabetes mellitus and nephropathy, *J Nutr* 2004;134:1874-1780.
10. Azadbakht L, Shakerhosseini R, Atabak S et al., Beneficiary effect of dietary soy protein on lowering plasma levels of lipid and improving kidney function in type II diabetes with nephropathy, *Eur J Clin Nutr* 2003;57:1292-1294.
11. Teixeira SR, Tappenden KA, Erdman JW Jr, Altering dietary protein type and quantity reduces urinary albumin excretion without affecting plasma glucose concentrations in BKS.cg-m +Lepr db/+Lepr db(db/db) mice, *J Nutr* 2003;133:673-678.
12. Matsuzawa Y, Adiponectin: Identification, physiology and clinical relevance in metabolic and vascular disease, *Atheroscler Suppl.* 2005;6:7-14.