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File: ■ Stevia (*Stevia rebaudiana*; Asteraceae)
■ Metabolic Syndrome
■ Literature Review

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RE: Review of Stevia Bioactivities Suggests Potential Benefits for Metabolic Syndrome beyond Reduced Sugar Consumption

Carrera-Lanestosa A, Moguel-Ordóñez Y, Segura-Campos M. *Stevia rebaudiana* Bertoni: a natural alternative for treating diseases associated with metabolic syndrome. *J Med Food.* October 2017;20(10):933-943.

Metabolic syndrome (MetS) is found in 15-40% of the world's population, depending on gender, age, and ethnicity. MetS is usually defined as the presence of at least three risk factors, including abdominal obesity, hypertension, diabetes mellitus or hyperglycemia, and various forms of dyslipidemia, which lead to or are correlated with insulin resistance, oxidative stress, and chronic inflammation. MetS increases the risk of cardiovascular disease (CVD). While pharmaceuticals are used to treat CVD and many of these risk factors, they can also cause unwanted side effects. Therefore, complementary approaches to MetS are of interest.

Stevia (*Stevia rebaudiana*; Asteraceae) is native to the Amambay Mountains between Brazil and Paraguay. Its leaves, unlike the leaves of most species of *Stevia*, contain steviol glycosides, primarily stevioside and rebaudioside A, that are 250-300 times sweeter than sugar and are noncaloric. This has led to its growing popularity as a natural sweetener; however, it also contains over 100 known antioxidant and medicinal constituents that might increase the benefits of substituting it for sugar. The goal of this paper was to review the reported effects of steviol glycosides and aqueous/alcoholic extracts of leaves, flowers, and roots of stevia on obesity, hyperglycemia, hypertension, and hyperlipidemia associated with MetS. How included literature was located was not specified.

Calorie-free sweeteners, such as stevia, are helpful to control calorie intake and can lead to a calorie deficit of 380 cal/day or loss of 1 lb. of body weight in nine to 10 days. [Note: an earlier review is cited as the source of this figure.] Stevia, aspartame, and saccharose [i.e., sucrose] have been reported to produce similar satiety levels, but stevia reduced glucose and postprandial insulin levels relative to the other two. Isosteviol (a metabolic compound of stevioside) also improved lipid profiles and caused weight loss in diabetic mice. In a number of studies of diabetic rodents, stevioside, powdered

stevia leaf, or various extracts reduced blood glucose and increased insulin secretion. Stevioside suppressed glucagon in β-type cells by inducing the genes involved in glycolysis. It also has been found to reduce blood glucose levels by altering and inhibiting metabolic enzymes in the small intestine, allowing tissues and muscles to make better use of glucose. One study found that stevioside (20 mg/kg body weight) administered to 12 people with type 2 diabetes mellitus resulted in an unspecified decrease in plasma glucose and an 18% decrease in postprandial glucose.

Steviosides have been shown to reduce hypertension in several animal studies and at least three human studies, two of them lasting one to two years. In one of these, stevioside (500 mg) reduced arterial pressure in patients with hypertension compared to placebo, with systolic pressure being reduced from 150 to 140 mmHg and diastolic pressure from 95 to 89 mmHg. Vasodilatory effects have been demonstrated. In a human study, consumption of stevia extracts increased levels of high-density lipoprotein cholesterol and significantly reduced levels of total cholesterol, low-density lipoprotein cholesterol, and triglycerides.

The authors conclude that studies of stevia demonstrate that it is more than just a sweetener and that alcoholic and aqueous extracts, along with isolated compounds, show therapeutic potential in diseases and conditions associated with metabolic syndrome, including obesity, diabetes, hypertension, and dyslipidemia. Further research is needed to explore its additional phytochemicals, including phenols and flavonoids, and their effects and mechanisms of action.

The authors report no conflicts of interest.

—Erin Smith, MSc., CCH

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