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REPORT

Controlling Blood Sugar with Cinnamon and Coffee Berry

By Dave Tuttle



Even people who pay careful attention to what they eat may see their blood sugar levels increase as they get older. Likewise, aging is associated with a potentially hazardous decline in insulin sensitivity. The regrettable outcome is that an ever-growing number of adults are diabetic or pre-diabetic, with glucose levels that are slowly but surely rising above the desired threshold of 100 mg/dL.

Fortunately, scientists have discovered that, in addition to weight loss and exercise, certain phytonutrients can help your body defend itself against these dangers. Natural plant chemicals from cinnamon and coffee berry can help control blood sugar in several ways, thus offering protection against dangerous conditions such as metabolic syndrome and diabetes.

HOW THE BODY CONTROLS BLOOD SUGAR

The body regulates blood sugar levels in several ways. The one most commonly understood involves insulin, a hormone secreted by the pancreas that delivers glucose to cells throughout the body. When you eat a meal, the pancreas responds by releasing insulin to transport the glucose into the cells. As long as receptors on the cell walls remain sensitive to insulin, the channeling of glucose out of the bloodstream occurs relatively quickly and without excessive insulin production.

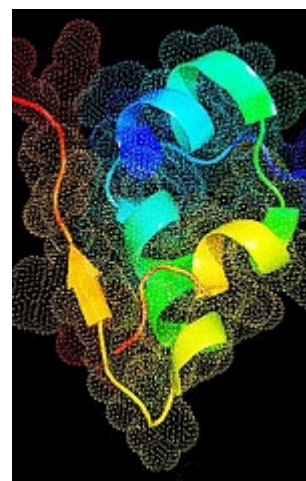
Sometimes, however, the cells become resistant to insulin's effects. When this happens, the pancreas pumps out ever-greater amounts of insulin in an attempt to force the glucose into the cells. This effort is only partially effective in most instances, and may result in higher blood glucose levels and eventually type II diabetes. Nutrients such as chromium and lipoic acid may help to improve insulin sensitivity.¹

Unfortunately, in some non-insulin-dependent diabetics and obese individuals, the body's internal glucose-releasing mechanisms are more active than they should be, increasing blood glucose beyond optimal levels. Down-regulation of these processes can therefore be beneficial to controlling blood sugar.²

CINNAMON PROMOTES HEALTHY BLOOD SUGAR

Cinnamon has been used for several thousand years in traditional Ayurvedic and Greco-European medical systems. Native to tropical southern India and Sri Lanka, the bark of this evergreen tree is used to manage conditions such as nausea, bloating, flatulence, and anorexia. It is also one of the world's most common spices, used to flavor everything from oatmeal and apple cider to cappuccino. Recent research has revealed, however, that regular use of cinnamon can promote healthy glucose metabolism.

A study performed at the US Department of Agriculture's Beltsville Human Nutrition Research Center isolated insulin-enhancing complexes in cinnamon that are involved in preventing or alleviating glucose intolerance and diabetes.³ Three water-soluble polyphenol polymers were found to have beneficial biological activity, increasing insulin-dependent glucose metabolism by roughly 20-fold in vitro.³ The nutrients displayed significant antioxidant activity as well, as did other phytochemicals found in cinnamon, such as epicatechin, phenol, and tannin. Moreover, scientists at Iowa State University determined that these polyphenol polymers are able to up-regulate the expression of genes involved in activating the cell membrane's insulin receptors, thus increasing glucose uptake and lowering blood glucose levels.⁴



Computer artwork of an insulin molecule.

These benefits of cinnamon have been confirmed in animal experiments. For example, when rats were given two different doses of an oral cinnamon supplement for three weeks, glucose infusion into their cells more than doubled, even with the lower dose studied.⁵ The extract improved insulin action by enhancing the insulin-signaling pathway in skeletal muscle, resulting in

increased glucose uptake.

Cinnamon can even help control the negative effects of a diet high in fructose, a simple sugar.⁶ When rats were fed large amounts of fructose for three weeks with or without the addition of cinnamon extract to their drinking water, the cinnamon extract improved the glucose infusion rate in the fructose-fed animals so much that it equaled that of control rats eating a standard chow diet. According to the study authors, this suggests that the early use of cinnamon could prevent the development of insulin resistance in those who consume abundant fructose sugar.

Because the incidence of cardiovascular disease is increased up to fourfold in type II diabetics, researchers have sought out nutrients that can simultaneously improve glucose metabolism and lipid levels. In a recent study published in *Diabetes Care*, cinnamon proved to be such a dual-action agent. Sixty adults (30 men, 30 women) with type II diabetes were divided into six groups. The first three groups consumed one, three, or six grams of cinnamon daily, while the other three groups consumed equivalent numbers of placebo capsules.

The spice or placebo was consumed for 40 days, followed by a 20-day washout period. After the initial 40-day period, all three levels of cinnamon reduced mean fasting serum glucose levels by 18-29%. The one-gram dose also reduced triglyceride levels by 18%, low-density lipoprotein (LDL) by 7%, and total cholesterol by 12%. Higher doses of cinnamon produced even greater reductions in triglycerides, LDL, and total cholesterol.⁷



Cinnamon

Even better, these decreases persisted throughout the 20-day washout period. While glucose and triglyceride levels increased modestly during the washout period compared to day-40 levels, they remained below the levels recorded before cinnamon supplementation began. Meanwhile, LDL and total cholesterol levels continued to decline throughout the 20 days after cinnamon use stopped. This study suggests that cinnamon has sustained effects, so the benefits should continue even if a dose is occasionally missed. The results also suggest doses of one gram or more are likely to be beneficial in controlling blood glucose and lipid levels.⁷

Cinnamon thus appears to be one of the most powerful nutrients available for improving glucose metabolism. USDA researchers at the Beltsville center studied the effects of 49 herbs, spices, and medicinal plant extracts on glucose utilization in the fat cells of rats.⁸ They found that cinnamon was the most bioactive product, followed by witch hazel, green and black teas, and allspice. The active phytochemicals in cinnamon were determined to be the polyphenols. Another Beltsville study

found that cinnamon potentiated insulin activity more than threefold.⁹

COFFEE BERRY CUTS DIABETES RISK

Coffee is one of the world's most popular beverages, yet most people know very little about the fruit that produces coffee beans. Grown in mountainous tropical climates, the brightly colored fruit ripens into a glowing red berry that is usually harvested by hand. The berry's exterior is discarded and the bean is dried and processed. Roasting normally occurs in the country where the beverage will be consumed.

However, as with many fruits, most of the powerful nutritional benefits of coffee are found in the whole fruit itself, not just in the seed (or bean). Nature evolved the cherry of the coffee shrub to withstand intense ultraviolet radiation found at mountainous elevations. As a result, whole coffee fruit is loaded with beneficial antioxidants and other powerful plant nutrients that are partially destroyed during the separation and roasting processes of conventional coffee production.

This nutrient-rich coffee fruit has been relegated to virtual obscurity because it quickly deteriorates during normal coffee harvesting.

Now, however, a patent-pending technology has been developed that preserves the whole coffee fruit, eliminating the potential for toxicity and making it possible to develop supplements that contain all of the nutrients naturally found in the fruit.

The coffee berry contains some well-studied phytochemicals such as chlorogenic acid, caffeic acid, ferulic acid, and quinic acid.¹⁰ These nutrients have recently been shown to help quench free radicals,¹¹ provide cardiovascular benefits,¹² and reduce cholesterol oxidation.¹³ However, some of coffee berry's most impressive effects can be seen in blood glucose management.



Kona coffee beans growing on tree.

Chlorogenic acid and caffeic acid are the two primary nutrients in coffee that benefit individuals with high blood sugar. Glucose-6-phosphatase is an enzyme crucial to the homeostatic regulation of blood sugar. Since glucose generation from glycogen stored in the liver is often overactive in people with high blood sugar,² reducing the activity of the glucose-6-phosphatase enzyme leads to reduced blood sugar levels, with consequent clinical improvements.

Chlorogenic acid has been shown to inhibit the glucose-6-phosphatase enzyme in a dose-dependent manner, resulting in reduced glucose production.¹⁴ In a human clinical trial at the Moscow Modern Medical Center, 75 healthy volunteers were given either 90 mg of chlorogenic acid a day or a placebo. Blood glucose levels of the chlorogenic acid group were 15-20% lower than those of the placebo group.¹⁵ Chlorogenic acid also has an antagonistic effect on glucose transport, decreasing the intestinal absorption rate of glucose.¹⁶ This may help to reduce blood insulin levels and minimize fat storage.

Caffeic acid has benefits for elevated blood sugar as well. At National Cheng Kung University in Taiwan, scientists determined that this acid increases glucose uptake into cells, helping to remove it from the bloodstream.¹⁷ When researchers at nearby Taipei Medical College injected caffeic acid into diabetic rats, they saw a dose-dependent reduction in plasma glucose.¹⁸ However, a similar effect was not observed in normal rats, suggesting that insulin is not involved in this action. In a related experiment, the researchers observed that caffeic acid reduced elevated plasma glucose in insulin-resistant rats receiving a glucose challenge test.¹⁸

Three studies have shown that coffee consumption helps reduce the risk of type II diabetes. In an analysis of more than 17,000 Dutch men and women, the more coffee a person drank, the lower the incidence of diabetes. Consuming three to four cups a day decreased the risk by 23%, while persons drinking more than seven cups daily cut their risk in half.¹⁹



Blood glucose test in diabetes.

A study among middle-aged Finnish men and women confirmed these results. The Finns drink more coffee per capita than any nation in the world, so its impact on their public health could be dramatic. After controlling for numerous variables, this study found that consuming three to four cups a day reduced diabetes risk by 24%. Those consuming 10 or more cups lowered their risk by 61%. The scientists suggested that this protective effect is partially due to the inhibition of glucose-6-phosphatase activity by chlorogenic acid, since glucose-6-phosphatase is widely considered a significant factor in the abnormally high rates of hepatic glucose production observed in the diabetic state.²⁰ Consequently, they believe that reduced glucose-6-phosphatase hydrolysis can lower glucose output, leading to decreased plasma glucose concentrations. Chlorogenic acid also has an antagonistic effect on glucose transporters at the intestinal stage, and has been shown to influence the secretion of two gastrointestinal peptides known for their glucose-lowering effects.²⁰ These various mechanisms may explain why coffee can produce such

a dramatic decrease in the incidence of diabetes.

Another study of coffee consumption explored the relative benefits of caffeinated versus decaffeinated coffee. This analysis examined the intake patterns of more than 41,000 men and nearly 85,000 women participating in the Health Professionals Follow-up Study and the Nurses' Health Study. Due to the different start dates for these investigations, the men were followed for 13 years and the women for 18 years. While the researchers found correlations between regular caffeinated coffee and diabetes that were similar to those of previous studies, they also discovered a lesser, but still significant, relationship between decaffeinated coffee and disease incidence. After controlling for several variables, men who drank one to three cups of decaffeinated coffee daily reduced their risk by 9%, while those drinking four or more cups a day lowered it by 26%. Women experienced a slightly smaller reduction in risk than men. Tea drinkers saw no decrease in their risk for diabetes.²¹ While caffeine intake is associated with a decreased risk of type II diabetes, intake of decaffeinated coffee can still cut your chances of developing diabetes. For those who wish to avoid stimulants like caffeine, this is good news indeed.

A MAJOR ADVANCE IN GLUCOSE MANAGEMENT

The growing epidemic of type II diabetes in the United States is neither surprising nor inevitable. It is a direct consequence of a profound deterioration in the dietary habits and lifestyle practices of millions of Americans.

Fortunately, health-conscious individuals can implement preventive strategies to help maintain healthy blood sugar levels. In addition to exercising regularly and maintaining a healthy body weight, nutrients such as chromium and lipoic acid can help support optimal insulin action, helping to keep the body's cells sensitive to insulin's signals. Cinnamon increases glucose uptake into the cells, while coffee berry contains phytochemicals that promote healthy blood sugar levels.

In combination with regular exercise and maintenance of a healthy body weight, these nutrients can help support optimal metabolic function and blood sugar control.



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