



NATURAL MEDICINE JOURNAL
RESEARCH GUIDE

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BALANCING BLOOD SUGAR IN CLINICAL PRACTICE

A REVIEW OF INGREDIENTS
SCIENTIFICALLY SHOWN TO HELP
STABILIZE BLOOD SUGAR LEVELS

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Introduction

Fatigue, fuzzy thinking, headache, irritability, and increased thirst and urination are just some of the symptoms felt when someone's blood sugar levels are not within the normal range. These physical cues, along with laboratory testing, inform the integrative practitioner that a blood sugar balancing protocol may be needed. Maintaining a normal blood sugar, or glucose, level is foundational to preventative medicine and optimal wellness. Blood sugar imbalances inherently have negative health effects. The consequence of long-term imbalance is a higher risk of developing type 2 diabetes and many other chronic conditions.

Fortunately, there is usually plenty of time before type 2 diabetes develops. It is during this time, known as prediabetes, that regulation of blood sugar can be corrected, and type 2 diabetes can be prevented. While some people with prediabetes develop symptoms, many others have no symptoms at all. The Centers for Disease Control and Prevention reports that 1 in 3 Americans has prediabetes and of those, it's estimated that more than 84% don't know they are in danger of developing type 2 diabetes.

In this prediabetes stage, the body enters into a state of insulin resistance. The normal function of insulin is to act like a key that unlocks the "glucose doors" on cells. This allows glucose to freely enter the interior of cells, where it provides energy. Insulin resistance is when the "glucose doors" cannot be readily opened. This can be due to not enough insulin or a lack of response from the cells. When glucose cannot enter cells, it is left to circulate in the bloodstream. This circulating glucose can be measured with routine bloodwork (see Chart 1).

Impaired insulin responsiveness increases the patient's risk of developing obesity, cardiovascular disease, and type 2 diabetes.¹ With type 2 diabetes the body doesn't utilize insulin properly which puts the patient at risk of developing a variety of dangerous complications which are described in the next section. The American Diabetes Association reports that every year, 1.5 million Americans are diagnosed with diabetes and in 2017 it was reported as the 7th leading cause of death in the United States.

Dangers of high blood sugar

"Uncontrolled blood sugar over time can lead to diabetes, heart disease, liver disease, high cholesterol, and many other effects on overall health," explained integrative health expert Kyle Monk, MD, who is a pediatrician at Cedars-Sinai Medical Center. "While some of these conditions are reversible, others have cumulative effects and can predispose a person to even more health complications."

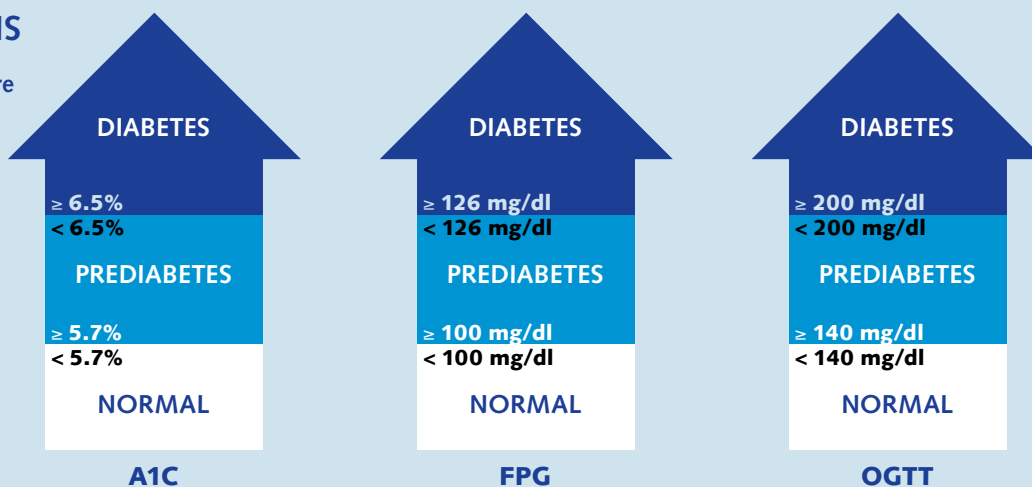
The blood sugar balance treatment goals are to eliminate symptoms of imbalance and reduce the risk of long-term complications associated with diabetes which include:²

- Cerebrovascular disease
- Depression
- Eye diseases such as retinopathy
- Ischemic heart disease, stroke, and/or peripheral vascular disease
- Kidney disease
- Metabolic syndrome
- Neuropathy

When it comes to conventional treatment of type 2 diabetes, prescription insulin therapy is often utilized after other medications stop working, with new insulin

Chart 1: DIAGNOSIS

Prediabetes and diabetes are diagnosed via hemoglobin A1C (HbA1c), fasting plasma glucose (FPG), or oral glucose tolerance test (OGTT).



Source: American Diabetes Association



formulations, delivery systems, and digital support continuing to expand.³ Some common medications used to treat type 2 diabetes include biguanides (metformin), dipeptidyl peptidase 4 inhibitors (alogliptin), and sodium-glucose cotransporter inhibitors (dapagliflozin).⁴

Even from a conventional treatment standpoint, however, it's critical to employ proactive preventive and treatment strategies that encompass diet, lifestyle, and natural blood sugar stabilizers. The first step in creating an integrative blood sugar balancing protocol is to closely consider blood sugar biology, which includes an evaluation of how natural sugar stabilizers work as potential first-line treatment choices.

The Biology of Blood Sugar Instability

Erratic blood sugar levels can cause equally erratic symptoms. For example, extremely high blood sugar can cause the patient to be extremely thirsty which can lead to frequent urination. Another patient with high blood sugar may have significant fatigue and listlessness with dizziness that can lead to nausea.

When blood sugar drops too low, that patient may also feel dizzy, restless, anxious, or angry sometimes with a racing pulse and cold sweats. The patient with low blood sugar often feels sudden hunger as their blood sugar dips and may have difficulty concentrating or even struggle with headaches.

Symptom severity is highly dependent on the degree and frequency of the blood sugar swings. However, the beauty of the biology of blood sugar stabilization means all of the uncomfortable and dangerous symptoms of erratic blood sugar go away when glucose homeostasis is regained.

The Carbohydrate Connection

The ups and downs of blood sugar spikes and crashes are often compared to a roller coaster ride with the goal being to get the patient off the ride. From a dietary standpoint, it's essential to remember that it's not just sugar that causes these extreme highs and lows, it's all simple carbohydrates. The fact is, simple carbohydrates such as fructose and some starches can impact blood sugar even more than table sugar does. This makes sense since some carbohydrates and starches are broken down into simple sugars and absorbed quickly, particularly in the absence of fats, fibers, or proteins. Blocking the absorption of carbohydrates, starches, and sugars can help reduce the absorption of sugars which is a key strategy in controlling blood sugar spikes and crashes.⁵

Natural blood sugar stabilizers work in several different fashions to influence absorption, metabolism, and other factors that help control extreme blood sugar fluctuations.

Natural Blood Sugar Stabilizers

“Prior to modern-day diabetes medications, people have been using herbals for centuries to reduce blood sugar,” explained clinical endocrinologist Mary Kellis, MD. “When focused on improving health and wellness, it is important to consider natural approaches.”

Using the previous “key” analogy, many of the natural substances used to stabilize blood sugar help unlock the entryway that glucose uses, improving the flow of glucose out of the bloodstream and into cells for energy production. We are continuing to learn how plants used in traditional medicines around the world can support blood sugar. When devising an effective blood sugar stabilization plan, considering some of these time-tested herbals is a good place to start, beginning with White mulberry leaf extract.



White Mulberry Leaf

In traditional Chinese medicine, White mulberry leaf extract (*Morus alba* L.) has a long history of use as a treatment for diabetes. White mulberry leaf extract helps block the absorption of carbohydrates and sugars by binding digestive enzymes that would otherwise be used to break down complex carbohydrates from the diet.⁶ Research has also found that there are at least 22 different compounds in mulberry leaves that contribute to its continued traditional use and reliability for insulin and glucose regulation.⁷

A 2017 randomized, double-blind, placebo-controlled clinical trial involving 37 adults with normal blood sugar concentrations demonstrated that mulberry leaf extract significantly reduced blood glucose levels and total insulin rises after ingestion of maltodextrin compared to placebo.⁸ In that study, a proprietary brand of mulberry leaf extract known as Reducose was used (see Chart 2).

A 2018 exploratory study found that mulberry leaf extract reduced the glycemic index (GI) value of carbohydrates as indicated by postprandial blood glucose levels.⁹ The researchers concluded that mulberry leaf extract could potentially help people with diabetes maintain a low-GI diet to help control blood sugar levels.

Gymnema sylvestre

“One of my favorite natural blood sugar stabilizers is *Gymnema sylvestre* because it mimics the shape of glucose and blocks the receptors on the tastebuds to curb sugar cravings,” said Dr. Monk, “and if you don’t crave sugar, you won’t eat it, so this herb helps to limit sugar intake, which is essential when balancing blood sugar levels.”

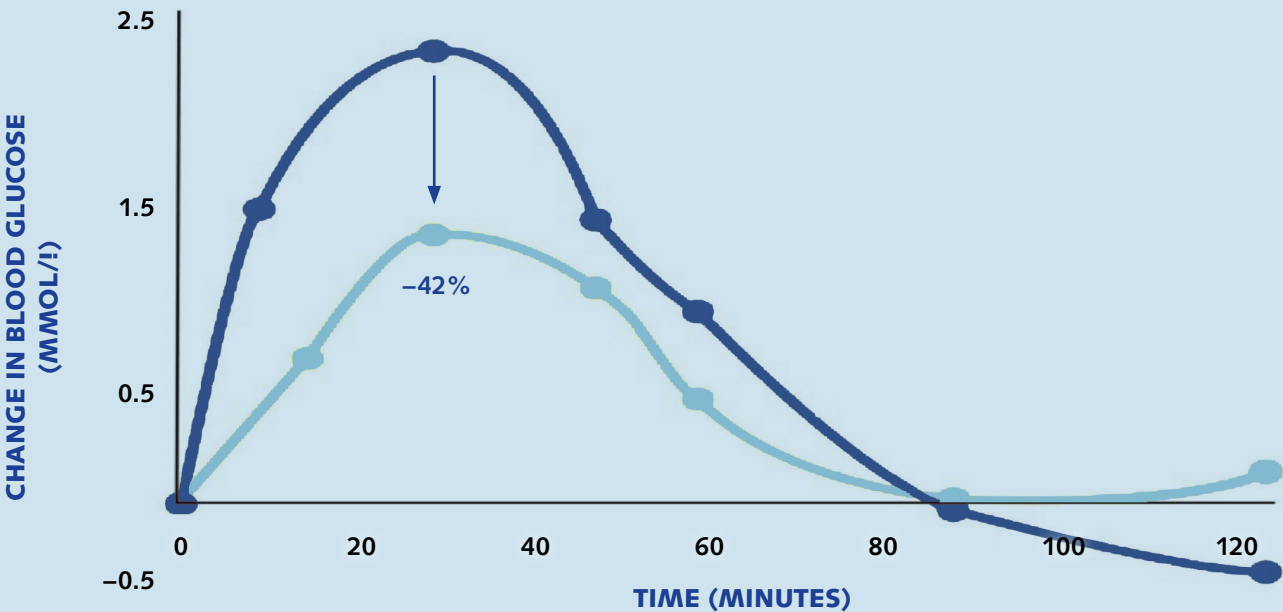


“Gymnema also blocks sugar absorption in the intestine and has been shown to have positive effects on cholesterol,” said Dr. Kellis.

Clinical research has shown that Gymnema is a reliable anti-diabetic agent.¹⁰ Among its many actions, it is uniquely able to curb sugar cravings, making it a useful

Chart 2: CHANGE IN BLOOD GLUCOSE

In a randomized, double-blind, placebo-controlled study, mulberry extract decreased insulin concentrations and improved glucose tolerance in those without blood sugar imbalance.



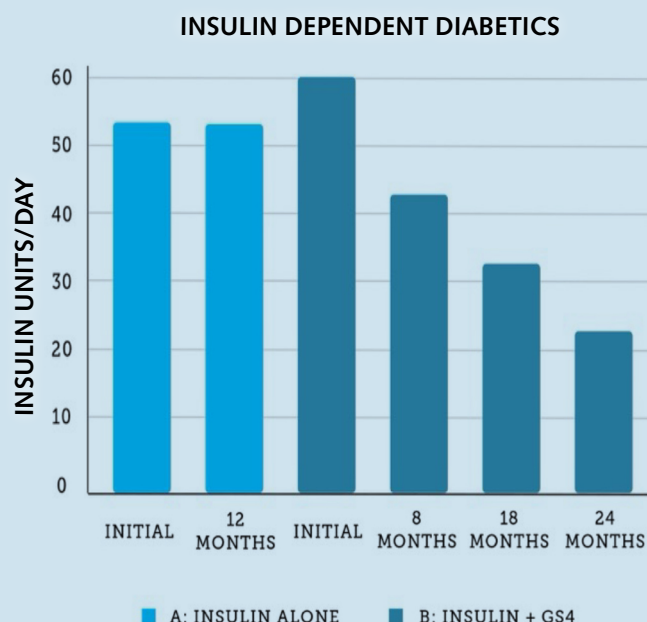
Source: Lown M, Fuller R, Lightowler H, et al. Mulberry extract improves glucose tolerance and decreases insulin concentrations in normoglycaemic adults: results of a randomized double-blind placebo-controlled study. *PLoS ONE*. 2017;12(2).



Chart 3: ANTI-DIABETIC EFFECT OF GYMNEMA

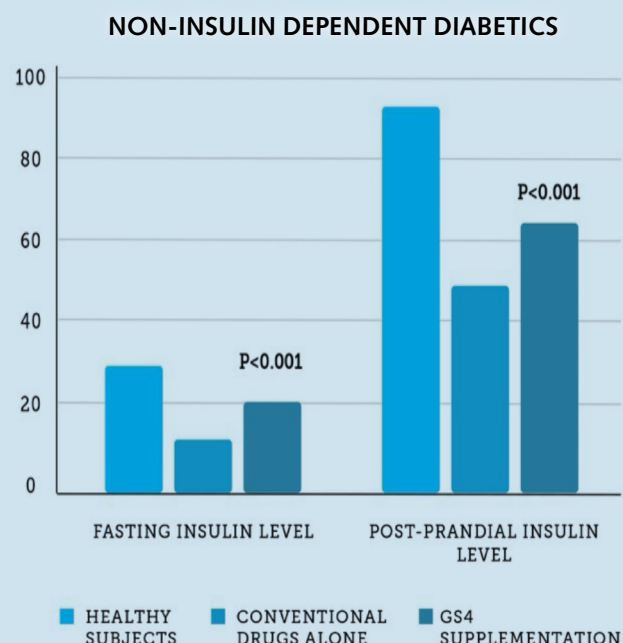
Insulin Supplementation requirements in IDDM patients on (A) Insulin alone (B) Insulin + GS4

Dependence on insulin significantly reduced with GS4 supplementation



Serum Insulin Levels in cases of NIDDM with conventional treatment and with GS4 supplementation

Better "Glycemic control" with GS4 supplementation



Source: Baskaran K, Ahamath B, Shanmugasundaram K, Shanmugasundaram ER. Antidiabetic effect of a leaf extract from *Gymnema sylvestre* in non-insulin-dependent diabetes mellitus patients. *J Ethnopharmacol.* 1990;30(3):295-300.

adjunct when limiting carbohydrate intake. The proposed *Gymnema* mechanisms of action include:^{11,12}

- Increases insulin secretion
- Improves glucose uptake into cells
- Inhibits glucose absorption in the intestine
- Promotes pancreatic islet cell regeneration

A small 2019 trial found that in addition to suppressing sweet taste sensations, *Gymnema* also delayed the glycemic response during and after glucose ingestion by increasing insulin secretion.¹³ *Gymnema* has also been shown to reduce insulin dependence in both type 1 and type 2 diabetes (see Chart 3).¹⁴

In addition to being available as a dietary supplement alone or in combination with other blood sugar stabilizers, *Gymnema* is also available as a convenient, easily dissolving, mint-flavored strip.

Chromium Picolinate

Chromium picolinate is another natural blood sugar stabilizer that has several mechanisms of action specifically related to insulin resistance and cardiovascular function including:¹⁵

- Augments the insulin signaling pathway
- Blunts the negative regulators of insulin signaling
- Diminishes oxidative stress
- Enhances AMPK activity
- Potentiates insulin activity
- Up-regulates cellular glucose uptake

A 2014 meta-analysis found that chromium supplementation significantly improved blood sugar control in diabetics.¹⁶ This is consistent with previous studies showing that chromium lowers fasting plasma glucose and fasting insulin while improving metabolic control

in patients with type 2 diabetes.¹⁷ A 2016 randomized, controlled trial showed that chromium picolinate not only improved fasting plasma glucose but also improved HbA1c levels in newly diagnosed adults with type 2 diabetes.¹⁸

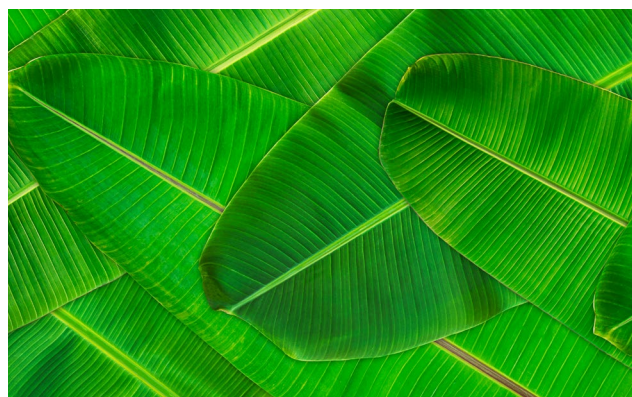
Research also indicates that the form of chromium may influence its effectiveness. A 2006 review found that chromium picolinate in particular had greater bioavailability compared to other forms of chromium, which resulted in better blood sugar balancing effect.¹⁹

Fenugreek seed extract

Fenugreek (*Trigonella foenum-graecum*) has a long history of use as a traditional medicine in India. Today, both animal and human studies have proven that fenugreek can help normalize hyperglycemia.^{20,21} Several compounds may be involved in the glucose lowering effects of fenugreek, including diosgenin, galactomannan, trigoneosides and 4-hydroxyisoleucine.²² Fenugreek has been shown to control blood sugar by slowing the rate of glucose absorption in the gut, improving the function of beta islet cells of the pancreas, promoting insulin sensitivity and improving glucose utilization within cells.²³ Less direct effects that can benefit those prone to high glucose include decreasing systemic inflammation and normalizing blood lipids.²⁴

According to a 2014 meta-analysis of 10 clinical trials, fenugreek seed extract led to significant reductions in fasting blood glucose, 2-hour glucose, and HbA1c.²⁵

Fenugreek seed extract also has a high concentration of soluble fiber. For example, avocados, which are considered to be a high-fiber food, have just over 10%



soluble fiber, whereas fenugreek seeds have about 30%. It has been shown that individuals with a diet high in soluble fiber have a significantly decreased risk of developing diabetes.²⁶

Banana Leaf Extract

Banana leaf extract (*Lagerstroemia speciosa*) is a natural blood sugar stabilizer and works by speeding up glucose transport into cells, making it easier to be used for energy.²⁷ Like many glucose-reducing agents, it may also help with weight loss. Banana leaf extract contains corosolic acid, which not only positively influences glucose metabolism but also has antioxidant and anti-hyperlipidemic activity.²⁸

Clinical Conclusions

“If a natural approach is no longer effective in the treatment of prediabetes, then other drugs and interventions can be introduced to help achieve target blood glucose levels,” said Dr. Kellis.

In addition to diet and exercise, utilizing the natural blood sugar stabilizers featured in this guide is a prudent first-line treatment strategy that has scientific substantiation. In the previously mentioned studies, all of the natural ingredients were well tolerated. As with any blood sugar treatment, combining several natural glucose control agents may provide additional effects, so close monitoring should always be done. Monitoring for interactions with prescription medications is also important.

“I am finding that patients are gravitating to natural remedies and newer approaches to healthcare and this includes blood sugar control,” said Dr. Monk. “I think it’s important to embrace a more integrative approach to a healthier lifestyle that our patients can feel comfortable with. This will also enhance compliance, which is critical when it comes to balancing blood sugar.”

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