Diabetes has two forms. In the type that develops early in childhood (type 1), the insulin-secreting cells of the pancreas are destroyed (probably by a viral infection), and blood levels of insulin drop nearly to zero. However, in type 2 diabetes (usually developing in adults) insulin remains plentiful, but the body does not respond normally to it. (This is only an approximate description of the difference between the two types.) In both forms of diabetes, blood sugar reaches toxic levels, causing injury to many organs and tissues.

Conventional treatment for type 1 diabetes includes insulin injections and careful dietary monitoring. Type 2 diabetes may respond to lifestyle changes alone, such as increasing exercise, losing weight, and improving diet. Various oral medications are also often effective for type 2 diabetes, although insulin injections may be necessary in some cases.

Principal Proposed Natural Treatments

Several alternative methods may be helpful when used under medical supervision as an addition to standard treatment. They may help stabilize, reduce, or eliminate medication requirements; or correct nutritional deficiencies associated with diabetes. However, because diabetes is a dangerous disease with many potential complications, alternative treatment for diabetes should not be attempted as a substitute for conventional medical care.

Other natural treatments may be helpful for preventing and treating complications of diabetes, such as peripheral neuropathy, cardiac autonomic neuropathy, retinopathy, and cataracts. See the article on Complications of Diabetes for more information.
Treatments for Improving Blood Sugar Control

The following treatments might be able to improve blood sugar control in type 1 and/or type 2 diabetes. However, for none of these is the evidence strong. One point to keep in mind is that the mere fact of joining a study tends to improve blood sugar control in people with diabetes, even before any treatment is begun! Presumably, the experience of being enrolled in a trial causes participants to watch their diet more closely. This serves to indicate, however, that for diabetes, as for all conditions, use of double-blind, placebo-controlled method is essential. Only if the proposed treatment proves more effective than placebo can it be considered to work in its own right.

Another point to keep in mind is this: If any natural treatment for diabetes actually works, you will need to reduce your medications to avoid hypoglycemia. For this reason, medical supervision is essential.

Chromium

Chromium is an essential trace mineral that plays a significant role in sugar metabolism. Some evidence suggests that chromium supplementation may help bring blood sugar levels under control in type 2 diabetes, but it is far from definitive.

A 4-month study reported in 1997 followed 180 Chinese men and women with type 2 diabetes, comparing the effects of 1,000 mcg chromium, 200 mcg chromium, and placebo. The results showed that HbA1c values (a measure of long-term blood sugar control) improved significantly after 2 months in the group receiving 1,000 mcg, and in both chromium groups after 4 months. Fasting glucose (a measure of short-term blood sugar control) was also lower in the group taking the higher dose of chromium.

A double-blind, placebo-controlled trial of 78 people with type 2 diabetes compared two forms of chromium (brewer's yeast and chromium chloride) against placebo. This rather complex crossover study consisted of four 8-week intervals of treatment in random order. The results in the 67 participants who completed the study showed that both forms of chromium significantly improved blood sugar control. Positive results were also seen in other small double-blind, placebo-controlled studies of people with type 2 diabetes. However, several other studies have failed to find chromium helpful for improving blood sugar control in type 2 diabetes. These contradictory findings suggest that the benefit, if it really exists, is small.

A combination of chromium and biotin might be more effective. Following positive results in a small pilot trial, researchers conducted a double-blind study of 447 people with poorly controlled type 2 diabetes. Half the participants were given placebo and the rest were given a combination of 600 mg chromium (as chromium picolinate) along with 2 mg of biotin daily. All participants continued to receive standard oral medications for diabetes. Over the 90-day study period, participants given the chromium/biotin combination showed significantly better glucose regulation than those given placebo. The relative benefit was clear in levels of fasting glucose as well as in HgA1c.

One placebo-controlled study of 30 women with gestational diabetes (diabetes during pregnancy) found that supplementation with chromium (at a dosage of 4 or 8 mcg chromium picolinate for each kilogram of body weight) significantly improved blood sugar control.

Chromium has also shown a bit of promise for helping diabetes caused by corticosteroid treatment.

For more information, including dosage and safety issues, see the full Chromium article.

Ginseng

In double-blind studies performed by a single research group, use of American ginseng (Panax quinquefolius) appeared to improve blood sugar control. In some but not all studies, the same researchers subsequently reported possible benefit with Korean red ginseng, a specially prepared form of Panax ginseng. However, in other studies (conducted by the research group mentioned in the previous paragraph), ordinary Panax ginseng seemed to worsen blood sugar control rather than improve it. Yet another group found potential benefit. It seems possible that
certain ginsenosides (found in high concentrations in some American ginseng products) may lower blood sugar while others (found in high concentration in some *Panax ginseng* products) may raise it. It has been suggested that since the actions of these various ginseng constituents are not well defined at this time, ginseng should *not* be used to treat diabetes until more is known.\(^{172}\)

For more information, including dosage and safety issues, see the full *Ginseng* article.

### Aloe

The succulent aloe plant has been valued since prehistoric times as a topical treatment for burns, wound infections, and other skin problems. However, recent evidence suggests that oral aloe might be useful for type 2 diabetes.

Evidence from two human trials suggests that aloe gel can improve blood sugar control.

A single-blind, placebo-controlled trial evaluated the potential benefits of aloe in either 72 or 40 people with diabetes. (The study report appears to contradict itself).\(^{21}\) The results showed significantly greater improvements in blood sugar levels among those given aloe over the 2-week treatment period.

Another single-blind, placebo-controlled trial evaluated the benefits of aloe in people who had failed to respond to the oral diabetes drug glibenclamide.\(^{22}\) Of the 36 people who completed the study, those taking glibenclamide and aloe showed definite improvements in blood sugar levels over 42 days as compared to those taking glibenclamide and placebo.

While these are promising results, large studies that are double- rather than single-blind will be needed to establish aloe as an effective treatment for improving blood sugar control.

Note that in the above we are referring to the gel of the aloe vera plant, and not the leaf skin (the latter is drug aloe, not aloe gel). However, some confusion has been introduced by the fact that some leaf skin may find its way into gel products, and that could be the actual active ingredient in aloe gel regarding diabetes.\(^{23,24}\) It is possible, therefore, that completely pure aloe gel might not work!

For more information, including dosage and safety issues, see the full *Aloe* article.

### Cinnamon

Cinnamon has been widely advertised as an effective treatment for type 2 diabetes as well as high cholesterol. The primary basis for this claim is a single study performed in Pakistan.\(^{153}\) In this 40-day study, 60 people with type 2 diabetes were given cinnamon at a dose of 1, 3, or 6 g daily. The results reportedly indicated that use of cinnamon improved blood sugar levels by 18% to 29%, total cholesterol by 12% to 26%, LDL (“bad”) cholesterol by 7% to 27%, and triglycerides by 23% to 30%. These results were said to be statistically significant as compared to the beginning of the study and to the placebo group.

However, this study has some odd features. The most important is that it found no significant difference in benefit between the various doses of cinnamon. This is called lack of a “dose-related effect,” and it generally casts doubt on the results of a study.

In an attempt to replicate these results, a group of Dutch researchers performed a carefully designed 6-week, double-blind, placebo-controlled study of 25 people with type 2 diabetes.\(^{173}\) All participants were given 1.5 g of cinnamon daily. The results failed to show any detectable effect on blood sugar, insulin sensitivity, or cholesterol profile. Furthermore, a double-blind study performed in Thailand enrolling 60 people, again using 1.5 g of cinnamon daily, also failed to find benefit.\(^{218}\)

On the other hand, a double-blind trial of 79 people that used 3 g instead of 1.5 g daily did find that cinnamon improved blood sugar levels.\(^{174}\) And, a randomized trial involving 58 people with type 2 diabetes also concluded that 2 g of cinnamon daily reduced HbA1c levels (a measurement of blood sugar levels over time), as well as *high blood pressure*.\(^{235}\)
In addition, a very small study evaluated cinnamon for improving blood sugar control in women with polycystic ovary disease, and it too found evidence of benefit.\textsuperscript{205}

Regarding type 1 diabetes, a study of 72 adolescents failed to find benefit with cinnamon taken at a dose of 1 g daily.\textsuperscript{204}

A meta-analysis (formal statistical review) of all published evidence concluded that, thus far, cinnamon has not yet been shown to have any effect on blood sugar levels in people with diabetes.\textsuperscript{222}

The bottom line: The evidence regarding cinnamon as a treatment for diabetes is highly inconsistent, suggesting that if cinnamon is indeed effective, its benefits are minimal at most.

For more information, see the full Cinnamon article.

Other Treatments Studied For Their Effect On Blood Sugar Control

The food spice fenugreek might also help control blood sugar, but the supporting evidence is weak. In a 2-month, double-blind study of 25 people with type 2 diabetes, use of fenugreek (1 g daily of a standardized extract) significantly improved some measures of blood sugar control and insulin response as compared to placebo.\textsuperscript{9} Triglyceride levels decreased and HDL (“good”) cholesterol levels increased, presumably due to the enhanced insulin sensitivity. Similar benefits have been seen in animal studies and open human trials as well.\textsuperscript{10-12} However, it is possible that the effects of fenugreek are simply due to its dietary fiber content.

Ayurveda, the ancient healing system of India, has been studied for its potential effect on blood sugar control.\textsuperscript{13-16} The Ayurvedic herb gymnema may be helpful for minor cases of type 2 diabetes when used alone or with standard care (under a doctor’s supervision in either case). Combination herbal therapies used in Ayurvedic medicine have also shown some promise for improving blood sugar control.\textsuperscript{84-86,159,238} A 2011 review included trials on a variety of herbal mixtures, including Diabecon, Cogent DB, Inolter, Hyponidd, and Pancreas Tonic.\textsuperscript{238} Compared to placebo or usual care, the mixtures of Diabecon, Cogent DB, and Inolter significantly reduced HbA1c levels (an indicator of overall blood sugar control) and fasting blood sugar levels. Another study attempted to test the effectiveness of whole-person Ayurvedic treatment, involving exercise, diet, meditation, and herbal treatment.\textsuperscript{193} However, minimal benefits were seen.

Studies in rats with and without diabetes suggest that high doses of the mineral vanadium may have an insulin-like effect, reducing blood sugar levels.\textsuperscript{25-35} Based on these findings, preliminary studies involving human subjects have been conducted, with some promising results.\textsuperscript{36-41} However, of 151 studies recently reviewed, none were of sufficient quality to judge whether or not vanadium is at all beneficial in type 2 diabetes.\textsuperscript{226} The researchers did find that vanadium was often associated with gastrointestinal side effects. Furthermore, there may be some cause for concern given the high doses of vanadium used in some of these studies.

The following herbs are proposed for helping to control blood sugar, but the supporting evidence regarding their potential benefit is, in all cases, at best highly preliminary. For some, there are as many negative results as positive.

- Agaricus Blazei\textsuperscript{202}
- Berberine (Goldenseal)
- Black tea\textsuperscript{21,22,23,24,25,26}
- Caiapo\textsuperscript{215}
- Cod protein\textsuperscript{215}
- Caviar\textsuperscript{181}
- Coccinia indica (also known as Coccinia cordifolia)\textsuperscript{50,225}
- Garlic\textsuperscript{220}
- Green tea\textsuperscript{211,212,213,237}
- Guggul\textsuperscript{220}
- Holy basil (Ocimum sanctum)\textsuperscript{58-59}
- Maitake\textsuperscript{22}
- Milk thistle\textsuperscript{197}
Nopal cactus (Opuntia stricta) 60-65

Onion 155

Oolong tea 157

OPCs 188, 214, 227

Salacia oblonga 217

Salvia hispanica (a grain) 217

Salt bush 48-49, 55-57

Additionally, the supplements arginine, 71, 185 carnitine, 89 coenzyme Q10 (CoQ10), 91 DHEA, glucomannan, lipoic acid, 92 melatonin combined with zinc, 194 and vitamin E 87-88, 134, 175 might also help control blood sugar levels, at least slightly. 44, 140

One placebo-controlled study found hints that use of medium chain triglycerides (MCTs) by people with type 2 diabetes might improve insulin sensitivity and aid weight loss. 212

The herb bitter melon (Momordica charantia) is widely advertised as effective for diabetes, but the scientific basis for this claim is limited to animal studies, uncontrolled human trials, and other unreliable forms of evidence. 51-53, 68, 69, 141 The one properly designed (eg, double-blind, placebo-controlled) study of bitter melon failed to find benefit. 208

Conjugated linoleic acid (CLA) has shown promise in preliminary trials. 73 However, other studies have found that CLA might worsen blood sugar control. (See Supplements to Use Only with Caution for more information.)

One study found that in insulin metabolism in 278 young, overweight subjects improved on a calorie-restricted diet rich in fish oil from seafood or supplements compared to those on a diet low in fish oil. Though highly preliminary, the results suggest that fish oil may help delay the onset of diabetes in susceptible individuals. 228 In another study of 50 people with type 2 diabetes, 2 g per day of purified omega-3-fatty acids (fish oil) was able to significantly lower triglycerides levels. 229 However, it had no effect on blood sugar control.

Other herbs traditionally used for diabetes that might possibly offer some benefit include Anemarrhena asphodeloides, Azadirachta indica (neem), Catharanthus roseus, Cucurbita ficifolia, Cucumis sativus, Cuminum cyminum (cumin), Euphorbia prostrata, Guaiacum coulteri, Guazuma ulmifolia, Lepechinia caulescens, Medicago sativa (alfalfa), Musa sapientum L. (banana), Phaseolus vulgaris, Psacalium peltatum, Rhizophora mangle, Spinacea oleracea, Tournefortia hirsutissima, and Turnera diffusa. 75-83

A double-blind study of more than 200 people evaluated the effectiveness of a combination herbal formula used in traditional Chinese herbal medicine (Coptis Formula). 145 This study evaluated Coptis Formula with and without the drug glibenclamide. The results hint that Coptis Formula may enhance the effectiveness of the drug, but that it is not powerful enough to treat diabetes on its own. Another randomized trial, this one lacking a control group, found no added benefit for Tai Chi in the treatment of blood glucose and cholesterol levels among 53 people with type 2 diabetes over a period of 6 months. 251

One study claimed to find evidence that creatine supplements can reduce levels of blood sugar. 206 However, because dextrose (a form of sugar) was used as the “placebo” in this trial, the results are somewhat questionable.

In one study, the herb Tinospora crispa did not work, and showed the potential to cause liver injury. 160

One study found hints that the supplement DHEA might improve insulin sensitivity. 158 However, a subsequent more rigorous study failed to find benefits. 207

Relatively weak evidence hints that genistein (an isoflavone extracted from soy) might help control blood sugar. 210

It has been suggested that if your child has just developed diabetes, the supplement niacinamide—a form of niacin, also called vitamin B3—might slightly prolong what is called the honeymoon period. 92 This is the interval during which the pancreas can still make some insulin, and the body’s need for insulin injections is low. However, the benefits (if any) appear to be minor. A cocktail of niacinamide plus antioxidant vitamins and
minerals has also been tried, but the results were disappointing.\textsuperscript{24} (Niacinamide has also been tried for preventing diabetes in high risk children. See Preventing Diabetes below.)

According to most studies, fructo-oligosaccharides (FOS, also known as "prebiotics") do not improve blood sugar control in people with type 2 diabetes.\textsuperscript{176-177}

Massage therapy has shown some promise for enhancing blood sugar control in children with diabetes.\textsuperscript{146} A review of 9 clinical trials found insufficient evidence to support the Traditional Chinese practice of Qigong as beneficial for treatment of type 2 diabetes.\textsuperscript{223}

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**Treating Nutritional Deficiencies in Diabetes**

Both diabetes and the medications used to treat it can cause people to fall short of various nutrients. Making up for these deficiencies (either through diet or the use of supplements) may or may not help your diabetes specifically, but it should make you a healthier person overall.

One double-blind study found that people with type 2 diabetes who took a multivitamin/multimineral supplement were less likely to develop an infectious illness than those who took placebo.\textsuperscript{147}

People with diabetes are often deficient in magnesium,\textsuperscript{3,95,96} and inconsistent evidence hints that magnesium supplementation may enhance blood sugar control.\textsuperscript{142,190} People with either type 1 or type 2 diabetes may also be deficient in the mineral zinc.\textsuperscript{97-99} Vitamin C levels have been found to be low in many people on insulin, even though they were consuming seemingly adequate amounts of the vitamin in their diets.\textsuperscript{100-102} Deficiencies of taurine\textsuperscript{103} and manganese have also been reported.\textsuperscript{104}

The drug metformin can cause vitamin B\textsubscript{12} deficiency.\textsuperscript{105} Interestingly, taking extra calcium may prevent this.\textsuperscript{106}

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**Preventing Diabetes**

**Niacinamide**

Evidence from a large study conducted in New Zealand suggested that the supplement niacinamide—a form of niacin, also known as vitamin B\textsubscript{3}—might be able to reduce the risk of diabetes in children at high risk.\textsuperscript{107} In this study, more than 20,000 children were screened for diabetes risk by measuring certain antibodies in the blood (ICA antibodies, believed to indicate risk of developing diabetes), it turned out that 185 of these children had detectable levels. About 170 of these children were then given niacinamide for 7 years (not all parents agreed to give their children niacinamide or have them stay in the study for that long). About 10,000 other children were not screened, but they were followed to see if they developed diabetes.

The results were positive. In the group in which children were screened and given niacinamide if they were positive for ICA antibodies, the incidence of diabetes was reduced by almost 60%.

These findings suggest that niacinamide is an effective treatment for preventing diabetes. (The study also indicates that tests for ICA antibodies can very accurately identify children at risk for diabetes.)

However, an even larger study that attempted to replicate these results in Europe (The European Nicotinamide Diabetes Intervention Trial, or ENDIT) failed to find benefit. This study screened 40,000 children at high risk, and selected 552.\textsuperscript{108, 187} The results, unfortunately, were negative. Rate of diabetes onset was not statistically different in the group given niacinamide as compared to those given placebo. Another study also failed to find
At present, therefore, hopes are dimming for this approach.

**Dietary Changes**

The related terms “glycemic index” and “glycemic load” indicate the tendency of certain foods to stimulate insulin release. It has been suggested that foods that rank high on these scales, such as white flour and sweets, might tend to exhaust the pancreas, and therefore lead to type 2 diabetes. For this reason, low-carbohydrate and low glycemic-index diets have been promoted for the prevention of type 2 diabetes. However, the results from studies on this question have been contradictory, and far from definitive. 113-127,236

There is no question, however, that people who are obese have a far greater tendency to develop type 2 diabetes than those who are relatively slim; therefore, weight loss (especially when accompanied by increase in exercise) is clearly an effective step for prevention. 128,161,207 One review suggests that a weight decrease of 7%-10% is enough to provide significant benefit.

**Other Natural Treatments**

Studies investigating the preventive effects of antioxidant supplements have generally been disappointing. In an extremely large double-blind study, use of vitamin E at a dose of 600 IU every other day failed to reduce risk of type 2 diabetes in women. 191 Another very large study, this one enrolling male smokers, failed to find benefit with beta-carotene, vitamin E, or the two taken together. 224 And, another large study of female health professionals over 40 years old with or at high risk for cardiovascular disease found that long-term supplementation (average of 9.2 years) with vitamin C, vitamin E, or beta-carotene did not significantly reduce the risk of developing diabetes compared to placebo. 232 In a smaller (but still sizable) trial involving a subgroup of these same women supplementation with vitamins B6, B12, and folic acid also did not reduce risk of type 2 diabetes. 234

Several observational studies suggest that vitamin D may also help prevent diabetes. 110-112,192 However, studies of this type are far less reliable than double-blind trials.

One observational study failed to find that high consumption of lycopene reduced risk of developing type 2 diabetes. 178

**Supplements to Use Only With Caution**

In a double-blind, placebo-controlled study of 60 overweight men, use of conjugated linoleic acid (CLA) unexpectedly worsened blood sugar control. 135 These findings surprised researchers, who were looking for potential diabetes-related benefits with this supplement. Other studies corroborate this as a potential risk for people with type 2 diabetes and for overweight people without diabetes. 162-164 Another study, however, failed to find this effect. 196 Nonetheless, at present people with type 2 diabetes or at risk for it should not use CLA except under physician supervision.

Unexpected results also occurred in a study of vitamin E. For various theoretical reasons, researchers expected that use of vitamin E (either alpha tocopherol or mixed tocopherols) by people with diabetes would reduce blood pressure; instead, the reverse occurred. 199 For this reason, people with diabetes should probably monitor their blood pressure if they take high-dose vitamin E supplements.

There are equivocal indications that the herb ginkgo might alter insulin release or insulin sensitivity in people with diabetes. 135,165,184 The effect, if it exists at all, appears to be rather complex; the herb may cause some increase in insulin output, and yet might actually lower insulin levels overall through its effects on the liver and perhaps on oral medications used for diabetes. Until this situation is clarified, people with diabetes should use ginkgo only under the supervision of a physician.
Despite hopes to the contrary, it does not appear that selenium supplements can help prevent type 2 diabetes, but rather might increase the risk of developing the disease.81

For information on other herbs and supplements that may interact adversely with drugs used by people with diabetes, see the individual drug articles in the Drug Interactions section of this database.

Contrary to earlier concerns expressed at one time, vitamin B<sub>3</sub> (niacin) and fish oil appear to be safe for people with diabetes.24,135-138

A few early case reports and animal studies had raised concerns that glucosamine might be harmful for individuals with diabetes, but subsequent studies have tended to allay these worries.130-134,166-168,198,216

Finally, if any herb or supplement does in fact successfully decrease blood sugar levels, this could potentially lead to dangerous hypoglycemia. A doctor's supervision is strongly suggested

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