

## Step Up Your Metabolism! Especially Helpful for Diabetics

- **Alpha Lipoic Acid (ALA).** ALA is an antioxidant known to lower blood sugar. It also recycles other antioxidants. Diabetics often use it to treat nerve damage. ALA increases the number of energy generators, called mitochondria, in each cell. Mitochondria are your body's furnaces and can make up about ten percent of your body weight. The more mitochondria your body has, the more it will burn sugar to create energy. ALA also reduces triglycerides and improves insulin sensitivity. To improve mitochondrial function and number, your health care provider may suggest timed-release doses of R-alpha lipoic acid in conjunction with methylated resveratrol<sup>13</sup> and quercetin,<sup>14</sup> which extends the life of resveratrol. **Note:** CoQ10 in the reduced form (ubiquinol) is also important to mitochondrial function. It recycles the critical antioxidants vitamin C and E. Oxidation rates increase as the mitochondria in each cell generate energy. Adequate CoQ10 minimizes oxidation. Together, these are a powerful combination for diabetics. Choose a high quality gel-cap CoQ10, oil-based and crystal-free.
- **Acetyl-L-Carnitine (ALC).** ALC helps transport fatty acids into the mitochondria. These fatty acids also help maintain healthy mitochondrial membranes.
- **Chromium.** Found in whole grains, nuts, and particularly broccoli, chromium activates insulin and changes cell membranes to allow sugars to pass through cells for use or storage. Many adults are chromium-deficient. One reason is that chromium, essential for sugar metabolism, has been stripped from refined sugars and grains. Another is that diets rich in sugars accelerate chromium excretion. This means that every time you eat refined carbohydrates you deplete rather than build chromium stores. According to Oregon State University's Linus Pauling Institute Micronutrient Information Center, "Because chromium appears to enhance the action of insulin and chromium deficiency has resulted in impaired glucose tolerance, chromium insufficiency has been hypothesized to be a contributing factor to the development of type 2 diabetes." The center also states, "Individuals with pre-existing kidney or liver disease may be at increased risk of adverse effects and should limit supplemental chromium intake."
- **Zinc.** Excessive sugar consumption also depletes zinc. Zinc is a component of the insulin molecule that moves sugar out of the blood stream. Zinc combats cold and flu viruses. It also aids wound healing and supports the immune and reproductive systems, especially the prostate. Zinc also supports healthy liver function.
- **Limit caffeine and chocolate.** Both raise blood glucose, cholesterol, and uric acid. They decrease chromium, magnesium, and zinc levels.

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<sup>13</sup> Resveratrol helps control obesity and improve insulin sensitivity in cells.

<sup>14</sup> Quercetin is an antioxidant found in small amounts in onions, tea, broccoli, and apples.

<sup>15</sup> Xymogen is an example of a reputable company that carries these products. Since ALA has a limited lifespan (about 30 minutes), they offer a timed release ALA supplement called ALAMax CR. Resveratin is their product that provides resveratrol and quercetin together.

- **Limit alcohol consumption.** Alcohol also raises levels of blood glucose, cholesterol, and depletes magnesium, manganese, potassium, and folic acid. Alcohol, caffeine, most meats, and many other foods need to be buffered with alkalizing foods, as discussed in, “Environmental, Non-Estrogen Related Risk Factors for Osteoporosis.”
- **Enjoy egg yolks, milk, poultry broccoli, and fish** often. They are rich in biotin, an important B vitamin. Biotin contributes to many steps of energy metabolism.
- Your doctor may suggest a **vanadyl sulfate supplement**. Vanadyl sulfate and insulin each move glucose out of the bloodstream. Because they use different pathways, vanadyl supplements may help lower insulin levels. It may also help protect pancreatic beta cells that produce insulin. Research continues.

Some doctors believe **L-glutamine** (or glutamine peptides that are more stable and better-absorbed and utilized) can reduce cravings for sugar, alcohol and other carbohydrates. Improved insulin signaling in liver and muscle cells is one of its many benefits. Glutamine is the most abundant amino acid, but is often depleted in those with constant high metabolic stress or the yeast overgrowth that often accompanies excessive sugar intake. Food hinders glutamine absorption; therefore take supplements on an empty stomach. Meat, eggs, and dairy are glutamine-rich foods. Vegetarians find it in legumes, raw cabbage, beets and some seeds like hemp and chia. [**Note:** Those with kidney disease or severe liver failure should not take glutamine. Many diabetics have kidney damage and should definitely take it only under a doctor’s supervision.] There are many other strategies for reducing sugar cravings. See “Sugar, An Unrecognized Addiction” in the “Food as Medicine” chapter.

- **Glutathione.** Alternatively, consider strategies that raise glutathione levels. See more in Chapter Fourteen and “Menu for Immune System Boosting” in Appendix V. Diabetics are almost always deficient in glutathione and benefit from boosting strategies.
- **Leptin.** Learn more about leptin resistance and leptin signaling. Just as you can restore the sensitivity of fat, muscle and liver cells to insulin’s signals, you can restore sensitivity to leptin sensitive neurons in the hypothalamus. There are several books available on the subject. Dr. Rosedale’s books and web articles are good starting points. Dr. Rosedale is a metabolic expert on the subject of leptin.
- **Raw Apple Cider Vinegar.** To even out blood sugar spikes after a high-carbohydrate meal, take 1 to 2 tablespoons of raw apple cider vinegar, perhaps in a salad dressing before meals. Vinegar may even out blood sugar spikes and help insulin ferry sugar into cells. [In one study, pre-diabetic subjects who took apple cider vinegar prior to eating a meal, cut blood glucose concentrations by 34 percent. These levels were superior than those of the healthy controls who did not have pre-diabetes. Type 2 diabetics improved their glucose levels by 19 percent when they consumed apple cider vinegar.]

Raw apple cider vinegar also provides gut colonizing probiotics and minerals that help buffer acidifying foods. Read more about this important principle in Chapter Seven, “Environmental Non-Estrogen Related Risk Factors for Osteoporosis.” Many diabetics suffer with osteoporosis and arthritis.

- **Herbs.** For those interested in Ayurvedic remedies, the National Institute of Health says, “There is evidence to suggest that the single herbs *Coccinia indica*, holy basil, fenugreek, and *Gymnema sylvestre* and the herbal formulas Ayush-82 and D-400 have a glucose-lowering effect and deserve further study. Evidence of effectiveness of several other herbs is less extensive (*C. tamala*, *Eugenia jambolana*, and *Momordica charantia*).

- **Vitamin C.** Vitamin C competes with sugar for absorption, so diabetics often have low levels of the antioxidant vitamin C. High blood sugar levels increase the oxidative stress that damages cells and creates disease, so diabetics often take megadoses of vitamin C. However, it is best to get this and other antioxidants as part of a well-balanced diet because high supplemental vitamin C intake by diabetics, as with smokers, paradoxically increases oxidation, rather than reducing it. Supplemental C may also create AGEs. See Chapter Two: Immune System Sings the Sugar Blues.] Keeping sugar levels low prevents a lot of oxidative stress.
- **Mushrooms/Adiponectin.** Enjoy mushrooms regularly. It may be that button and portabella mushrooms increase adiponectin levels. Adiponectin is a protein-signaling molecule that regulates fat and sugar metabolism. Fat cells produce adiponectin, just as they produce leptin and the inflammatory messenger TNF. However adiponectin levels actually decrease as body fat accumulates. Like leptin, adiponectin signals your brain when you are full. It is known to suppress diabetes, atherosclerosis, and fatty liver disease through its anti-inflammatory effects on blood vessel walls. “Higher adiponectin levels are associated with a lower risk of type 2 diabetes across diverse populations, consistent with a dose-response relationship.”
- **Nutrition.** Learn more about food, nutrition, and the essential fatty acid balance between omega-3 and omega-6 fatty acids. Consumed in the proper balance, these fatty acids lower triglyceride level and reduce overall inflammation. They are briefly introduced in Chapter Twelve of *Mouth Matters*. Avoid all trans fats, such as margarine.
- **PQQ (polyquinoline quinone)** supplements are known to boost each cell’s energy producers, the mitochondria. Anything that boosts mitochondrial function boosts health.
- **Exercise** is probably the most effective strategy. Exercise increases insulin sensitivity because muscles must have sugar to burn for energy. Aerobic exercise also multiplies the number and function of mitochondrial furnaces in each cell, especially of muscle cells. When human cells are packed with mitochondria, oxidative stresses diminish and the body becomes highly energy efficient. [An interesting note: skeletal muscles produce nitric oxide (NO) as they contract. NO relaxes and opens blood vessels, encourages muscle cells to accept blood sugars, and fuels the mitochondria with oxygen. NO also activates mitochondria production.
- **Ozone therapies, various light therapies like low and high intensity lasers and PEMF therapies** also boost mitochondrial numbers and output.