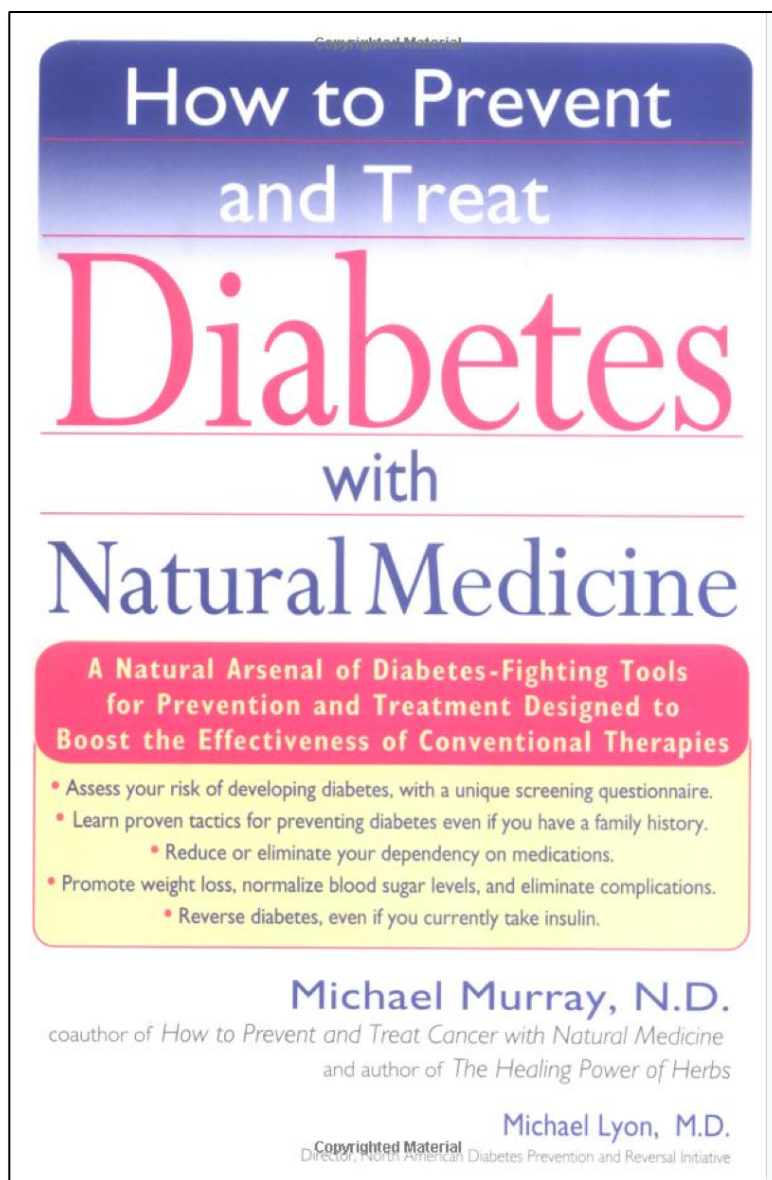


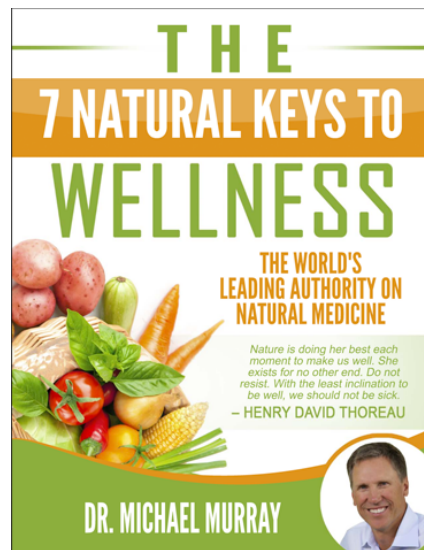
*Excerpt from the book:*

# How to Prevent and Treat Diabetes with Natural Medicine

## Chapter 7: Diet Therapy in Managing Diabetes



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## **Excerpt from the book: How to Prevent and Treat Diabetes with Natural Medicine**

### **Chapter 7. Diet Therapy in Managing Diabetes**

Diet is fundamental to the successful treatment of diabetes, whether it be type 1 or 2. Over the years there has been quite a war of opinions as to the best diet for people with diabetes. One of the first dietary strategies was to completely restrict carbohydrates of all sorts in favor of high protein and fatty foods.

Unfortunately, this diet proved disastrous to the long-term health of diabetics as it carried with it severe consequences to cardiovascular and kidney health. On the other end of the spectrum was the high complex carbohydrate, low fat type diet. This diet was also doomed because it did not differentiate quality of carbohydrate. Furthermore, eating the right type of oils promotes proper insulin action. Any diet that severely restricts beneficial oils would ultimately fail.

After reviewing every scientific article on the role of diet in diabetes treatment that we could find, what we offer here is an easy to follow program that will produce results that is based upon the evolutionary understanding of what constitutes the optimal diet for individuals with diabetes. While it is currently not the diet that the American Diabetes Association (ADA) is recommending, we believe that it soon will be what we are recommending is based upon a large body of positive clinical research.

Does this mean if you have diabetes that we want you to disregard what your doctor is telling you about diet? Well, first of all in all probability your doctor has most likely never talked to you at all about diet and if they have it was only in general terms, e.g., stay away from sugar, cut down on the amount of saturated fat, try to eat more high protein foods, etc, or perhaps they gave you a brochure on the Food Guide Pyramid.

We are going to make very specific recommendations here to provide you with the absolute best diet to battle diabetes based upon our Optimal Health Food Pyramid (see Chapter 5, page 000).. If your doctor is telling you to follow the diet program endorsed by the ADA the (Eating Right Pyramid), please tell him that you are following our recommendations – please take him or her a copy of our open letter to physicians (see Appendix 000, page 000) and our dietary pyramid. We are sure that if they do any follow up by actually looking at the scientific studies on diet and diabetes that they will endorse our program like so many others. You will need to have a good working relationship with your doctor so that you can be monitored properly.

#### **Our daily food prescription**

The optimal diet for the treatment of diabetes is virtually the same as the program that we have presented in Chapter 5. The difference is that there often needs to be an even stricter avoidance of foods with a high glycemic load (e.g., above 19; see Appendix 000, page 000). What will determine how strict that you will need to be with your intake of carbohydrates is based upon your ability to get your blood sugar measurements and

glycosylated hemoglobin (hemoglobin A1c) levels under control and achieve/maintain ideal body weight. Obviously, the poorer the control the more you will have to restrict carbohydrate intake.

Initially, some people with diabetes – especially those who have poorly controlled blood sugar levels – may need to avoid meals with a total glycemic load of more 30 and space these meals at least three hours apart. Higher glycemic load meals can be consumed if one of the special natural products designed to slow gastric emptying and blunt after meal blood sugar levels is used (these compounds are discussed in Chapter 9).

In Appendix 000, pages 000-000, we provide a daily plan for treating diabetes with natural medicine that includes diet, lifestyle, and supplementation recommendations. Included in this Appendix is a sample weekly menu complete with recipes. To follow here is our daily food prescription based upon a 2,000 calorie a day diet followed by a brief description of the individual food groups, the clinical research on diet therapy in diabetes, and the importance again of the following foundational supplements for people with diabetes: a high potency multiple vitamin and mineral formula, green drinks; and a pharmaceutical grade fish oil product.

If you need to increase your caloric intake, try to get the extra calories you need by increasing the number of servings of vegetables, nuts, and legumes as these are the best foods for improving blood sugar control. For athletes or people engaged in heavy physical labor or exercise, be sure to add another serving of seafood, meat, or poultry to your daily intake or add a soy protein or whey protein smoothie providing an additional 25 to 30 grams of protein.

**Table 8.1 Daily food group recommendations:**

Foods	Daily Servings (2,000 calorie diet)
Vegetables total servings	5 to 7
Green leafy and cruciferous vegetables	2 to 4
Low glycemic vegetables	2 to 3
Other vegetables	1 to 2
Good oils	
Total servings	4
Nuts and seeds	1
Olive, macadamia, flaxseed, or canola oil	2 to 3
Whole grains	3 to 5
Legumes	2 to 3
	(4 to 5 if vegetarian)
Quality protein	2-3
Fruit	2 to 3
Dairy	1 to 2 (optional)

Foods to avoid entirely

- Refined white flour products: pastas, cakes, muffins, pretzels, etc.
- Refined sugar-loaded cereals, candies, baked goods, etc.

- Processed foods packed full of empty calories (sugar and fat) or salt (e.g., soups, microwave or theater-style popcorn, chips, etc.).
- Margarine, butter, and shortening.
- Smoked or cured meats: bacon, hot dogs, smoked luncheon meats, sausages, ham, spam, etc.
- Meats cooked at extremely high temperatures or cooked to well-done
- Heavily sweetened or artificially sweetened soft drinks, Kool-Aid, juice-flavored drinks, etc.
- Fried foods including French fries, potato chips, corn chips, and doughnuts.

### *Vegetables – 5 to 7 servings daily*

In Latin, the word vegetable means "to enliven or animate." Vegetables give us life and should be the main focus of any health promoting diet. Vegetables provide the broadest range of nutrients of any food class. They are rich sources of vitamins, minerals, carbohydrates, and protein. Vegetables also provide high quantities anticancer phytochemicals.

When cooking vegetables it is very important that they not be overcooked. Overcooking will not only result in loss of important nutrients it will also alter the flavor of the vegetable. Light steaming, baking, and quick stir-frying are the best ways to cook vegetables. Do not boil vegetables unless you are making soup, as much of the nutrients would be left in the water. If fresh vegetables are not available, frozen vegetables are preferred over their canned counterparts. The only exception is for tomato products (e.g., soup, paste, sauce, etc.) because these products actually provide more absorbable lycopene than raw tomatoes.

We have divided your vegetable intake into three categories: green leafy and cruciferous vegetables; low glycemic vegetables; and starchy vegetables. Doing so, will encourage you to eat a variety of these life-giving foods, help you achieve a "rainbow assortment," and allow you to focus on low-glycemic items. One serving equals 1 cup raw leafy vegetables (such as lettuce or spinach); 1/2 cup raw non-leafy or cooked vegetables 1 serving equals 1/2 cup cooked vegetables or fresh vegetable juice.

### Green leafy and cruciferous vegetables – 2 to 4 servings daily

Alfalfa sprouts  
 Beet greens  
 Bok choy  
 Broccoli  
 Brussels sprouts  
 Cabbage  
 Cauliflower  
 Chard  
 Chinese cabbage  
 Collard greens  
 Dandelion

Endive  
Escarole  
Kale  
Mustard greens  
Lettuce (the darker, the better)  
Parsley  
Spinach  
Turnip greens  
Watercress

Low glycemic vegetables – 2 to 3 servings daily

Artichoke (1 medium)  
Asparagus  
Bean sprouts  
Bell peppers  
Carrots  
Celery  
Cucumber  
Fennel  
Mushrooms  
Okra  
Onions  
Peas (fresh or frozen)  
Radishes  
Rhubarb  
String beans, green or yellow  
Summer squash  
Tomatoes, tomato paste, tomato sauce, tomato juice, vegetable juice cocktail  
Zucchini

Starchy vegetables – 1 to 2 servings daily, but only if blood sugar levels are well controlled.

Beets  
Parsnip  
Potato  
Pumpkin  
Rhubarb  
Rutabaga  
Winter, acorn, or butternut squash  
Yam or sweet potato

*Whole grains – 3-5 servings daily*

It is very important to choose whole grain products (e.g., whole grain breads, whole grain flour products, brown rice, etc.) over their processed counterparts (white bread, white flour products, white rice, etc.). Whole grains provide substantially more nutrients and

health-promoting properties. Whole grains are a major source of complex carbohydrates, dietary fiber, magnesium and other minerals, and B vitamins. The protein content and quality of whole grains is also greater than that of refined grains. Diets rich in whole grains have been shown to be helpful in both prevention and treatment of diabetes, but they must have a low glycemic load (certainly below 20). See Appendix 000, pages 000-000 for the specific values. To further improve blood sugar levels, we recommend taking ProMannan – a special fiber mixture – or natural glucosidase inhibitors (both of these natural products will be discussed in Chapter 9) before a meal containing any complex carbohydrates to slow down the absorption of the sugars.

One of the following equals one serving:

Bread

Whole wheat, rye or other whole grain 1 slice

Cereals

Whole grain cereal 1/2 cup

Corn

Cooked whole kernel corn 1/2 cup

Corn on cob 1 small

Flour and flour products

Whole wheat flour (uncooked) 2 1/2 tbsp

Whole gain pasta (cooked) 1/2 cup

Whole grains (cooked)

Rice, oats, wheat, barley, quinoa, spelt, etc. 1/2 cup

*Beans (Legumes) – 2-3 servings daily*

Beans are a mainstay in most diets of the world and are second only to grains in supplying calories and protein to the world's population. Compared to grains, they supply about the same number of total calories, but usually provide 2 to 4 times as much protein and are a richer source of the soluble fiber that lowers cholesterol and stabilizes blood sugar levels. While we do not recommend using canned vegetables or fruit, canned beans retain their fiber content and anticancer flavonoids. Plus, given the long preparation time for cooking beans, canned beans are extremely quick and convenient.

There are a variety of delicious beans to choose from.

Black-eyed peas

Chick peas

Garbanzo beans

Kidney beans

Lentils

Lima beans

Pinto beans

Soybeans, including tofu

Split peas

*Fruits – 3 to 4 servings daily*

Fruits are a rich source of many beneficial nutrients and regular fruit consumption has been shown to offer significant protection against diabetes and other chronic degenerative diseases including cancer, heart disease, cataracts, and strokes. Fruits make excellent between meal snacks and super desserts (e.g., fresh berries alone are fantastic). It is easy to get into the habit of eating only a few varieties of fruit. Again, we encourage you to eat a rainbow assortment of fruits over the course of a week. Since flavonoids are so important to the prevention of the complications of diabetes, we also encourage supplementing your diet with flavonoid-rich extracts (discussed in Chapter 9, page 000-000).

*Good Oils (Nuts, Seeds, and Oils) – 4 servings daily*

These foods provide the beneficial oils, especially the monounsaturated fats, and regular nut consumption has been shown to improve blood sugar regulation. Focus on raw nuts and seeds. Definitely avoid nuts and seeds roasted in oils or coated with sugar. Nuts and seeds are great to add to salads and sautéed greens. Try to mix it up a bit, by eating a variety of nuts and seeds such as almonds, brazil nuts, walnuts, pecans, flaxseeds, sunflower seeds, and pumpkin seeds.

Use olive, macadamia, flaxseed, or canola oil to replace the butter, margarine, and shortening that you use for cooking or as a salad dressing. We also recommend using flaxseed oil in homemade salad dressings, so we provide some recipes in Appendix 000. You never want to cook with flaxseed oil, it is too rich in polyunsaturated fats that are easily damaged by heat. Macadamia nut oil is the best cooking oil, but olive oil is great for sautéed vegetables while canola oil is usually best for baked goods because it has the least “nutty” flavor. Coconut oil is also very stable in cooking and is fine to use in small quantities. It contains saturated fat, but it is metabolized differently than animal derived saturated fats and it is safe to use in moderation.

We want you to have at least one serving of nuts or seeds (one serving equals ¼ cup) and 3 tablespoons of the healthy oils daily along with taking a high quality fish oil supplement.

*Dairy –1 or 2 servings daily (optional)*

We have found that many people are allergic to milk or lack necessary enzymes to digest dairy products. Even for people who do tolerate dairy foods, milk consumption should be limited to no more than one or two servings per day. Use nonfat or reduced fat dairy products over whole milk varieties. Also, fermented dairy products like yogurt, kefir, and acidophilus-fortified milk are preferred over milk. If you haven't tried some of the soy milk alternatives to cow's milk, they are delicious, especially the flavored varieties like vanilla and chocolate. One serving equals 1 cup of milk, yoghurt or cottage cheese; or 1 ounce of cheese. If dairy products are not consumed, we recommend that you take a well absorbed and lead free calcium supplement, preferably one combined with magnesium. (see appendix 000, page 000)



### *High quality protein – 2-3 servings daily*

We have continually stressed the detriment of saturated fat and the importance of the omega-3 fatty acids in fish in the battle against developing diabetes, so it should be no surprise of our recommendation in this category. We want you to consume fish at least 3, but no more than 6, times per week. Fish is an excellent source of high quality protein. Chicken and turkey can also provide excellent protein with very little fat especially if you eat only the white meat (breast) and do not eat the skin. Eggs are also a very good source of high-quality protein. There is 5.5 grams of protein (11.1% of the daily value for protein) in one egg and only 68 calories. Although some people are concerned about the cholesterol content of eggs, studies have now shown that most people can eat one or two eggs a day without measurable changes in their blood cholesterol levels. If you are concerned about the cholesterol, use only the egg whites or choose one of the several egg-white products on the market such as Egg Beaters.

In perhaps one of the most important recommendations, we want you to keep the intake of red meat (beef, veal, or lamb) to no more than two servings per month and choose the leanest cuts possible, keep the portion size limited to about the size of a deck of cards, and do not charbroil or cook the meat to overdone (it increases the formation of cancer causing compounds). Also, consider some of the alternatives to beef such as buffalo, venison, elk, rabbit, ostrich, or emu.. These emerging beef alternatives are lower in saturated fat and provide higher levels of omega-3 fatty acids.

### **Clinical studies with diet therapy in type 1 diabetes**

We have stressed in Chapter 6 the importance of monitoring blood sugar levels in both type 1 and type 2 diabetes. In type 1 diabetes it is an absolute necessity. Achieving optimal daily blood glucose measurements and hemoglobin A<sub>1</sub>C levels insure a longer, healthier life for people with type 1 diabetes. In that goal, diet is also critical, but so is the intensified insulin therapy as described in Chapter 000.<sup>i</sup> Numerous clinical studies have shown impressive results in improving blood sugar control when diets high in fiber and low in glycemic load are utilized. This fact holds true in both adults and children; and in both type 1 and type 2 diabetes.

In regards to studies in children, let's take a look at a study conducted in children 8 to 13 years of age in Melbourne, Australia.<sup>ii</sup> The subjects were divided into a group to follow the ADA's exchange program diet and another group instructed to eat low glycemic index foods. While there was no change in A<sub>1</sub>C in the exchange diet (8.6%), the group eating the low glycemic dropped from 8.6% to 8.0% - an acceptable value in children. Rates of excessive blood sugar levels were 66% for the exchange diet vs. 35% for those eating low GI foods. While these results are great, what the study really highlighted the impact of eating a low GI diet on the quality of life. There were significantly fewer family conflicts, limitations placed on family activities, and difficulties in meal selections. Furthermore, parents and children alike showed a clear preference for the low GI diet.

Similar results have been seen in adults with type 1 diabetes, including pregnant women with type 1 diabetes, following a high-fiber, low GI diet.<sup>iii,iv,v,vi</sup> What these studies and others indicate is that a low GI and GL diet is emerging as the most scientifically proven dietary support for type 1 diabetes. We have taken the proven diet to a much higher level by also considering the role of fats on insulin action.

### **From our patient files**

Susan was 24 when I began to see her for regular diabetic care. Already a type 1 diabetic for 10 years, Susan was frustrated with her “brittle” diabetes. Although she wanted to achieve better blood sugar control -- her hemoglobin A1c was usually over 9.5 percent and her daily blood sugars were often over 250 mg/dl (14 mmol/L), if she tried to keep her blood sugars lower with increased insulin dosages, she would often become hypoglycemic.

Over the past year, she had to visit the emergency department on 3 occasions with severe insulin reactions (hypoglycemia) and she was afraid that she would never get her driver’s license back again. On the other hand, she didn’t feel well much of the time and she knew that a hemoglobin A1c of 9.5 put her at a high risk for serious diabetic complications. On top of this, her insulin requirements had increased about 30% over the past 5 years. This, and her elevated triglyceride level suggested that she was becoming insulin resistant. In essence, although she was a type 1 diabetic, she was developing signs of type 2 diabetes as well (i.e. insulin resistance, elevated triglycerides and increased body fat).

Susan had a body mass index (BMI) of 27 (155 lb and 5’4”) and she didn’t exercise much. She was very carefully following the ADA diet plan that was taught at the hospital diabetic education center. However, even though she was eating the 1800 calorie diet as prescribed, she had gained more than 10 pounds over the past 5 years. Susan was very good about avoiding sugar but she loved (white) bread and pasta. She used exchanges almost every meal to increase the servings of bread and pasta without increasing her daily calories.

Her appetite was often ravenous before meals and she found it hard not to eat more than her diet allowed. When I talked to her about the importance of glycemic index and glycemic load, she was surprised that no one had ever mentioned these concepts or even had her consider the fiber in her diet. When I reviewed a diet diary she completed over 3 days, it was clear that the total glycemic load (GL) of her diet was far higher than ideal and she probably ate less than 10 grams of fiber on most days. She didn’t eat enough protein and when she did, it was usually ground beef or cheese. She ate too much saturated fat, not enough omega-9 and omega-3 fatty acids, insufficient antioxidant phytochemicals and far too little fiber. I was glad to learn about all of this because there were so many positive things she could do to improve her health!

The first thing I did was get her to commit to a regular exercise program. To start with, she agreed to walk for ½ hour on most days. I estimated that she could burn an extra 200 calories per day during her walk and by the increase in her metabolic activity. If she kept

her calories the same she would be able to burn an extra 1200-1400 calories per week. By this calculation alone, she would be able to lose about 2 pounds per month or 24 pounds per year. I had her aim for a 10% reduction in weight.

This modest weight loss would promote a restoration of insulin sensitivity and allow for a lower total daily insulin dose which would help to counteract the weight promoting effects of excessive insulin. As well, I gave her a table showing the glycemic index and glycemic load of foods. She agreed to select from the low GI foods as much as possible and to keep her total glycemic load below 150 per day. Instead of using exchanges to increase her starch intake, she began to eat a lot more fresh vegetables and fruits (along with a “greens” drink daily), and she also began to eat fish and chicken instead of ground beef and cheese. She ate moderate servings of whole grain products and I had her take a water soluble fiber supplement before each meal, fish oil capsules and a high potency multivitamin.

Within few days of this program, she began to notice that her insulin requirements were less. As well, her appetite decreased significantly on the higher protein, higher fiber, and low glycemic index/glycemic load diet. She started feeling so good from her walks that she ended up walking 1 hour most days and she also began going to a gym twice per week to lift weights (instead of walking on those days).

Within 3 months she had lost 18 pounds (more than the 10% weight loss goal) and her insulin requirements were down 1/3 from when we started. Her hemoglobin A1c was just under 8 and her triglycerides were normal. At this point, I referred her for training to begin intensive insulin therapy with a goal to get her on an insulin pump and to get her blood sugars under even better control. Overall, she felt better than she had in years and she hadn't had a significant hypoglycemic episode since she began her dietary and lifestyle changes.

### **Clinical studies with diet therapy in type 2 diabetes**

Diet is a key therapeutic area in type 2 diabetes. In fact, diet alone can often be effective as the sole factor in treating and reversing type 2 diabetes. Of course, we are recommending more than diet alone as lifestyle and supplements are also important. The point we are making is that the treatment of type 2 diabetes really begins with diet. And, just as in type 1 diabetes, there is considerable evidence from clinical trials that the diet that we are recommending is emerging as the most scientifically proven approach especially when considering not only its effect on blood glucose levels but also the effects that it exerts in reducing the sequelae of diabetes such as high cholesterol levels, heart disease, high blood pressure, and complications of diabetes.<sup>vii</sup>

One of the key goals is to get the total fiber intake from foods to at least 50 grams. In one study the effects of two diets on blood sugar levels were compared.<sup>viii</sup> One diet contained 24 grams of dietary fiber as 8 g of soluble fiber and 16 g of insoluble fiber based upon the recommendations of the ADA while the other provided a total of 50 g as 25 g of soluble fiber and 25 g of insoluble fiber. Both diets had the same calorie level and percentages of

fat, carbohydrate, and protein. After 6 weeks, the average daily blood sugar levels were 13 mg per dl lower in the group on the higher fiber diet.

Furthermore, the high-fiber diet also lowered the total area under the curve for 24-hour blood sugar levels as well as insulin concentrations and reduced total cholesterol concentrations by 6.7%, triglyceride concentrations by 10.2%, and very-low-density lipoprotein cholesterol concentrations by 12.5%. This study shows quite clearly that a high intake of dietary fiber, particularly of the soluble type, above the level recommended by the ADA, improves glycemic control, decreases hyperinsulinemia, and lowers plasma lipid concentrations in patients with type 2 diabetes. Similar studies looking at a low GI diet versus a high GI diet have shown quite clearly the advantages of a low GI diet.<sup>ix,x</sup>

### **From our patient files**

Rick was a “meat and potatoes” kind of guy. He loved to fly fish, watch football, and drink beer with his buddies. He had also smoked since he was 14 and enjoyed a good cigar 2 or 3 times per week. The problem was that Rick was now so heavy that he couldn’t walk to his favorite fly fishing holes without ending up exhausted. That was compounded by the fact his fly fishing shoulder was now so stiff and painful that he couldn’t cast a line. “Can’t you just give me something for this shoulder so I can cast a fishing line doc?”

I wanted to look into things a bit deeper first. An X-ray showed that he had calcific tendonitis of the shoulder (a common accompaniment of diabetes). His fasting blood sugar was 220 mg/dl (12 mmol/L), confirming the diagnosis of diabetes. His cholesterol and triglycerides were elevated and his blood pressure was 140/95. His C-peptide level was elevated, confirming that he had elevated insulin levels and that he was in the earlier stages of type 2 diabetes. His hemoglobin A1c level was 8.5 indicating that his average blood sugar was about 200 mg/dl (11 mmol/L) over the past 3 months.

What Rick needed, more than a strong pain killer, was a good heart to heart talk with his doctor. I leveled with him. He needed to know that his diet and lifestyle was killing him and that he might be disabled or dead within ten years if he didn’t take the fork in the road that I was directing him to take. Rick was only thirty six, with three young children and a great job. The prospect of being disabled from work or not living to see his kids grow up was the wakeup call he needed. I had Rick in several times over the next few months for nutritional and lifestyle counseling, and to help him quit smoking. Since Rick’s wife did all the cooking, I made sure that she was there each time.

Rather than putting him on a strict diet that deprived him of enjoyment of food, I taught Rick and his wife about the principles of the low glycemic index / low glycemic load diet. I also gave them recipes to try, knowing that the average family gets most of their calories from seven to ten favorite recipes. Therefore, by helping them to discover ten new recipes that are low glycemic index, high fiber alternatives, along with acceptable snacks, Rick was able to cut way down on his daily calories, saturated fat and glycemic load with almost no discomfort. He also had to exercise discipline in his choices at

restaurants and in size of his portions with each meal, but with the appetite reducing supplements I prescribed, this was far easier than he imagined it could be.

After getting cleared to exercise by a treadmill test, Rick began to walk his dog every day, gradually increasing the time and pace and on the weekends he cycled or hiked to his favorite fishing holes with his wife. She had never shown an interest in his hobby before, but now that their future was at stake she gladly went along for the exercise. Once his diabetes was under good control, I began to help him with his shoulder, knowing that chronic pain problems are much easier to work with when diabetes is in good control.

A year later, Rick looked and felt like a new man! He had lost 43 pounds and he was amazed that he did this while enjoying the whole process. He learned a new way to eat and used the appetite reducing low glycemic load diet along with appetite reducing supplements and he lost weight without even feeling like he was dieting. I taught Rick to think of diabetes like a coach standing over his shoulder and telling him to be wise in his food choices and his decision to exercise.

His blood tests improved steadily over that year until, around the anniversary of our first visit I was pleased to let him know that, according to all of the tests, he was no longer a diabetic. I helped him to understand that he was like an alcoholic in recovery, who was now living in sobriety, and that the disease was always around the corner, waiting for an opportunity to take over his life again. Even though the diabetes was gone, he had to live this new and careful lifestyle for the rest of his life if he wanted to keep diabetes from raising its ugly head once again. The payoff in how he looked and felt made it all worth while.

### **Foundational supplements for individuals diabetes**

We feel there are three key dietary supplements that are critical to promote health and prevent disease.

1. A high-potency multiple vitamin and mineral formula.
2. Take a “greens” drink product.
3. Take a pharmaceutical grade fish oil supplement.

In addition to these items, we would recommend a total of 500 to 1,500 mg of vitamin C and 400 to 800 IU of vitamin E daily as part of a foundation for nutritional supplementation for people with diabetes. In Chapter 9, we will provide additional recommendations to greatly reduce appetite and improve glucose control with natural products while in Chapter 10 we give recommendations for supplements to deal with the major complications of diabetes.

*A high-potency multiple vitamin and mineral formula* is an absolute must for people with diabetes. Follow the guidelines given in Appendix 000 on pages 000-000 on how to select a high quality formula. The individual with diabetes has such an increased need for many nutrients that supplementation is an absolute must. Supplying the diabetic with

additional key nutrients has been shown to improve blood sugar control as well as help prevent or reduce the development of the major complications of diabetes. Taking a multiple vitamin and mineral supplement has also been shown to boost immune function and reduce infections in diabetics.<sup>xi</sup> Specific examples of nutrients that the diabetic needs more of include chromium, vitamin C, vitamin E, certain B vitamins, manganese, magnesium, potassium, and zinc. These nutrients will be discussed below and many will also be discussed in Chapters 9 and 10 as well. As you will see, supplementation with many of these nutrients not only leads to significant improvements in blood sugar control, but also in preventing complications.

### *Chromium*

The first nutrient to discuss is chromium, a trace element whose importance to human nutrition was not discovered until 1957. Chromium is vital to proper blood sugar control as it functions in the body as a key constituent what is referred to as the "glucose tolerance factor." Chromium works closely with insulin in facilitating the uptake of glucose into cells. Without chromium, insulin's action is blocked and glucose levels are elevated. There is evidence that marginal chromium status is quite common in the United States. A chromium deficiency may be an underlying contributing factor to the tremendous number of Americans that have diabetes, hypoglycemia, and are obese.

There have been over 20 clinical studies with chromium supplementation in diabetes. In some of these studies in type 2 diabetes, supplementing the diet with chromium has been shown to decrease fasting glucose levels, improve glucose tolerance, lower insulin levels, and decrease total cholesterol and triglyceride levels, while increasing HDL-cholesterol levels. Although there are also studies that have not shown chromium to exert much effect in improving glucose tolerance in diabetes, there is no argument that chromium is an important mineral in blood sugar metabolism. At this time, however, it appears that chromium supplementation is likely to produce meaningful improvements in glycemic control only in people who are deficient in this essential trace element.<sup>xii</sup>

Although there is no RDA for chromium, it appears that we need at least 200 mcg each day in our diet. People with diabetes need to supplement between 200-400 mcg per day. Chromium polynicotinate, chromium picolinate, and chromium-enriched yeast are suitable forms to supplement the diet with.

### *Vitamin C*

Since the transport of vitamin C into cells is enhanced by insulin,<sup>xiii</sup> many people with diabetes suffer from a relative deficiency of vitamin C inside their cells even if they consume an adequate amount of vitamin C in their diet. As a result, the individual with diabetes needs to take extra vitamin C.

In addition to its role as an antioxidant, vitamin C is required in immune functions and the manufacture of collagen, the main protein substance of human body. Since collagen is such an important protein for the structures that hold our body together (connective

tissue, cartilage, tendons, etc.), vitamin C is vital for wound repair, healthy gums, and the prevention easy bruising. A chronic, latent vitamin C deficiency leads to a number of problems for the diabetic including an increased tendency to bleed (increased capillary permeability), poor wound healing, elevations in cholesterol levels, and a depressed immune system. Vitamin C supplementation has shown to exert a mild effect in improving glucose control as evident by a slightly lower A<sub>1</sub>C in the vitamin C group (8.5%) compared to a placebo (9.3%) in one double-blind study.<sup>xiv</sup> Probably more important than any significant effect on improving blood sugar control is the fact that vitamin C supplementation has been shown to reduce the formation of compounds linked to the development of diabetic complications (this aspect will be discussed on pages 000-000).

In one of the most recent studies of vitamin C supplementation in type 2 diabetes, 30 patients, 45 to 70 years of age, who not only had type 2 diabetes but also high blood pressure were randomly assigned in a double-blind manner to take either a 500 mg vitamin C tablet or a placebo daily for 4 weeks. ascorbic acid daily by mouth or placebo. Vitamin C supplementation decreased systolic blood pressure from 142.1 to 132.3 mm Hg and diastolic pressure from 83.9 to 79.5. Additional analytical methods designed to measure vascular resistance also demonstrated significant improvements in arterial stiffness. These results indicate that vitamin C supplementation is effective in improving the elasticity and function of blood vessels in patients with type 2 diabetes.<sup>xv</sup>

While vitamin C supplementation is necessary, do not rely exclusively on supplements to meet all of your vitamin C requirements. Vitamin C rich foods are rich in compounds, like flavonoids and carotenes, which work to enhance the effects of vitamin C as well as exert favorable effects of their own. While most people think of citrus fruits as the best source of vitamin C, vegetables also contain high levels especially broccoli, peppers, potatoes, and Brussels sprouts.

### *Vitamin E*

Vitamin E functions primarily as an antioxidant in protecting against damage to the cell membranes. Without vitamin E, the cells of the body would be quite susceptible to damage. Nerve cells are particularly vulnerable. Vitamin E supplementation or a high vitamin E diet has been shown to exert a protective effect in many common health conditions including diabetes. Diabetics appear to have an increased requirement for vitamin E. Vitamin E not only improves insulin action, it exerts a number of beneficial effects when taken at dosages ranging from 400 to 800 IU that may aid in preventing the long-term complications of diabetes including:

- Prevention of free radical damage to LDL cholesterol and the vascular lining.<sup>xvi,xvii,xviii</sup>
- Improves the functioning of blood vessels and the cells that line the blood vessels.<sup>xix,xx</sup>
- Increases the concentration of magnesium within cells.<sup>xxi,xxii</sup>
- Decreases the level of C-reactive protein and other inflammatory

- compounds.<sup>xxiii,xxiv</sup>
- Increases the level of glutathione – an important intracellular antioxidant – within cells.<sup>xxv</sup>
  - Improves the rate of conduction of the electrical impulse through the nervous system.<sup>xxvi</sup>
  - Improves blood flow to the eye and improves diabetic retinopathy.
  - Improves kidney function and normalizes creatinine clearance – an indicator of kidney function – in diabetics with mild elevations.<sup>xxvii</sup>

Be sure that the vitamin E that you take is a natural form. Such forms are designated *d*-, as in d-alpha-tocopherol, while synthetic forms are *dl*-, as in dl-alpha-tocopherol. (The letters d and l indicate mirror images of the vitamin E molecule.) The human body recognizes and responds only to the *d*- form. The *dl*- form may actually prevent the *d*-form from entering cell membranes. The bottom line is use the natural form. Because of the way the body utilizes vitamin E, the individual with diabetes will require lifelong supplementation for maximum benefits.<sup>xxviii</sup>

### **Effects of tomato juice, vitamin E and vitamin C in type 2 diabetes**

Inflammation is an underlying factor in the progression of atherosclerosis and other complications of diabetes. Markers of inflammation and the potential for free radical damage include the measurement of circulating levels of C-reactive protein (CRP) and the susceptibility of LDL cholesterol to oxidation. These measurements were determined in 57 patients with type 2 diabetes after they were randomized to receive either tomato juice (500 ml/day), vitamin E (800 U/day), vitamin C (500 mg/day), or a placebo for 4 weeks.<sup>xxix</sup> Both the vitamin E and tomato juice groups demonstrated considerable protection against free radical damage to LDL, but only vitamin E reduced CRP. These findings highlight the importance of fat soluble antioxidants like carotenes and vitamin E in the prevention of heart disease in patients with diabetes.

[END BOX]

### *Niacin and Niacinamide*

Niacin (vitamin B<sub>3</sub>) containing enzymes play an important role in energy production; fat, cholesterol, and carbohydrate metabolism; and the manufacture of many body compounds including sex and adrenal hormones. Niacin, like chromium, is an essential component of the glucose tolerance factor making it a key nutrient for hypoglycemia and diabetes.

Supplementing the diet of individuals with vitamin B<sub>3</sub> in the form of niacinamide has been shown to exert many favorable effects. Foremost is its possible application in reversing recently diagnosed type 1 diabetes. This effect is discussed in more detail in Chapter 9.

### *Vitamin B6*



Pyridoxine or vitamin B6 is an extremely important B vitamin involved in the formation of body proteins and structural compounds, chemical transmitters in the nervous system, red blood cells, and hormone-like compounds known as prostaglandins. Vitamin B6 is also critical in maintaining hormonal balance and proper immune function.

Vitamin B6 supplementation appears to offer significant protection against the development of diabetic nerve disease (neuropathy).<sup>xxx</sup> Diabetics with neuropathy have been shown to be deficient in vitamin B6 and benefit from supplementation.<sup>xxxii</sup> The neuropathy of a vitamin B6 deficiency is indistinguishable from diabetic neuropathy. Individuals with long standing diabetes or who are developing signs of peripheral nerve abnormalities should definitely supplement their diets with vitamin B6. Vitamin B6 is also important in preventing other diabetic complications.

Vitamin B6 supplementation can be a very safe and effective treatment for gestational diabetes (diabetes caused by pregnancy). In one study of 14 women with gestational diabetes were given 100 mg of vitamin B6 each day for two weeks resulted in eliminating the diagnosis in 12 out of the 14 women.<sup>xxxiii</sup>

### *Magnesium*

Like manganese and chromium, magnesium is also involved in glucose metabolism. There is considerable evidence that diabetics should take supplemental magnesium. The reasons: over half of all people with diabetes show evidence of magnesium deficiency and magnesium may prevent some of the complications of diabetes like retinopathy and heart disease. Magnesium levels are usually low in diabetics and lowest in those with diabetic complications like retinopathy and neuropathy. Clinical studies have shown magnesium supplementation (usually 400 to 500 mg per day) improves insulin response and action, glucose tolerance, and the fluidity of the red blood cell membrane in patients with diabetes.<sup>xxxiii,xxxiv</sup>

The RDA for magnesium is 350 mg per day for adult males and 300 mg per day for adult females. The diabetic may need twice this amount because they tend to lose excessive magnesium through their kidneys.<sup>xxxv</sup> Most of the magnesium should be derived from the diet. The average intake of magnesium by healthy adults in the U.S. ranges between 143 and 266 mg per day. This is obviously far below the RDA. Food choices are the main reason. While magnesium occurs abundantly in whole foods, food processing refines out a very large portion of magnesium. The best dietary sources of magnesium are tofu, legumes, seeds, nuts, whole grains, and green leafy vegetables. Fish, meat, milk, and most commonly eaten fruit are quite low in magnesium. Most Americans consume a low magnesium diet because their diet is high in refined foods, meat, and dairy products.

In addition to eating a diet rich in magnesium, the diabetic should supplement their diet with 300-500 mg of magnesium. For best results, use highly absorbable sources of magnesium like magnesium aspartate or citrate. Also, diabetics should be sure to get at least 25 mg of vitamin B6 per day as the level of vitamin B6 inside the cells of the body appear to be intricately linked to the magnesium content of the cell. In other words

without vitamin B6 (as well as vitamin E), magnesium will not get inside the cell and will, therefore, be useless.

### *Zinc*

Zinc functions in more enzymatic reactions than any other mineral as it is a cofactor in over 200 different enzymes. Although severe zinc deficiency is very rare in developed countries, many individuals in the United States have marginal zinc deficiency. This occurrence is particularly true in the elderly population as well as in people with diabetes. Low levels of zinc in the body is associated with an increased susceptibility to infection, poor wound healing, a decreased sense of taste or smell, or skin disorders. Zinc deficiency, like chromium deficiency, has also been suggested to play a role in the development of diabetes.<sup>xxxvi</sup>

Zinc is involved in virtually all aspects of insulin metabolism: synthesis, secretion and utilization. Zinc also has a protective effect against beta-cell destruction, and has well-known anti-viral effects. Diabetics typically excrete too much zinc in the urine and therefore require supplementation. Diabetics should take at least 30 mg of zinc per day. Zinc is also found in good amounts in whole grains, legumes, nuts, and seeds.

### *Manganese*

Manganese functions in many enzyme systems including enzymes involved in blood sugar control, energy metabolism, and thyroid hormone function. Manganese also functions in the antioxidant enzyme superoxide dismutase or SOD. In guinea pigs, a deficiency of manganese results in diabetes and the frequent birth of offspring who develop pancreatic abnormalities or no pancreas at all. Diabetics have been shown to have only one-half the manganese of normal individuals. A good daily dose of manganese for a diabetic is 3-5 mg.

### *Green Drinks*

We introduced the term “green drinks” in previous chapters to refer to green tea and a number of commercially available products containing dehydrated barley grass, wheat grass, or algae sources such as chlorella or spirulina. Such formulas are rehydrated by mixing with water or juice. These products—packed full of phytochemicals, especially carotenes and chlorophyll—are more convenient than trying to sprout and grow your own source of greens. An added advantage is that they tend to taste better than, for example, straight wheatgrass juice. Some of the more popular brands are Enriching Greens, Green Magma, Greens +, Barlean’s Greens, and ProGreens. Of these, Enriching Greens is the one that we rate the highest.

Green foods such as young barley grass, wheat grass, spirulina, and chlorella are exceptionally high in nutritional value. Given their rich source of antioxidants, they are very important supplements for the diabetic. In addition, they may also help improve blood sugar control based upon the results of a study with spirulina.<sup>xxxvii</sup> In the study,

two months of spirulina supplementation (2 g/day) produced an appreciable lowering of fasting blood glucose (27% decline) and a significant reduction in the A<sub>1</sub>C levels (34% decline) clearly indicating improvements in long-term blood sugar regulation. Triglycerides declined by 22% and total cholesterol dropped 11%.

In another study, 36 type 2 diabetic patients received one of the following supplements daily for 4 weeks: 15 g barley leaf extract, 200 mg vitamin C and 200 mg vitamin E, or barley leaf plus vitamins C and E.<sup>xxxviii</sup> The results indicated that the ingestion of the barley leaf extract along with the vitamins produced the greatest antioxidant protection compared to either barley leaf extract or vitamins C and E alone. Antioxidant protection was measured by looking at the effect that the supplements had on protecting different fractions of LDL cholesterol from oxidative damage.

While these studies used spirulina and barley leaf, we believe that using any of the popular brands listed above will likely produce similar results. We recommend drinking one to two servings daily. Try to consume these drinks 20 minutes before or two hours following a meal.

#### *Pharmaceutical grade fish oil supplements*

The benefits of the omega-3 oils from fish oils have been described previously. We use the term “pharmaceutical grade” to signify a high potency fish oil product that is also free from heavy metals, environmental contaminants, lipid peroxides, and other harmful compounds. The specific product that we recommend is RxOmega-3 Factors from Natural Factors because we know first hand the quality control steps employed to insure the product is free contaminants. Each capsule provides 600 mg of long-chain omega-3 fatty acids (400 mg EPA/200 mg DHA). We recommend one capsule daily for general health and two capsules daily for people with diabetes.

Two intensive investigations, one conducted at Oxford University and the other at the Mayo Clinic, analyzed data from 18 double-blind clinical trial involving 823 participants followed for an average of 12 weeks.<sup>xxxix, xl</sup> Doses of fish oil (18% EPA and 12% DHA content) ranged from 3 to 18 g/day. Both evaluations came to the same conclusions. Although fish oil supplementation has no statistically significant effect on glycemic control, it does appear to offer the same protection against heart disease in people with diabetes that it does to people without diabetes.<sup>xli</sup> It is important to point out that many of the studies in patients with diabetes were conducted with lower quality fish oil products that contained significant amounts of cholesterol and lipid peroxides, as a result in some of these studies there was an elevation in LDL cholesterol noted. This occurrence highlights the importance of using a pharmaceutical grade fish oil product as we have not seen increases in LDL cholesterol with these higher quality products.

Fish oil supplements are best taken at or near the beginning of a meal to avoid any fishy aftertaste – some people experience burping up a little of the oil if they take it at the end of the meal on a full stomach.

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