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Real Life Stories of People Who Have Challenged Life-Threatening Illnesses and Won

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and PATH Medical Clinic

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High Blood Sugar

Integrative Strategies for Supporting Healthy Metabolism

By Bruce Scali

According to the American Diabetes Association, more than 5 million of the 20 million Americans who have diabetes have not yet been diagnosed with the disease. A condition of elevated blood sugar, diabetes is the sixth leading cause of death in the United States. If current trends continue, diabetes and its complications will be America's leading cause of death by 2010, surpassing both cancer and heart disease.

Diabetes is fast becoming a global epidemic. In the US alone, more than 1 million new cases are diagnosed each year, with associated health costs that exceed $100 billion.[1] Worldwide, diabetes cases are expected to grow from the 135 million people who were diagnosed in 1995 to at least 300 million by 2025, with a 42 percent increase in industrialized countries and a stunning 170 percent increase in developing nations.[2,3] Life expectancy is typically four to eight years lower for diabetics than for non-diabetics.[4] The American Diabetes Association reports that the risk of death for diabetics is two times that for non-diabetics.

What Is Diabetes?

After eating carbohydrate-dense foods like white rice, white bread, and potatoes, the body breaks down these starchy foods into the simple sugar,

glucose. Glucose serves as the primary energy source for the human body. The hormone insulin transports glucose into the cells where it can be used as fuel. When the body does not produce enough insulin, or if the cells do not respond to the insulin that the body produces, glucose builds up in the blood, a condition called *hyperglycemia,* or high blood sugar. This metabolic defect produces free radicals as well as advanced glycation end products,[5] which are formed when a sugar molecule attaches to a free amino acid to create a nonfunctioning structure in the body. High blood sugar that leads to oxidation and glycation is associated with serious complications such as heart disease, stroke, kidney disease, nerve damage, blindness, and vascular problems that can necessitate an amputation.[5,6]

While a definitive cause for diabetes has not been identified, genetic predisposition, environmental factors such as viruses and chemicals, and nutritional and other lifestyle factors may contribute to its incidence. Sedentary lifestyles and modern diets that are rich in refined starches (white bread, pasta, white rice) and sugars (sodas, breakfast cereals, candy) account for much of the explosive growth in diabetes cases.

Types of Diabetes

Diabetes exists in several forms.

- *Type I diabetes* was previously known as *insulin-dependent diabetes mellitus* or *juvenile-onset diabetes.* This is an autoimmune condition characterized by the body attacking insulin-producing cells in the pancreas. The result is an inability to produce insulin, necessitating insulin injections. Type I diabetes usually presents in people under the age of 20, and accounts for less than 10% of all diabetes cases.

- *Type II diabetes,* formerly known as *non-insulin-dependent diabetes mellitus,* usually presents in those older than 40 and is characterized by a metabolic inability of cells to process glucose because of a loss of sensitivity to insulin. In response to the buildup of unused glucose, the pancreas produces more insulin. When cells do not get the energy they need, the liver produces more glucose. As this cycle perpetuates, the body is flooded with glucose and insulin. Over time, pancreatic insulin production shuts down, and a type II

diabetic could become insulin dependent. Environmental, lifestyle, and genetic factors are strongly associated with type II diabetes.

- *Gestational diabetes* can occur in women during pregnancy, and usually disappears after childbirth.
- *Secondary diabetes* can result from chronic or recurrent conditions such as pancreatitis, or from an adverse effect of some medications, particularly antipsychotic drugs such as clozapine and olanzapine.[7,8]

Diagnosing Diabetes

Diabetes is definitively confirmed by measuring blood glucose levels after an overnight fast (fasting plasma glucose) and after ingesting a 75-gram glucose load (oral glucose tolerance test, or OGTT). These two tests measure the body's ability to metabolize glucose. The hemoglobin A1C (HbAlc) test measures glycated hemoglobin in red blood cells and is used to measure average glucose levels over a three-month period. Although not a diagnostic test, the hemoglobin A1C measurement assesses the efficacy of treatment methods over an extended period of time.

Diabetic laboratory parameters are as follows:

- *Fasting glucose:* >125 mg/dL (milligrams per deciliter) on at least two occasions.
- *Oral glucose tolerance test:* >200 mg/dL at two hours.

Common symptoms of diabetes include frequent urination, excessive thirst, extreme hunger, unusual weight loss, increased fatigue, irritability, and blurred vision. Anyone experiencing these symptoms should consult a physician for examination and assessment.

Pre-Diabetes

Many millions of people are at risk for developing diabetes and are beginning to experience the changes in physiology that occur with the disease. These individuals display an impaired fasting glucose of 100-125 mg/dL, alone or in combination with an impaired glucose tolerance of 140-199 mg/dL. More than 40 million US adults between the ages of 40 and 74 are pre-diabetic, according to the American Diabetes Association.

A number of risk factors are associated with type II diabetes. These include obesity, physical inactivity, dyslipidemia (elevated triglycerides and low levels of high-density lipoprotein, or HDL), hypertension, low testosterone (in young and middle-aged men), and family history of the disease.[9-12] These risk factors are noteworthy because studies have shown that modifying several of them can help with the management of diabetes.[13,14] For example, one study involving overweight patients concluded, "The risk of type II diabetes could be reduced by 58 percent...with changes in lifestyle of high-risk overweight subjects with impaired glucose tolerance."[15] Another stated, "All four main studies of lifestyle intervention on diabetes incidence found a direct benefit for diet and exercise intervention compared with usual care."[16]

Insulin Resistance and Syndrome X

As noted earlier, cellular resistance to insulin results in increased pancreatic insulin production. Excess insulin in the bloodstream, called *hyperinsulinemia,* is often a prelude to diabetes.[17] In 1988, Gerald Reaven, M.D., an authority on insulin resistance, coined the phrase "Syndrome X," also known as metabolic syndrome, to identify a cluster of metabolic disorder symptoms that often accompany abnormal blood glucose levels: *hyperlipidemia,* or elevated low-density lipoprotein (LDL), cholesterol, and triglycerides; abdominal obesity; hypertension; and hyperinsulinemia.

An estimated one in four individuals who have hyperinsulinemia will progress to type II diabetes.[18] Considering that other Syndrome X symptoms also have been correlated with diabetes, it is clear that anyone with this metabolic disorder is at high risk for becoming one of the millions of future diabetics.[19]

The common thread in both diabetes and Syndrome X is glucose, both its level and absorption. The key to treatment, then, is how to prevent an overload of glucose in the blood, and how to support insulin's action in the body.

Lifestyle Changes

The American Diabetes Association and diabetes specialists agree that the first line of defense against the disease is a lifestyle-modification program. Anyone with high blood sugar can incorporate lifestyle changes, a proper

diet, and well-chosen nutritional supplements in a comprehensive program to help control blood sugar and improve health.

Losing weight and eating properly are the first lines of defense against high blood sugar. According to a major study, "Obesity is considered the most important risk factor for type II diabetes."[20] Studies have shown that losing as little as 1.5% of body weight can improve diabetic parameters, and that those who lost 15% of their body weight were able to discontinue oral medications. The link between obesity and diabetes is irrefutable.[21-23] Other lifestyle factors also have a major impact.

Regular exercise is as important for diabetes management as it is for general health. As little as 30 minutes of walking a day can dramatically improve glucose control.[24-26] Smoking appears to increase the risk of developing type II diabetes.[27,28] Smoking by diabetics also increases their risk of complications affecting the eyes and kidneys.[29] Moderate alcohol consumption can improve insulin sensitivity and also has a positive effect on C-reactive protein, a cardio-vascular risk factor.[30-32] Finally, stress contributes to obesity and initiates harmful hormone responses to the body's sudden demand for energy: adrenaline breaks down glycogen into glucose, and Cortisol inhibits insulin action, exacerbating hyperglycemia. Thus, stress avoidance may help with glucose control.[33]

Table 1: Glycemic Index of Common Foods			
Baked potato	95	White pasta	55
White bread	95	Unsweetened juice	40
White rice	95	Rye bread	40
Mashed potatoes	90	Lentils	30
Chocolate bar	70	Soy	15
Corn	70	Green vegetables	<15
Boiled potatoes	70	Tomato	<15
Banana	60		

Proper Diet

Carbohydrate-rich food must be digested and converted to the simple sugar glucose for use by the body as energy. The primary components in any diet are