THE NEW SCIENCE OF APPETITE CONTROL

REACH YOUR **IDEAL BODY WEIGHT** ALMOST *EFFORTLESSLY!*

HUNGER FREE FOREVER

TAME YOUR APPETITE AND TUNE YOUR METABOLISM FOR LIFELONG WEIGHT CONTROL

MICHAEL T. MURRAY, N.D., AND MICHAEL R. LYON, M.D.

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Restore Blood Sugar Stability

Using breakthrough technology, we have discovered that one of the absolute keys to achieving effective weight loss and long term weight control is to maintain glucose or blood sugar levels within a very narrow range. The notion that optimal blood sugar control plays an important role in the regulation of appetite is not new. What is new is that we were the first to conduct landmark research demonstrating that frequent and rapid swings in blood sugar underlies the magnified appetite and frequent food cravings so typical of individuals who are struggling with their weight. We refer to this unstable state of blood sugar control as increased glycemic (blood sugar) volatility.

We have seen clearly that increased glycemic volatility is an abnormality that can be demonstrated in almost every person with a weight problem and it is highly correlated to their inability to lose weight and keep it off. In contrast, our program utilizes a combination of therapeutic products and dietary changes that brings about a rapid reduction in glycemic volatility and a marked stabilization in blood sugar. We will continue to state repeatedly throughout the book that reducing blood sugar volatility and improving the action of insulin is one of the key reasons our program is so successful in achieving effective and permanent weight loss. When blood sugar is highly stable around the clock, appetite is reduced and undesirable food cravings are remarkably diminished, making weight loss and long term weight maintenance well with the reach of most people.

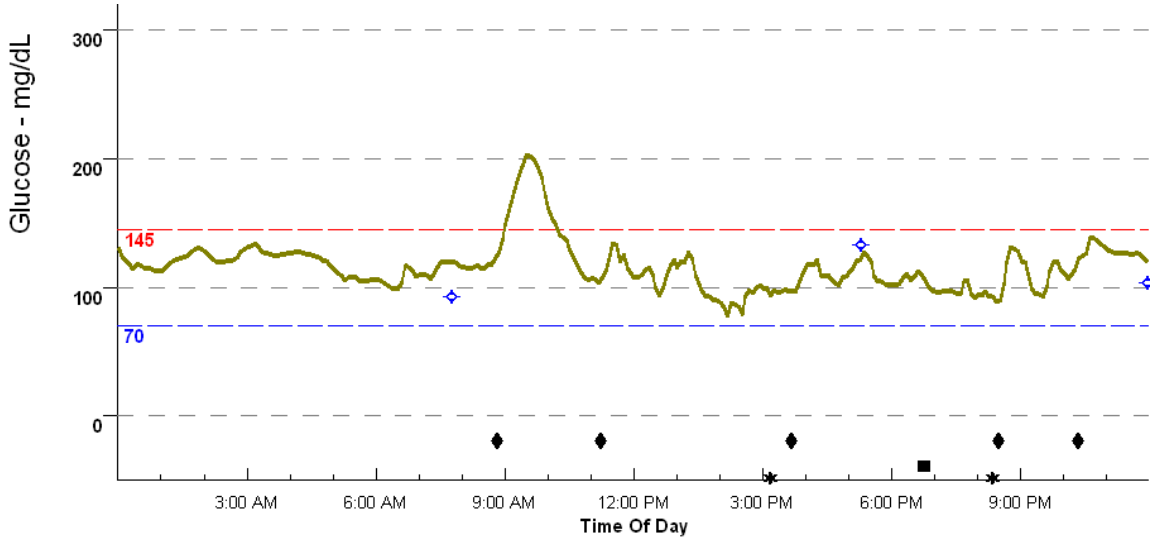

Figure 3.1 - Overweight Adult Before Weight Loss Demonstrating Elevated Blood Sugar (Glycemic) Volatility.

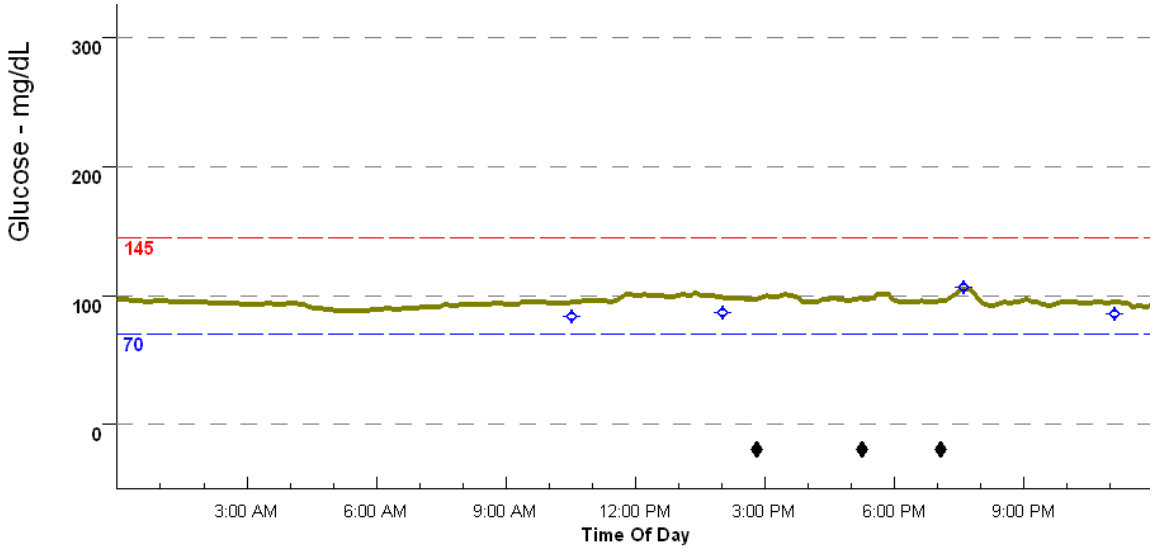

Figure 3.2 - Healthy (non-volatile) 24 hour continuous blood sugar in an overweight adult 4 weeks into the Hunger Free Forever Program.

A GLUCOSE PRIMER

While fat is the preferred energy source in most tissues, the brain is critically dependent upon glucose as its energy source. If blood glucose levels were to drop below a certain minimum value, death

would occur in a few seconds. Therefore, there are a lot of very sophisticated feedback and control mechanisms that ensure the brain has a constant steady supply of glucose to prevent you from simply running out of glucose and falling over dead.

The majority of glucose in the body is derived from dietary carbohydrates. There are two groups of carbohydrates, simple and complex. Simple carbohydrates, or sugars, are naturally found in sugars in fruits and vegetables, but most of the simple sugars consumed in developed countries are in the form of refined sugar like sucrose (white sugar). Complex carbohydrates include starch and other larger carbohydrate molecules.

When high sugar, or low fiber, starchy foods are eaten in excess, blood sugar levels rise quickly, producing a strain on blood sugar control. The body responds to the rise in blood glucose levels after meals by secreting insulin - a hormone produced by the beta cells of the pancreas – a small gland that resides at the base of the stomach. Insulin lowers blood glucose by increasing the rate that glucose is taken up by cells throughout the body. Declines in blood glucose, as occur during fasting or exercise, cause the release of glucagon - another hormone produced by the pancreas. Glucagon stimulates the release of glucose stored in the muscles and liver as glycogen. If blood sugar levels fall sharply or if a person is angry or frightened, it may result in the release of epinephrine (adrenalin) and corticosteroids (cortisol) by the adrenal glands. These hormones provide quicker breakdown of stored glucose for extra energy during a crisis or increased need.

Ideally, these mechanisms are effective in keeping blood sugar levels within a very narrow range. Unfortunately, a great deal of Americans stress these control mechanisms through diet and lifestyle. As a result, obesity, diabetes and other disorders of blood sugar regulation are among the most common disease of modern society.

THE IMPORTANCE OF CARBOHYDRATES IN WEIGHT MANAGEMENT

Low–carb and no-carb diets have enjoyed tremendous popularity as a weight loss strategy. And, often they can produce quick and

dramatic results. But, those short-term benefits are outweighed by rebound weight gain. When the body is starved for carbohydrates, it will initially derive glucose by breaking down the storage form of glucose (glycogen) stored in the muscles and liver and releasing it into the bloodstream as glucose. If you were completely without food, i.e., starving, there is enough glycogen stored in your muscles and liver to supply your bloodstream with glucose for about two days (much less if you are exercising during starvation). If starvation continues after this stored glycogen is gone, the body will sacrifice tissues and organs containing protein, and that protein is broken down into glucose by the liver so that blood glucose never goes below the level required to sustain life. In addition, the brain switches gears a bit and is able to burn not only glucose for energy, but also compounds known as ketones. This energy source is produced in the liver from fatty acids. Ketones have a strong, characteristic odor and are the reason many people following a low-carb diet experience bad breath similar to the breath of alcohol intoxication.

Is ketosis necessary for weight loss? Absolutely not, and while ketosis is usually not dangerous (though it can be life-threatening if severe, especially in a diabetic) it is certainly not a particularly healthful state. In addition, one of the major problems with a low-carb diet or even a very low calorie diet as we see it is that they inevitably produce a loss of significant amounts of muscle mass. The muscle is sacrificed in order to provide the dieter with a constant supply of blood sugar. In fact, if you lose weight through fasting or other forms of severe dieting, a significant proportion of the weight loss will be in the form of water (each molecule of glycogen binds six molecules) and muscle mass. This sort of weight loss will significantly lower your metabolic rate and reduce the primary fat burning furnace in the body – lean muscle mass – thereby setting you up for serious weight gain later on.

Insulin and Blood Sugar Control

Proper blood sugar control is dependent upon the action of insulin. You can think of insulin like a key that opens the door of the cell letting glucose in to feed the cell. Around the clock, the pancreas secretes a small amount of insulin that allows necessary amounts of glucose to enter into cells to keep them alive and energized. After a meal, as the bloodstream becomes flooded with glucose, a large pulse of insulin is released from the pancreas, resulting in a significant increase in the uptake of glucose into muscles and other organs. In this way the sugar in the blood is quickly transferred to organs, energizing them and keeping blood sugar from rising too high.

Unfortunately, when you start gaining weight, particularly when you gain internal belly fat (visceral adipose tissue), substances are secreted from the visceral adipose tissue that promote insulin resistance, a condition in which insulin is released but it no longer works as effectively as it should. Insulin, as a molecule, is still the same, but the cells throughout the body lose some of their ability to sense and respond properly to insulin.

Because elevated blood sugar is so harmful, the body works hard to keep blood sugar normal as insulin resistance develops. It does this by releasing higher than normal amounts of insulin around the clock and particularly after meals. In fact, if insulin levels did not rise substantially as insulin resistance developed, diabetes would inevitably occur in the early stages of insulin resistance. In most cases, these high levels of insulin fend off diabetes for some time but have several implications for those who are now living with a weight problem.

Glucose: A Double-Edged Sword

We have stressed the importance of glucose in supplying energy to the brain and the fact that if blood sugar levels drop too low, you die. The same is true if blood sugar levels go too high, though it is a longer more insidious death. Because glucose is fuel for your body, in many ways it is like gasoline for your car. If you run out of glucose, your body will "quit" just like when your car runs out of gas. Likewise,

whenever your blood glucose levels are elevated it creates a toxic mess like it would if you spilled gasoline when you are filling your car. In optimal health, the body maintains very tight control over blood glucose levels and it works very hard to keep those levels within a very narrow range.

When blood glucose levels surge too high, excessive glucose cannot be readily taken up by cells and it begins to bind to various body proteins and other molecules, changing their structure and creating physiological chaos. These “sugar coated molecules” are called advanced glycosylated end products and their accumulation is considered to be one of the principle factors that lead to accelerated aging and, eventually, death as excessive glycosylation has many adverse effects: inactivation of enzymes, inhibition of regulatory molecule binding, and the formation of abnormal protein structures to name a few. Of course diabetes is characterized by persistent and repeated elevations in blood glucose and glycosylated proteins. As a result, it provides the grave example of the damage that can be produced when blood sugar levels get too high and there is excessive glycosylation.

Major Complications of Diabetes

- Heart disease and stroke- Adults with diabetes have death rates from cardiovascular disease about 2 to 4 times higher than adults without diabetes.
- High blood pressure - About 75% of adults with diabetes have high blood pressure.
- Blindness - Diabetes is the leading cause of blindness among adults.
- Kidney disease - Diabetes is the leading reason why people need to go on dialysis accounting for 43% of new cases.
- Nervous system disease - About 60% to 70% of people with diabetes have mild to severe forms of nervous system damage. Severe forms of diabetic nerve disease are a major contributing cause of lower-extremity amputations.
- Amputations - More than 60% of lower-limb amputations in the United States occur among people with diabetes.

- Periodontal disease - Almost one third of people with diabetes have severe periodontal (gum) disease.
- Pain – Many diabetics fall victim to chronic pain due to conditions such as arthritis, neuropathy, circulatory insufficiency or muscle pain (fibromyalgia).
- Depression – Is a common accompaniment of diabetes. Clinical depression can often begin to occur even years before diabetes is fully evident. As well, depression is difficult to treat in poorly controlled diabetics.
- Autoimmune disorders – thyroid disease, inflammatory arthritis and other diseases of the immune system commonly add to the suffering of diabetes.

THE PROBLEM IS NOT A LACK OF INSULIN

At our clinic we measure insulin levels in most of our weight loss patients and we commonly discover their fasting insulin levels to be two to three times the normal value even in many who are only modestly overweight. Even though fasting blood sugar levels or glucose tolerance tests are "normal" in many of these people, we consider those with evidence of insulin resistance to be "diabetics in training". Research suggests that many of these individuals will eventually become diabetics, when their pancreas finally tires and is unable to produce the massive amount of insulin required to keep their blood sugar out of the diabetic range in the face of insulin resistance. Moreover, we now realize that insulin resistance, even if diabetes never develops, brings with it a whole host of serious health problems. Restoring insulin sensitivity is the only real answer to this dilemma and one of the principle goals of our program.

Our program is especially beneficial if you have type 2 diabetes. While in type 1 diabetes there is insufficient insulin production requiring daily insulin therapy, in type 2 diabetes insulin levels are typically initially elevated indicating a loss of sensitivity to insulin by the cells of the body. Roughly 90% of the 18 million American with diabetes have type 2 diabetes. Type 2 diabetes is intricately linked to obesity, in particular, increased visceral adipose tissue (belly fat).

ARE YOU A DIABETIC IN TRAINING?

Pre-diabetes, also called “impaired glucose tolerance”, is a condition that occurs when a person's blood glucose levels are higher than normal but not high enough for a diagnosis of type 2 diabetes. There are almost as many people in the United States with pre-diabetes (about 16 million) as there are diabetics. Although many of these people are reassured by their doctors or told that they just have “a touch of diabetes”, research increasingly indicates that impaired glucose tolerance, even if diabetes never fully manifests, is accompanied by serious health risks and it should be treated carefully.

Many people with impaired glucose tolerance fulfill other criteria of what is known as the metabolic syndrome. This condition, originally referred to as syndrome X by Stanford University endocrinologist Gerald Reaven, MD, refers to a cluster of metabolic risk factors that includes:

- Central obesity (excessive fat tissue in and around the abdomen) as demonstrated by a greater waist to hip circumference, i.e., a greater waist-to-hip ratio.
- Low levels of HDL cholesterol:
  - Men - Less than 40 mg/dl
  - Women - Less than 50 mg/dl
- Fasting blood triglycerides greater than or equal to 150 mg/dl
- Elevated blood pressure (130/85 mmHg or higher)
- Insulin resistance (the body can’t properly use insulin or blood glucose) as demonstrated by the presence of pre-diabetes (glucose levels between 101 and 125 mg/dl)

The metabolic syndrome is a serious health issue because people who have it are at increased risk for coronary artery disease, other diseases related to plaque buildup in artery walls (e.g., stroke and

peripheral vascular disease), and type 2 diabetes. The presence of four or more of the above criteria is associated with a 2.5 times greater risk of having a heart attack or stroke and a nearly 25 times greater risk of developing diabetes.

It is estimated that about 60 million adults in the US meet the criteria for the metabolic syndrome. The metabolic syndrome — as well as type 2 diabetes, pre-diabetes, and obesity — can be viewed as different facets of the same disease, having the same underlying dietary, lifestyle, and genetic causes. These risk factors are detailed in Chapter 4. The bottom line is that the human body was simply not designed to handle the amount of refined sugar, white flour, salt, saturated fat, and other harmful food components that many people in the United States and other "Western" countries -- especially those who live a sedentary lifestyle -- consume. The result is the emergence of a metabolic syndrome, and type 2 diabetes with all of their accompanying health risks.

Insulin Resistance, Weight Gain and Appetite

Insulin itself is classified as an anabolic hormone. That means that it promotes growth of both muscle and fat in those who are insulin sensitive. Unfortunately, when insulin resistance develops, insulin continues to stimulate the growth of fat but has it has little effect on muscle. Those who develop insulin resistance and its accompanying elevated insulin levels (hyperinsulinemia), now have a hormonal tendency to deposit fat and lose muscle mass. In essence, when you are insulin resistant, your muscles are starved and your fat cells are overfed. Because of this, it is very difficult for fat to be burned efficiently when you are in an insulin resistant state. Unless insulin sensitivity is restored, weight loss through dieting is an uphill battle at best and is impossible for most people.

It used to be thought that the brain was not affected by insulin. This belief was based upon false assumptions that there were no insulin receptors in the brain. However, insulin receptors have now been discovered in nearly every region of the brain, especially those regions in charge of controlling appetite. In insulin-sensitive people, a rise of insulin after meals results in a promotion of satiety through its

action in the brain. However, in those with insulin resistance, even the excessive insulin levels experienced after meals no longer result in a significant sense of satiety.

In normal individuals, it has been shown that regions of the brain responsible for appetite regulation respond to after meal elevations in insulin by significantly increasing their intake of glucose, and, subsequently, the metabolic activity in these regions. In particular, the brain regions most responsible for appetite like the hypothalamus readily respond to insulin. This reaction to insulin results in a decrease in appetite and a sense of satiety. In contrast, those with insulin resistance have been shown to lack this increase in metabolic activity in these important brain regions following a significant rise in insulin levels. We now know that the brain becomes insulin resistant along with the rest of the body and that this insulin resistance plays an important role in the loss of after meal satiety that accompanies weight gain. Think of the appetite control center having an off button for appetite that will only respond to insulin. With insulin resistance the appetite never really gets shut down.

Insulin Resistance and Blood Sugar Control

Obviously, one of the key abnormalities in insulin resistant individuals is their loss of precise control over blood sugar. To a large extent because of their frequently increased blood sugar levels, these “diabetics in training” experience the same kinds of accelerated aging and tissue damage that occurs in diabetics but just at a slower pace. Cardiovascular disease, high blood pressure, liver disease and kidney damage are just a few of the many complications that can arise from pre-diabetes. Importantly, for those who want to lose weight, this loss of precision control over blood sugar results in a significant increase in appetite.

When blood sugar surges after a meal in those with insulin resistance, it is accompanied by a massive release of insulin. This insulin eventually does activate insulin receptors to open up cells to glucose and this glucose surge is usually followed by a rapid drop in blood sugar. As blood sugar plummets, the brain, pancreas and liver sense this rapid drop and an emergency is declared since extremely low blood sugar is potentially deadly. To prevent severe low blood

sugar (hypoglycemia), hormones such as glucagon, epinephrine (adrenalin) and cortisol are released, all of which promote the release of stored glycogen from the liver and muscles, and result in the synthesis of glucose from dietary or body protein. Most importantly, those with insulin resistance will experience food cravings as their blood sugar begins to drop. In essence, the brain is alarmed by any rapid drop in blood sugar so it does everything it can to get you to reach for a quick sugar fix.

It has been known since the 1950's that a sudden decrease in blood sugar over a short period of time is a primary trigger that results in a desire for food and, in many cases, the initiation of eating if food is readily available. Several experiments on both animals and humans support this so called "glucostatic theory" of appetite control. Although we know that the control of appetite is influenced by a whole orchestra of hormones, peptides and neurotransmitters, glucose can still be considered as a lead player and perhaps the conductor of this orchestra. Currently, we know that rapid and deep drops in blood sugar are particularly associated with very strong, and in some cases irresistible urges to eat.

Do You Experience Symptoms of Hypoglycemia?

Great controversy has arisen over the concept of hypoglycemia (hypo=low; glycemia=blood sugar). It is well recognized that diabetics on insulin or certain oral medications can experience episodes of low blood sugar or hypoglycemia. However, the medical profession has resisted the notion that people without diabetes can experience significant hypoglycemia except in rare cases of insulin producing tumors of the pancreas or medical conditions such as alcoholism. Many non-diabetics indeed experience symptoms suggestive of hypoglycemia when, one to three hours after meals, they begin to feel weak, shaky, and dizzy and, during such an episode, they often experience strong food cravings, especially for sweets. Many of the same people know that if they eat something, particularly high carbohydrate foods, when they experience these symptoms that the symptoms usually improve or resolve within a few minutes. Many have also learned that if they avoid sugary or starchy foods and eat meals high in protein along with frequent high-protein snacks they

can reduce or avoid these symptoms significantly. All of this does, indeed sound like hypoglycemia, however, when their blood sugar is checked during these episodes is uncommon for it to be in the significantly or dangerously hypoglycemic range. Although many of these people have accepted the concept that they suffer from hypoglycemia and many even refer to themselves "hypoglycemics", they seldom find a medical doctor that will support this diagnosis.

From our research, using continuous blood glucose monitors in our patients, we believe that most of these individuals actually experience rapidly dropping blood sugar with or without mild to moderate hypoglycemia and that this is a direct result of insulin resistance and a loss of precise control over blood sugar. In people who are prone to such symptoms, these uncomfortable experiences occur more frequently and of a greater magnitude when they eat foods that have a high glycemic impact.

Elevated Glycemic Volatility

Even if their blood sugar never drops below normal, we have found many individuals experience blood sugar surges after meals followed by rapidly dropping blood sugar. It is during the time the blood sugar is dropping rapidly over a short period of time that hormones like adrenaline and cortisol are released, creating the typical weakness, agitation and shakiness. Hunger pangs and brain fog that accompany such experiences probably results from decreased brain metabolism as well as glucosensory brain receptors that detect this rapidly dropping glucose and then respond by sending out strong signals that it is time to eat. Hypoglycemia is simply not the best term to describe this condition, since most often blood sugar levels do not go below normal values. Instead, we call this condition of rapidly fluctuating blood sugar “elevated glycemic volatility” and we have good reason to believe that elevated glycemic volatility is at the heart of most weight problems. What we have discovered, is that these individuals suffer from rapidly fluctuating blood sugar levels that is generally related to some degree of insulin resistance and made worse by wrong food choices (more than a moderate amount of high glycemic impact foods).

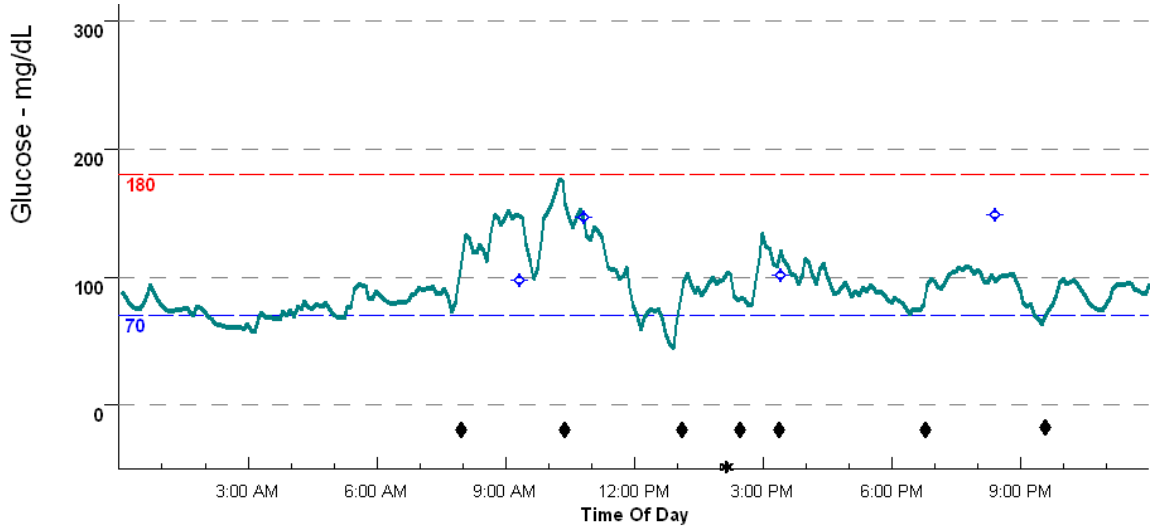

Figure 3.3 - In this case, black diamonds represent times when patient feels “hypoglycemic” and then responds by eating. Each time represents an episode of rapidly dropping blood sugar but only 2 occasions (while awake) are actual hypoglycemic episodes (below 70 mg/dl). Elevated glycemic volatility with rapid drops in blood sugar explains most “hypoglycemic” symptoms in non-diabetics and it is even more commonly associated with food cravings or “hunger pangs”.

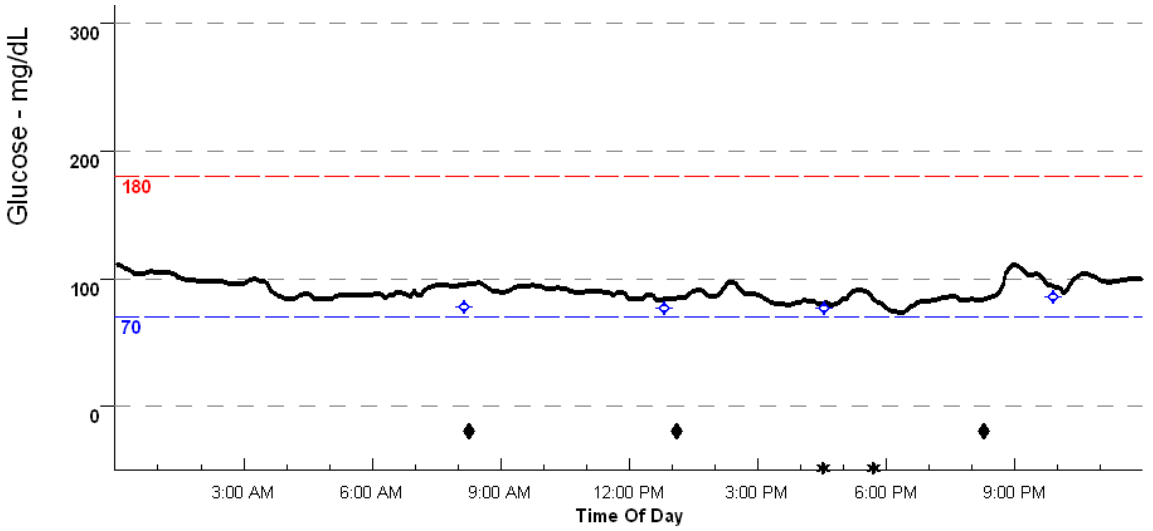

Figure 3.4 - Same patient 4 weeks into the Hunger Free Forever Program. Hypoglycemic symptoms and excessive food cravings now resolved.

Sweating, weakness, dizziness, shakiness, rapid heart rate are examples of some of these symptoms. Since the brain is critically dependent upon blood sugar as its primary fuel, when hypoglycemia becomes more severe, the brain is seriously affected. In such cases, symptoms of hypoglycemia can range from mild to severe and include such things as: headache, depression, anxiety, irritability, blurred vision, excessive sweating, mental confusion, incoherent speech, bizarre behavior, lack of coordination and later, if blood sugar goes below critical levels convulsions, coma and even death. Insulin or medication treated diabetics need to develop a keen awareness of hypoglycemia because serious hypoglycemic episodes can be dangerous and can cause permanent damage to the brain or sudden death. Unfortunately, the bodies of many diabetics become less sensitive to the initial (adrenaline related) signs of impending hypoglycemia over time (sweating, weakness, rapid heart rate, etc.). These individuals must develop an ability to monitor subtleties of their brain function instead in an effort to achieve good blood sugar control and avoid catastrophic hypoglycemic episodes.

ARE YOU RIDING THE BLOOD SUGAR ROLLER COASTER?

Do any of the following apply to you?

- My waist circumference is larger than my hips.
- It is difficult for me to lose weight.
- I crave sweets.
- I feel much better after I eat.
- I am very irritable if I miss a meal.
- I often cry for no reason.
- Sometimes I feel a bit spacey and disconnected.
- I have elevated blood sugar or triglyceride levels.
- I get anxious for no apparent reason.
- I wake up often during the night.
- I feel hungry all of the time.
- I often get very sleepy in the afternoon.

We have found that these symptoms and signs are very common in our patients with blood sugar volatility, a.k.a., the “blood sugar roller coaster.” How do we know they really have blood sugar volatility? Our research center was the first in the world to utilize a remarkable new technology as a tool for understanding the increased appetite and frequent food cravings so typical of individuals who are struggling with their weight and to then use this technology in helping overweight and obese people succeed in their weight loss efforts. This technology, known as the continuous glucose monitoring system (CGMS) has provided an amazing window through which we can view an overweight person's blood sugar continuously, and then relate fluctuations in their blood sugar to appetite, food cravings and food choices.

The CGMS is an electronic diagnostic system that requires the insertion of a sensing catheter under the skin of the abdomen. The sensing catheter contains a miniaturized electronic device that measures blood sugar and then sends this information every few seconds to a pager sized computer module worn on the patient’s belt for up to one week. The portable computer module then translates and records blood sugar data which can then be downloaded, after several days, to the doctor’s computer. A graph showing the average blood sugar reading every five minutes (288 blood sugar readings per day) can then be generated and studied in relationship to food intake, appetite, food cravings, hypoglycemic symptoms, medication and exercise.

Using the CGMS, we have discovered that most people with weight problems go through their days with remarkably fluctuating blood sugar or increased glycemic volatility. We now believe that getting people off the blood sugar roller coaster is essential to helping them successfully lose weight and keep it off. We have seen how this glycemic volatility is worsened with certain food choices (higher glycemic impact foods) but it is fundamentally related to insulin resistance and a loss of precise control over blood sugar. Below is another example case of what this data looks like before and after our program.

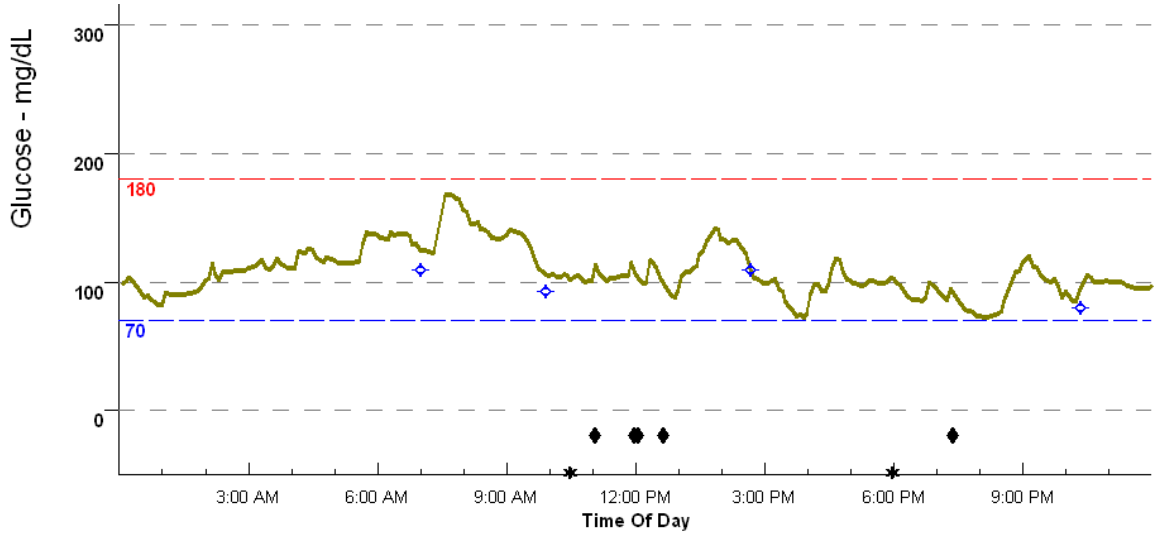

Figure 3.5 - Continuous Glucose Graph over 24 hours in typical overweight, non-diabetic patient before the Hunger Free Forever Program. Patient has elevated glycemic volatility (she is on the blood sugar roller coaster). Monitoring for several days showed that this was her consistent pattern even when she ate healthy food. Frequent food cravings were reported to occur at times when blood sugar rapidly dropped over short periods of time. This amounted to several significant food cravings per day. Feelings of hypoglycemia also occur when blood sugar drops rapidly, even when blood sugar is in the normal range (note: normal blood sugar is between 70 and 100 and so she spends a good deal of the day outside this ideal range).

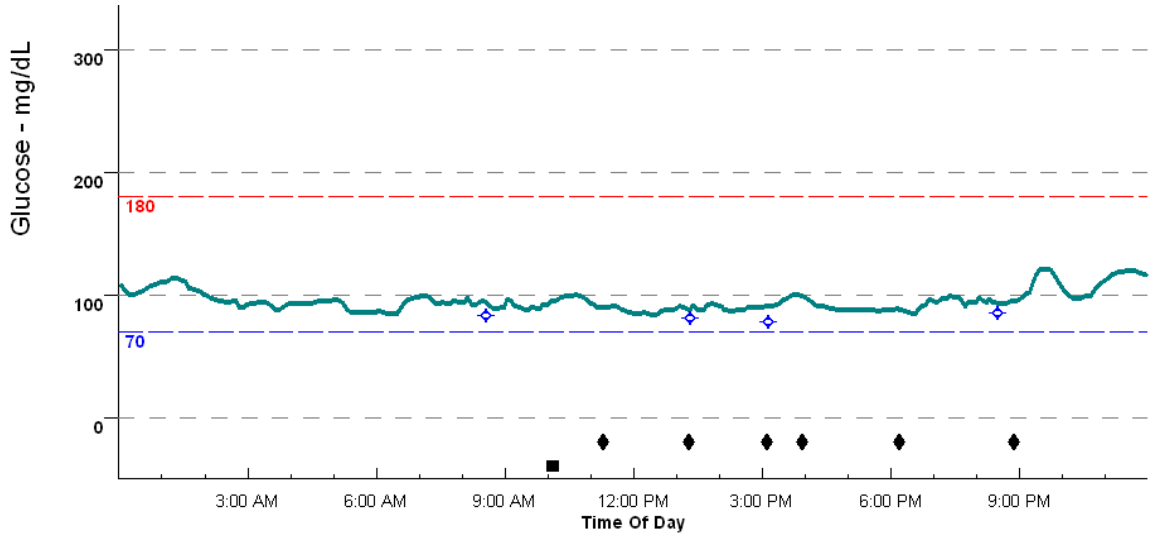

Figure 3.6 - Continuous Glucose Graph over 24 Hours in same

patient 4 Weeks into Hunger Free Forever Program. Patient now has nearly normalized glycemic volatility. Appetite and food cravings have dramatically diminished. Hypoglycemic symptoms no longer occur at all. As well, patient has more energy and mental clarity. Weight loss is progressing on target and with no discomfort. This type of change is very typical with the Hunger Free Forever Program and it dramatically illustrates the remarkable changes that occur with this program.

With the Continuous Glucose Monitoring System (CGMS), we have also diagnosed many people with diabetes who failed to demonstrate diabetes with the typical diagnostic tests. Since early recognition and treatment is of critical importance in the outcome of diabetes, we believe the CGMS could play a vital role in the prevention and early detection of diabetes.

HYPOGLYCEMIA: A HISTORICAL AND MODERN PERSPECTIVE

Both of us became interested in nutrition in the 1970s, at the time hypoglycemia was a popular self-diagnosis. There were a number of popular books (such as Sugar Blues by William Duffy, Hope for Hypoglycemia by Broda Barnes, and Sweet and Dangerous by John Yudkin) that fueled this public interest. In these books, the dangers of too much sugar in the diet were clearly spelled out. Yet since those books were published the per capita of sugar consumption has risen dramatically. The average American now consumes over one hundred pounds of sucrose and forty pounds of corn syrup each year. This sugar addiction probably plays a major role in the high prevalence of poor health and chronic disease in the United States.

Since these books came out, research in the past three decades has also provided an ever-increasing amount of new information on the role that both refined carbohydrates (sugar, high fructose corn syrup, and low-fiber starchy foods) and faulty blood

sugar control play in many disease processes. New terminology and descriptions (e.g., the metabolic syndrome and impaired glucose tolerance) are now used to describe the complex hormonal fluxes that are largely a result of the ingestion of too much refined carbohydrate. However, what research has failed to consistently demonstrate is that the symptoms of hypoglycemia actually correlate to low blood sugar levels. What our research with Continuous Glucose Monitoring System has shown is that the symptoms of hypoglycemia can occur simply as a result of rapidly falling of blood sugar levels and not so much a result of the blood sugar level ever dropping below normal. This finding helps explain why symptoms of hypoglycemia in the past correlated so poorly with actual blood sugar levels. It is not the level, but rather how fast the drop that is important.

GETTING OFF THE BLOOD SUGAR ROLLER COASTER

If you are riding the blood sugar roller coaster, it will be nearly impossible to lose weight. Frequent fluctuations in blood sugar, particularly when blood sugar rapidly drops in a short period of time, results in serious food cravings, even when your body has no real need of additional calories. If these events occur dozens of times per day, you are likely to give in and snack or drink sugary drinks, and those snacks and beverages will likely be loaded with calories. In the face of these food cravings, if you use sheer will power and hold off until your next meal, your appetite will be in overdrive and it is likely that you will eat too much of the wrong thing. Eating when your brain is sending out powerful signals to eat is not a good way to control your food choices, portion sizes or speed of eating.

We have seen over and over again, that reducing glycemic volatility (getting people off the blood sugar roller coaster) is the single most important change that will make weight loss efforts pleasant, comfortable and effective. We have worked with hundreds

of people who have tried and failed to lose weight through dieting. We have seen the remarkable transformation that occurs in these people when their blood sugar becomes stabilized and they no longer have to struggle with frequent food cravings and an appetite in overdrive. If you want to lose weight and keep it off for life, you must take the steps to get off the blood sugar roller coaster and onto the blood sugar superhighway instead. The five key steps to reduce blood sugar volatility include:

1. Following a low glycemic load diet.
2. Increasing your intake of dietary fiber and eat adequate protein throughout the day.
3. Taking PGX with every meal.
4. Engaging in a regular exercise program
5. Taking a high potency multiple vitamin with chromium

Following a Low-Glycemic Load Diet: The Glycemic Index and Glycemic Load

Every food affects blood sugar differently. You must become familiar with how foods affect your blood sugar and begin to make sensible food choices, preferring foods that have a lower impact on blood sugar. This does not mean that you should avoid carbohydrates (like the Atkins Diet or the South Beach Diet) or that you need some special ratio of carbohydrates to protein and fat (like the Zone Diet). We have found that blood sugar can be completely stabilized in non-diabetics and improved dramatically in diabetics when significant amounts of healthy carbohydrates are included in the diet. The key is to choose carbohydrates wisely and to consume modest portion sizes. Two tools to help you in this goal are the glycemic index and glycemic load.

The glycemic index (GI) is a numerical scale used to indicate how fast and how high a particular food raises blood glucose (blood sugar) levels. There are two versions of the GI, one based on a standard of comparison that uses glucose scored as 100, while the other is based on white bread. Foods are tested against the results of

the selected standard. Refined sugars, white flour products, and other sources of simple sugars are quickly absorbed into the bloodstream, causing a rapid rise in blood sugar. In response, the body boosts secretion of insulin by the pancreas. High-sugar, junk food diets definitely lead to poor blood sugar regulation, obesity, and ultimately Type 2 diabetes. But, the stress on the body that they cause, including secreting too much insulin, can also promote the growth of cancer and increase the risk of heart disease. So, we will make this simple recommendation: Don't eat "junk foods" and pay attention to the glycemic index of food that you eat.

CLASSIFICATION OF FOODS BY GLYCEMIC INDEX SCORES

Fruits and Vegetables		**Grains, nuts, legumes**	
Very High	Medium	Very High	Medium
None	Cantaloupe Grapes Oranges Orange Juice Peach Pineapple Watermelon	Refined Sugar Most cold cereals (e.g., Grape Nuts, Corn Flakes, Raisin Bran, etc.) Rice Cakes Granola	Oatmeal Pasta Peas Pita Bread Pinto Beans Rye Bread Whole-grain Breads Yams
High	Low	High	Low
Banana Raisins	Green beans Green pepper	Bagel Bread (white flour)	Lentils Nuts
Beets Apple Apricot Asparagus Broccoli Brussels	Lettuce Mushrooms Onions Plums Spinach	Carrots Corn Granola bar Onions Rice Tortilla	Seeds

Sprouts
Cauliflower
Celery
Cherries
Cucumber
Grapefruit
Strawberries
Tomato
Zucchini

The GI is quite useful, but since it doesn't tell you how much carbohydrate is in a typical serving of a particular food, another tool is needed. That is where glycemic load comes in. The glycemic load (GL) is a relatively new way to assess the impact of carbohydrate consumption that takes the glycemic index into account, but gives a more complete picture of the effect that a particular food has on blood sugar levels based on how much carbohydrate you actually eat in a serving. A GL of 20 or more is high, a GL of 11 to 19 inclusive is medium, and a GL of 10 or less is low. For example, let's take a look at beets – a food with a high GI, but low GL. Although the carbohydrate in beet root has a high GI, there isn't a lot of it, so a typical serving of cooked beets has a glycemic load that is very low, about 5. Thus, as long you eat a reasonable portion of a low glycemic load food, the impact on blood sugar is acceptable, even if the food is high in its GI. We recommend keeping the glycemic load for any 3 hour period less than 20 and just to be extra cautious we recommend taking PGX (discussed below) before any meal, especially if it contains any significant amounts of carbohydrate. PGX will lower the glycemic index of any food if the PGX is in your stomach at the same time as that food.

EXAMPLES OF GI, GL, AND INSULIN STRESS SCORE OF SELECTED FOODS

Food	GI	GL	Insulin stress (or glycemic impact)
Carrots, cooked, 1/2 cup	49	1.5	low
Peach, fresh, 1 large	42	3	low
Watermelon, ½ cup	72	4	low
Whole wheat bread, 1 slice	69	9.6	low
Baked potato, medium	93	14	medium

Brown rice, cooked, 1 cup	50	16	medium
Banana, raw, 1 medium	55	17.6	medium
Spaghetti, white, cooked, 1 cup	41	23	high
White rice, cooked, 1 cup	72	26	high
Grape Nuts™, ½ cup	71	33	very high
Soft drinks, 375 ml	68	34.7	very high

Avoid junk food and hidden sources of empty calories

According to the third National Health and Nutrition Examination Survey, which studied eating habits among 15,000 American adults, one-third of the average diet in this country is made up of unhealthy foods, including potato chips, crackers, salted snack foods, candy, gum, fried fast food, and soft drinks. These items offer little in terms of protein, fiber, vitamins, or minerals. What they do offer, is lots of "empty calories" in the form of sugar, white flour and fat. They fill you up with extra calories and leave you with little interest in the foods that give your body a fighting chance to prevent heart disease, cancer and other diseases.

How can you make healthier food choices and avoid the pitfalls of junk food? Here are a few guidelines:

- Read labels carefully. If sugar, flour (other than whole grain flour), fat, or salt are one of the first three ingredients listed, it is probably not a good option.
- Be aware that words appearing on the label, such as sucrose, glucose, maltose, lactose, corn syrup, or white grape juice concentrate, mean that sugar has been added.
- Look not just at the percentage calories from fat, but also the number of grams of fat. For every five grams of fat in a serving, you are eating the equivalent of one teaspoon of fat.
- If a snack doesn't provide at least two grams of fiber, it's not a good choice.

DIET ALONE HAS NO EFFECT ON REDUCING INCREASED BLOOD SUGAR VOLATILITY

In a very detailed analysis of the effect of eating a low-glycemic impact diet as demonstrated with the glucose monitoring system (CGMS), recent research that we have been involved with has shown that while levels of blood glucose could be reduced with diet, diet alone did not reduce the tremendous volatility that all of the subjects in the study possessed.

The significance of the results on the effect of a low-glycemic impact diet on blood sugar volatility as shown using the CGMS is quite important. What the results tell us is that because diet did not pre- vent the peaks and valleys in blood sugar levels, diet alone will fail in stabilizing appetite control in subjects with abdominal obesity.

Increase Your Intake of Fiber

Increasing your consumption of fiber is central to the success of this program. Eating high fiber foods in abundance will reduce hunger and promote satiety. Fiber also slows the absorption of carbohydrates from food, lowering their glycemic impact. Insoluble fiber (such as wheat bran, corn bran and vegetable fibers) increases the volume and viscosity of foods and it moderately reduces the glycemic impact of carbohydrates. Soluble fibers (such as oat bran, psyllium and legume fiber), on the other hand, absorb more water and tend to have a greater influence on a food's volume, viscosity and glycemic impact. Eating an abundance of fiber rich foods and especially those high in soluble fiber is central to the success of the Hunger Free Forever Program. Here are some suggestions to boost your fiber intake:

- Eat fresh vegetables and fruits for snacks at the first sign of hunger. Eat fruits and vegetables whole, only peeling when necessary.

- Get creative; add vegetables or fruits to foods (e.g. soups) and modify recipes whenever possible by adding extra fruits or vegetables.
- When you eat grains try to eat only whole grains -- read labels to confirm that foods are actually whole-grain.
- Use all bran cereals for breakfast or mixed with plain yogurt as a snack. Add all bran cereals to other cereals and to other foods whenever possible.
- Boiled whole grains are best. Brown rice, oatmeal, whole barley, barley grits and barley flakes are good examples. There are many creative ways to prepare boiled grains.
- Try to use legumes as often as possible. Take the time to learn many ways to use these remarkable foods.

Taking PGX with Every Meal

At the Canadian Center for Functional Medicine, we are credited with the co-discovery of the natural appetite reducing polysaccharide complex known as PolyGlycoplex (PGX). Working in cooperation with the discoverers of the glycemic index at University of Toronto and based upon their initial discoveries, our scientists have developed, what is now known to be a completely natural, water soluble non-starch polysaccharide (fiber) complex with greater volume, viscosity and glycemic index lowering capabilities of any fiber ever discovered. PGX can be put in a glass of water before a meal, sprinkled onto any moist food, taken in capsule form with meals or consumed as part of a meal replacement beverage. PGX allows you to eat smaller portions of food and still feel full and satisfied for much longer than if you were to consume the food alone. The effect of PGX on appetite and satiety has been demonstrated in double-blind placebo-controlled trials.

One of the remarkable effects of PGX is seen in its impact upon insulin sensitivity and blood sugar control. Double-blind studies have demonstrated that PGX substantially improves insulin sensitivity in insulin resistant subjects. In a study presented at the American Diabetes Association, a three week administration of PGX was accompanied by a fifty percent reduction in after meal insulin levels

and a forty percent improvement in insulin sensitivity along with a highly significant decrease in after meal blood sugars.

PGX has also been studied at the Glycemic Index Laboratories affiliated with University of Toronto. Here, researchers have shown that, when added to foods or beverages, PGX greatly reduces their glycemic index. The effect of PGX is far superior to that of any other soluble fibers including beta glucan from oats. This means that any food taken in conjunction with PGX will have a substantially lower glycemic impact.

At the Canadian Center for Functional Medicine, we have demonstrated repeatedly that glycemic volatility is reduced within days by the regular administration of PGX. In most cases, we instruct our patients to begin slowly, starting with 2 1/2 grams of PGX once per day. We have them gradually increase this over 1 to 2 weeks, until they are consuming 2 ½ to 5 grams of PGX 2 to 3 times per day. Most of our heavy subjects find that 5 grams of PGX with each meal reduces their appetite substantially. By eliminating their food cravings and choosing healthier foods it results in a remarkable stabilization of their blood sugar levels.

PGX is also available as part of a high-protein meal replacement. One the most successful approaches to weight loss is to consume a PGX containing meal replacement shake twice per day as a replacement for breakfast and lunch. The weight loss participant can then focus on eating one healthy meal per day along with healthy snacks. Additional PGX is usually consumed with their one evening meal. This approach is a very simple way to gain the benefits of PGX in terms of stabilization of blood sugar and restoration of insulin sensitivity. After initial weight loss goals are met, subjects usually begin eating two healthy meals and one meal replacement until their weight loss goals have been achieved. PGX is used as a supplement with the two normal meals. Further details about where to obtain PGX and how to use it correctly will be detailed in Chapter 10.

PGX IMPROVES THE METABOLIC SYNDROME

The underlying physiological defect in the metabolic syndrome is insulin resistance and its accompanying elevated insulin levels. PGX has shown to significantly improve all aspects of the metabolic syndrome. At the 64th annual meeting of the American Diabetes Association, held in Orlando, Florida in June 2004, the results of a clinical study using this proprietary fiber blend were presented by researchers from the Risk Factor Modification Centre at St. Michael's Hospital and the University of Toronto. Subjects with the metabolic syndrome took three grams of PGX or a placebo three times a day before meals. After three weeks, in the group taking PGX there was a 23% reduction in after-meal glucose levels, a 40% reduction in after-meal insulin release, and a 55.9% improvement in whole body insulin sensitivity scores. In addition, body fat was reduced by 2.8% from baseline over the 3-week study period.

Engaging in a Regular Exercise Program: You've Got to Move to Lose

Lack of physical activity promotes insulin resistance. Individuals who are sedentary tend to lose insulin sensitivity even if they don't gain significant amounts of weight. Lack of exercise results in a loss of lean body mass and a reduction in the number and efficiency of insulin receptors in various cells throughout the body. Moderate exercise helps to stabilize the appetite, normalize blood sugars and increase muscle mass, thus increasing your metabolic rate. If you want to get off the blood sugar roller coaster and be free from an appetite in overdrive, you need to make a commitment to regular exercise. This topic is further discussed in Chapter 7.

Take a High Potency Multiple Vitamin and Mineral Formula with Chromium

A deficiency of any one of several key nutrients required for the proper manufacture and function of insulin can lead to impaired sugar metabolism. Especially important are the minerals chromium, magnesium, zinc, and manganese; and B vitamins. The use of multiple vitamin and mineral supplements is associated with at least a 30% reduction of diabetes risk in men and a 16% reduction in risk for women, however, the supplements used in these studies are in our opinion far from ideal. In Appendix XXX we provide our recommendations for selecting a high quality formula.

One of the key nutrients deserves special mention – chromium. Proper blood sugar control requires chromium 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.

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.

TIM'S STORY

I first started gaining weight in my teen years. Up until then I was, by all accounts, a skinny little kid. But in my teen years, I developed a laziness that affected all aspects of my life. When it came to eating, because I was a picky eater, my parents basically let me make my own choices when it came to what I ate. So I tended to make things that I thought tasted good, and were fast and easy to make. As is the case with most convenience foods, what I was eating regularly was very high in both calories and fat. The only thing really keeping my weight in check was the variety of sports I was playing throughout the year. But as I entered adulthood, I was playing fewer organized sports, and an athletic 210 lbs. became a pudgy 240 lbs without me even noticing.

Every once in a while, I would decide to myself that I needed to lose weight, and would start myself on some sort of exercise program. But because I never bothered to change my eating habits to include a more balanced diet, my laziness would eventually kick in, and my lack of energy would lead me to abandon my well-intended regimen. I knew that I needed to make some serious lifestyle changes if I wanted to be healthier and more energetic, but, sadly, I just couldn't seem to motivate myself to do anything long term if I wasn't seeing any results.

A few days after my 30th birthday, and my wife showed me an ad seeking volunteers for a weight loss study. She asked me if I would like to check it out with her, so I agreed. I figured I had nothing to lose, but I went thinking this would be yet another failed attempt. It turns out this study involved PGX used in conjunction with a balanced diet and exercise. After having the program explained to

us, I thought that it just may be something that I could follow without too much hardship, but what really convinced me were some of the issues that surfaced during the medical exam at the beginning of the program. It turns out that my blood pressure was quite high, and I was showing signs of premature hardening of the arteries. At 30 years of age, my health was already going downhill! This was basically the incentive, the “kick in the butt” that I needed to start myself down a healthier path. So for the first 2 weeks, my wife and I followed the diet to the letter, using the PGX as directed, and working out at the gym. When we went to the first weigh-in after the first two weeks, I was feeling pretty good, and thought that I may have even lost a pound or two in the process. So I stepped on the scale and it took my mind several seconds to grasp the fact that I had lost almost 10 lbs. in the first two weeks.

After that day, I believe that my life has been changed forever. I can’t imagine returning to the habits that were putting my life in jeopardy, and after losing about 45 lbs. during the 12 weeks of the program, I know that the lifestyle changes I have made with the help of my wife will allow me to maintain a healthy weight for the rest of my life. I have never felt better than I do today, and I have PGX products to thank for helping me to finally conquer the laziness that had threatened my health for far too long.

Tim, age 30

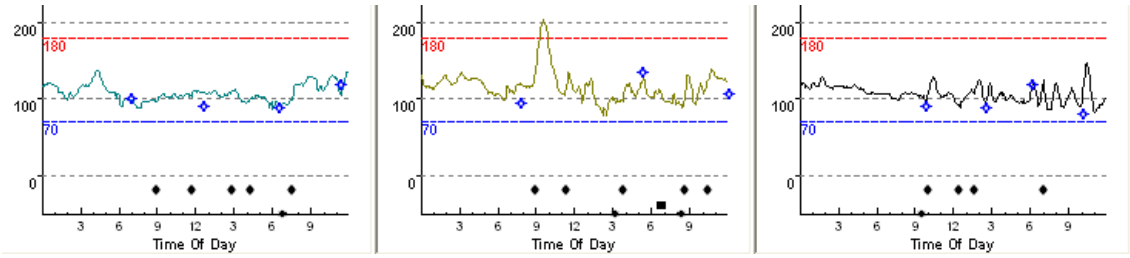

Figure 3.7 - Tim's Continuous Blood Glucose Before Starting the Hunger Free Forever Program.

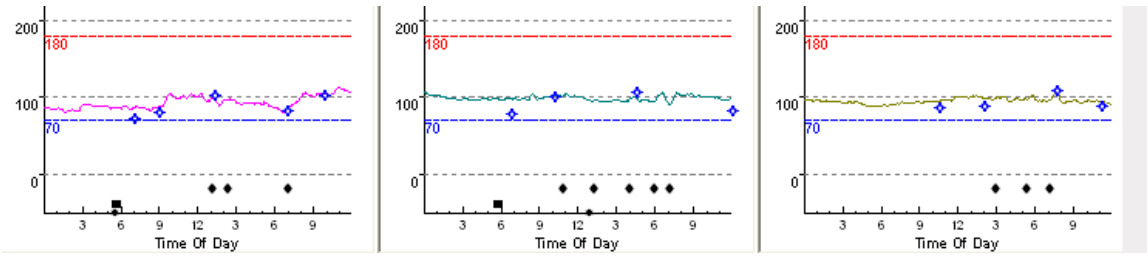

Figure 3.8 - Tim's Continuous Blood Glucose 6 Weeks After Starting the Hunger Free Forever Program.

CHAPTER SUMMARY

- Blood sugar volatility is a major factor for the increased appetite and frequent food cravings so typical of individuals who are struggling with their weight.
- Reducing blood sugar volatility is accomplished by following dietary, lifestyle, and supplement strategies that improve the sensitivity of cells throughout the body to insulin.
- Low–carb diets can produce quick and dramatic results, but they most often lead to rebound weight gain.
- The body works hard to keep blood sugar normal as insulin resistance develops by releasing higher than normal amounts of insulin.
- We commonly discover their fasting insulin levels to be two to three times the normal value even in many who are only modestly overweight.
- Insulin is as an anabolic hormone that promotes the growth of fat cells.
- Unless insulin sensitivity is restored, weight loss through dieting is an uphill battle at best and is impossible for most people.
- The brain can become insulin resistant along with the rest of the body and that this insulin resistance plays an important role in the loss of after meal satiety that accompanies weight gain.
- Although we know that the control of appetite is influenced by a whole orchestra of hormones, peptides and neurotransmitters, glucose can still be considered as a lead player and perhaps the conductor of this orchestra.
- Rapid and deep drops in blood sugar are particularly associated with very strong, and in some cases irresistible urges to eat.
- The five key steps to reduce blood sugar volatility involve:
    - Following a low glycemic load diet.
    - Increasing your intake of dietary fiber.
    - Taking PGX with every meal.
    - Engaging in a regular exercise program.
    - Taking a high potency multiple vitamin with chromium.

- Two tools to help you choose carbohydrates wisely and to consume modest portion sizes are the glycemic index and glycemic load.
- If you want to get off the blood sugar roller coaster and be free from an appetite in overdrive, you need to make a commitment to regular exercise.
- Blood sugar control requires chromium because it functions in the body as a key constituent of the glucose tolerance factor.