

Acupuncture to Treat Type 2 Diabetes

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Acupuncture in the Treatment of Type-2 Diabetes Mellitus

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“A Spoonful of Sugar Helps the Medicine Go Down”

While its a catchy phrase made popular in the Disney movie, “Mary Poppins”, it is now considered almost anathema in the modern medical community. Along with a sedentary lifestyle, the consumption of sugar in the form of soda-pop, sports and energy drinks, even simple white breads play a large part in the meteoric rise in obesity among both children and adults.

This has become such a huge trend in the United States that an entire culture has grown along side it encouraging people to be more accepting of obesity and that it’s “OK to be big”. The danger of such a trend is that it pointedly ignores the dangerous health risks of obesity; one of the biggest and most predominant being *Diabetes*. This connection was confirmed in a recent study published in Science Daily in 2009. Specifically, it proved how fat cells release a unique protein that causes liver and muscle cells to become de-sensitized to insulin⁽¹⁾.

So how big is the problem of diabetes in the United States? According to the CDC (Center for Disease Control), 25.8 million people or 8.3 % of the population has diabetes. In 2007, diabetes was the 7th leading cause of death according to the posted causes on death certificates. Direct medical costs of diabetes in 2007 was \$116 billion. Total costs (direct and indirect) of diabetes in 2007 was \$174 billion⁽²⁾.

In this paper we will be discussing Diabetes and how acupuncture and Traditional Chinese Medicine can be used to treat it. Before we do that, however, let’s get a better understanding of Diabetes.

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The Two Types of Diabetes:

- 1) **Diabetes Insipidus** is a rare condition where a lack of anti-diuretic hormone (ADH) also known as Vasopressin in the brain causes the kidneys to release excess water and results in extreme uncontrolled thirst.
- 2) **Diabetes Mellitus** is a much more common disease indicating a higher-than-normal level of sugar (glucose) in the blood due to a dysfunction of insulin.

In this article we will be focusing only on Diabetes Mellitus. Before we go into Diabetes Mellitus in greater detail, let's get a better understanding of the role of what happens when sugar enters our blood-stream.

Sugar comes from many sources but eventually breaks down into its most simple form called glucose. It is a critical ingredient in the Krebs's Cycle used to produce ATP (adenosine-triphosphate). ATP is the fundamental energy unit used for practically all cellular processes. This conversion from sugar into usable energy takes place within the cells. Before it can do this, however, we need to get the glucose INTO the cells.

Sugar is transported into the cells with the help of a hormone called *insulin*. Beta-cells in the pancreas release insulin into the blood and encourage adsorption of the glucose into cells (mostly muscle and fat cells). It also directs the liver to convert and store excess sugar in the form of glycogen. The intent of insulin is to LOWER blood sugar to a target level.

In times of greater need where our blood sugar runs low, alpha-cells of the pancreas secrete a hormone called glucagon. Glucagon directs the liver to convert the stored sugar (glycogen) back into glucose where it can travel to the cells that need it. The intent of glucagon is to INCREASE blood sugar to a target level. If everything is functioning normally, there is an ideal balance where there is enough sugar in the blood to feed the cells and is adjusted by levels of insulin and glucagon. Blood sugar levels are monitored in different ways. An **FBS test** or "fasting blood sugar" measures the amount of glucose in your blood after waiting at least 8 from your last meal. Normal levels are around **70-99 milligrams per deciliter (3.9-5.5 mmol/L)**. Levels of 126 or higher can indicate a problem.

The second test is the **2 hour postprandial test** where blood glucose levels are measured 2 hours after eating a meal. Normal levels in this test are around **70-145 mg/dL (3.9-8.1 mmol/L)**. Levels of 200 or higher can suggest a problem ⁽³⁾.

Diabetes Mellitus can be broken down into Type 1 and Type 2. **Type 1** indicates that a dysfunction in the b-cells of the pancreas lead to problems *producing* enough insulin. Diagnosis is typically made at an early age and is treated with supplemental insulin injections.

Type 2 also known as “insulin resistant” diabetes indicates a problem where the cells do not respond to the released insulin. Insulin is properly released by the pancreas, but for some reason it no longer facilitates the adsorption of glucose into the cells that need it. Since the cells are now starving for glucose, they trigger the pancreas to release even greater amounts of insulin. This results in abnormally high levels of both glucose AND insulin in the blood.

We will be focusing on this Type 2 version because it is the most common.

Why does this happen? What causes this insulin resistance? The exact mechanism leading to insulin resistance is not very well understood, but several factors have been identified that can increase the risk of Type 2 Diabetes:

Genetics: Certain cultures have been found to be more vulnerable to Type 2 Diabetes including African Americans, Native Americans, Hispanic Americans, and Japanese Americans. Even among caucasian cultures, there are simply some people who are more pre-disposed to diabetes than others ⁽³⁾.

Lifestyle:

- High blood triglyceride (fat) levels
- High blood pressure
- High-fat diet
- High alcohol intake
- Smoking cigarettes
- Sedentary lifestyle
- Obesity or being overweight

Other factors that studies show increase insulin resistance include glucocorticoids (also known as cortisol), free fatty acids, and growth hormones. Glucocorticoids (also known as cortisol) is a stress hormone that has been connected to a large number of health problems. Free-fatty acids are byproducts when fat is broken down and released into the bloodstream. Obese people, especially those high in belly-fat are at greater risk of releasing high-concentrations of these free-fatty acids ⁽⁴⁾.

While we cannot change our genetic make-up, we have complete control over our lifestyle choices. Simply choosing to live healthier through exercise and moderate intakes of quality foods can not only lower risk of getting Type 2 Diabetes, they can actually REVERSE the progression of the disease ⁽⁵⁾.

So I have high blood sugar levels. What’s the big deal?

Aside from the fatigue resulting from cells craving sugar and not being able to get it, the high glucose concentrations in the blood can cause very serious health problems around the body. A small representative of a very large list is shown below:

Eyes: Damage to the retina. This is called diabetic retinopathy and is the leading cause of blindness in the U.S.

Kidneys: Thickening and scarring of the glomerulus (the filters in the kidneys) causing the whole filtering action of the kidneys to become impaired and eventually fail.

Nerves: Nerve damage can lead to impaired healing responses. The most common result are “diabetic” ulcers on the feet and legs, often leading to amputations.

Atherosclerosis: Higher chance of forming fatty plaques in the blood vessels. This leads to higher chance of decreased circulation in the arms and legs (peripheral vascular disease), strokes, and heart attacks.

People may have diabetes for many years before they show enough symptoms to trigger an investigation and diagnosis. Some of the more common symptoms, however include: Fatigue, excessive weight-loss, excess thirst, excessive hunger, excessive urination, poor wound healing, lots of infections, blurry vision, and altered mental state ⁽⁶⁾.

High Insulin Levels:

Since this type of diabetes is considered “insulin-resistant” diabetes, there is an abnormally high concentration of insulin in the blood along with the high glucose levels. These high insulin levels can cause their own problems on the body. Problems due to prolonged high insulin concentration include: increase in belly-fat, increase in blood pressure, increased chance of osteoporosis, increased risk of cancer, and increased levels of homocysteine which are associated with high risk of heart disease, stroke, and birth defects ⁽⁷⁾. Of course, eventually, the pancreas can become depleted of insulin leading to insulin deficiency problems.

These wide-ranging effects reflect the complex relationship and influence that blood sugar and insulin levels have on our health.

Drugs to Treat Diabetes:

There are several types of medication used to treat diabetes. The majority of these are designed to do one or more of the following:

- Stimulate the release of insulin
- Inhibit the release of glucose from the liver
- Improve the cells sensitivity to insulin.
- Slow the breakdown of starches and sugars to glucose.

Of course, the side-effects of these drugs can have their own risks. Some of the more common reported side-effects include:

- Hypoglycemia (low blood sugar)
- Weight gain

- Nausea
- Headaches
- Upper respiratory tract infection
- Heart failure, attack, or stroke
- Liver disease
- Kidney damage ⁽⁸⁾

What Can You Do to Avoid or Reduce Risk of Type 2 Diabetes?

Before relying on these drugs and their health risks, people can explore much safer (and cheaper) alternatives. The combination of quality diet and exercise should be the absolute first line of defense in battling Type 2 diabetes.

In regards to diet, we are not focusing on “low-fat” diets. Instead we urge people to cut back the amount of sugar they eat. Aside from the classic sweets, sodas and energy drinks, sugar comes from the breads, pastas, corn, potatoes, and starchy foods that are such a huge part of the American diet. These “carbohydrate-rich” foods are broken down very quickly into the simple sugars that trigger a big surge of insulin. How quickly these break down into simple sugars like glucose is described in the term “glycemic-index”. On a scale of 1-100, high values indicate the food that breaks down very quickly and causes a rapid rise in blood sugar (resulting in a rapid release of insulin). On this scale for example, raw glucose would have a value of 100. In contrast, oatmeal has a score of 49. A low number suggests that the food breaks down more slowly, leading to a much more gradual rise in blood sugar and a result, requiring much less insulin to be released from the pancreas ⁽⁹⁾.

Charts showing the “GI” number for common foods are easily found all over the web. The goal is to avoid high GI foods (with a score above 70) and thus avoid the rapid rise in blood sugar and thus large insulin release.

The goal to eating lower “GI” foods (with a score below 55) is that we avoid the huge spikes of sugar and insulin response inherent in a high “GI” diet. Probably one of the most destructive diets is where a person skips breakfast, causing a lower-than normal blood sugar level, then splurges on a huge lunch full of the high “GI” foods. This results in a rapid jump in blood sugar and a massive surge of insulin. The extreme yo-yo effect on blood sugar and insulin levels is thought to be one of the causes of Type 2 diabetes.

A Brief Comment on Blood Sugar Levels and Obesity.

“The only real way to lose weight is to burn more calories than we intake.” It’s a simple matter of reducing calories!”. This is an “old-school” concept and is simply WRONG. Naturopathic Doctors and Chinese medical doctors have discovered long ago that it’s not just calories that make people fat. It’s the form of the calories that is important. Calories from fats, proteins, and carbohydrates affect the body differently. Foods that trigger higher insulin releases (high glycemic-index foods) are more prone to cause obesity than lower glycemic-index foods. So, the goal is to eat foods that cause slow

and gradual changes in insulin levels rather than rapid changes ⁽¹⁰⁾. Fortunately, this greater understanding of nutrition, weight loss, and insulin release is gaining a foothold across the entire medical community.

Exercise, Exercise...and... Exercise!!!

Let's face it, working-out takes WORK. Rigorous exercise leaves you an exhausted and sweaty mess. The physical and emotional health benefits are so extensive, however, that we cannot list them all in this article. But what about its specific benefits regarding insulin and diabetes? Studies show that even just one session of rigorous exercise can increase insulin sensitivity among patients for up to 16 hours ⁽¹¹⁾⁽¹²⁾. While the data is encouraging, it also suggests that there is definitely more going on than was first thought. A wonderful paper discussing this mechanism(s) in greater detail can be found here ⁽¹³⁾.

The combined evidence describing how exercise *increases* insulin sensitivity along with the research suggesting how fatty tissue releases a protein that *decreases* insulin sensitivity supports the idea that the combination of exercise and weight loss can be a very powerful tool to combat Type-2 diabetes ⁽¹⁴⁾.

These studies are just a small sampling confirming how effective healthy living through good diet and rigorous exercise can control Type 2 diabetes. But what if this simply isn't enough? Are there other tools that we can use to help?

Natural Medicine and Traditional Chinese Medicine offer several herbal solutions that have been clinically proven to have a strong effect on lowering blood sugar levels ⁽¹⁵⁾⁽¹⁶⁾. Since this article is focused on acupuncture, however, we are going to focus more on the effect of acupuncture on blood sugar levels and secondary symptoms of diabetes mellitus.

How Does Traditional Chinese Medicine View Diabetes?

While diabetes is much less common in China when compared to the United States, it has been recognized for over 2000 years and was described in some of the earliest texts on TCM and acupuncture ⁽¹⁵⁾.

In terms of Traditional Chinese Medicine (TCM), we identify the disease by how the disease manifests. In other words, we treat it based on what symptoms are present. As we've already mentioned, some of the more common symptoms include excessive thirst (polydipsea), excessive hunger (polyphagia), and excessive urination (polyuria).

In TCM this is known as "Xiao-ke" or "wasting thirsting" disease. It is also known as "Tang-niao-bing" or "sugar urine illness". We can then break this down into which area of the body is showing symptoms. Upper Xiao-ke (excessive thirst) is attributed to a Lung Yin Deficiency. Middle Xiao-ke (excessive hunger) is attributed to a combination

of Stomach Heat and Stomach/Spleen Yin Deficiency. Lower Xiao-ke is due to Kidney Yin Deficiency ⁽¹⁷⁾.

While there are several clinically proven Chinese herbal solutions to address these issues, this article will focus on how acupuncture can help.

Since these excessive thirst, hunger, and urination problems are due to high blood sugar levels, we are going to discuss how acupuncture is proven to lower blood sugar levels. We will also discuss how acupuncture can also help with diabetic neuropathy (pain in the extremities)

Several animal studies have confirmed that acupuncture and electro-acupuncture can *lower blood sugar by increasing insulin sensitivity* in artificially induced diabetic Type 2 rats ⁽¹⁸⁾. It was concluded that increasing insulin sensitivity and lowering blood sugar levels using electro-acupuncture was done by *lowering free-fatty acid concentration* and recovering expression of insulin signaling protein (IRS1 and the glucose isoform protein (GLUT4) that are found in skeletal muscle cells.

Another study reported in a journal, “Neuroscience Letters”, concluded that electro-acupuncture increased insulin sensitivity and thus glucose adsorption by additional mechanisms including the extra stimulation of acetylcholine (Ach) in the liver and nitric-oxide (NO). These substances seem to play an additional role in reducing free-fatty acid concentration ⁽¹⁹⁾.

That’s All Very Interesting if we are Treating Rats, But What About People?

Along with the numerous animal studies proving how acupuncture can lower sugar levels and increase insulin sensitivity, several trials have now shown how acupuncture can lower blood sugar levels (plasma glucose) levels in human patients with Type 2 diabetes mellitus. This significant drop in blood sugar levels was more pronounced with increasing treatments. After 3 months of treatment, acupuncture caused a drop in blood sugar levels in both glucose fasting state (8 hours after last meal) AND in the post prandial state (2 hours after last meal). The average glucose fasting levels dropped from **146** \pm 9.7 down to **111** \pm 8.3. The average post-prandial glucose levels dropped from **207** \pm down to **155** \pm 8.7.

Interestingly, the study also looked at lipid profiles (cholesterol), and body-mass index (fat content). After three months of acupuncture, the average Total cholesterol dropped from **158** \pm 8.4 down to **140** \pm 8.7. HDL-cholesterol (the good kind) increased from **39** \pm 1.1 up to **43** \pm 2.7. while the LDL-cholesterol (the bad kind) decreased from **91** \pm 8.8 down to **76** \pm 7.3.

Lastly, the study showed that body mass index (kg/m²) dropped from **26** \pm 0.89 down to **25** \pm 0.77. To put it simply, the patients become less fat. ⁽²⁰⁾.

While the blood-sugar lowering effects in humans are not completely understood, we assume that the models are similar to what was observed in rats; free-fatty acid levels decrease thus lowering insulin resistance. This particular study was conducted with well-documented body acupuncture points known for their blood-sugar lowering (hypoglycemic) effects. Most animal studies have shown that electro-acupuncture at 15 Hz gives a stronger effect than non-electro acupuncture. It would be interesting to see some human studies using electro-acupuncture rather than non-electro acupuncture to induce even stronger effects. Is this one study a fluke? Is this too good to be true? The current research says no. Based on recent literature reviews by the British Acupuncture Council (21), a study published in the American Journal of Chinese Medicine (22), and a report from the International Journal of Obesity(23) acupuncture has a significant influence in 1) Lowering blood sugar levels of Type-2 Diabetes patients, 2) Decreasing or eliminating diabetic neuropathy pain, 3) Lowering cholesterol levels 4) Decreasing free-fatty acid levels 5) Lowering body-mass index (obesity).

Diabetes in its several forms is a complex and very dangerous disease. Several factors including genetics, diet, exercise, and stress all can influence the likelihood to get diabetes, especially Type 2 Diabetes Mellitus. While it's impact is growing at a frightening rate around the world, there is hope! Simple life-style changes including diet and rigorous exercise have been clinically proven to stop and even reverse diabetes symptoms. Now with acupuncture, however, we have another powerful tool proven to help with several factors of diabetes. It's safe, inexpensive, and most importantly, proven to work.

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