



Diabetes and Nutrition

Daily Diet, Life Style, and Genetics



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T2DM (or DM2 Type 2 Diabetes Mellitus) is a complex chronic inflammatory and endocrine condition induced mostly by diet and lifestyle and further by toxic exposure. It is reversible, but requiring dietary discipline and commitment to physical activity. It is driven by a standard Western diet high in saturated fat, simple carbohydrates low in fiber, or carbohydrates with high glycemic impact, and steeped in a chemical soup.

Diabetes has a genetic component. However, research now suggests that even with the strongest genetic predisposition, such as in Hispanic, African American or Native American populations, T2DM can be avoided in most cases. When these groups follow the traditional diet and life style of their original culture, incidence of diabetes is extremely low. Since nutrition is one of the biggest contributing factors, it is also the best solution to the “diabesity” epidemic. Let’s take a closer look.

Fatty Acids and Oxidative Stress

Diabetes is not driven just by too much sugar in the diet, as we previously believed. More research now points to fatty acids as an equally important contributing factor. Saturated fat, commonly found in meat, dairy and butter and trans fats, or hydrogenated fat, in vegetable shortenings,

margarine, and baked products both affect insulin-binding receptors. Moreover, meat contains arachidonic acid, which is highly inflammatory. According to research, there is a strong relationship between red meat consumption and diabetes. The commonly used oils such as vegetable, soy, corn, sunflower, or safflower oils also contain highly pro-inflammatory Omega 6 fatty acids, further increasing inflammation. Diabetes means increased oxidative stress. Since fats are most prone to lipid peroxidation and oxidation, people with diabetes should be very selective about the amount and type of fat consumed.^{1,2}

Lipotoxicity and Environmental Triggers of Diabetes

Research suggests that lipotoxicity, caused by abnormal intramyocellular fat deposition in muscle from a fatty diet, contributes to an early stage insulin resistance, which later develops into diabetes due to added glucose toxicity.

Research now is also investigating environmental toxicity and POPs (Persistent Organic Pollutants), as contributory agents leading to gene expression, with subsequent glucose and insulin dis-regulation, eventually leading to diabetes. Chemical warfare used in Vietnam War may explain the particularly high incidence of T2DM among Vietnam veterans. Native Americans, who also share a very high incidence of diabetes, live on polluted reservation land. Even consumption of lake fish may increase risk of diabetes due to high levels of PCBs in fish. Data in NHANES report suggest a strong relationship between the incidence of CVD, DM2 and abnormalities in liver enzymes and urine concentration of Bisphenol A in a representative sample of the US popu-

lation (Bisphenol A is plastic commonly used in food packaging and water bottles). According to a study in Lancet “Although little direct evidence links exposure to POPs and the onset of diabetes, the epidemiological association is increasingly well defined. The public health implications of this association could be substantial.”^{3,4,5,6}

A Food Plan for Diabetes

A plant-based high carbohydrate diet has been shown to help diabetics reduce or even stop medications and improve their overall health. A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with Type 2 Diabetes.^{7,8}

The reason why a whole-food plant-based nutrition plan is beneficial for a diabetic is simple: not only are these foods nutrient-dense and high in vitamins, minerals and antioxidants, but they are low in fat, especially saturated fat, while they are abundant in fiber. Fiber is one of the keys to both prevention and treatment of diabetes.

Fiber engulfs an excess of cholesterol and toxins for excretion. It secures a repeated regular bowel movement; otherwise, toxins are reabsorbed and transported by the blood back to tissues, organs, glands and the brain, increasing inflammation and toxicity. Fiber slows down the glucose uptake while lack of fiber causes glucose to spike and plummet. Food derived from the animal kingdom naturally lacks fiber: there is zero fiber in a turkey and cheese sandwich, in scrambled eggs, or in baked salmon.

Diabetics have a poor nutritional status. Due to high oxidative free radical damage they have an increased need of antioxidants, and therefore 2 to 3 fruits and

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at least 8 to 12 cups of vegetables, (which really are unlimited), should be consumed. Vitamin and mineral status is also poor, especially chromium, zinc potassium, magnesium, B vitamins – some of the key factors in glucose and insulin regulation.

A whole food, mostly plant based, diet that is naturally high in fiber, with whole grains, beans, lentils, vegetables, fruits, nuts, and seeds provides the highest benefit for diabetics and more than enough fiber with no additional fiber supplements needed. Plants offer an incredible repertoire of phyto-chemicals that can help stabilize blood glucose and insulin, and therefore the more variety of plants we consume, the more versatile the benefit. Here are just a few examples: green tea bioflavones e.g. catechins, with at least 5 cups a day, may slow down glucose release from starchy foods and regenerate B-cells in pancreas. Onion and garlic contain allicin (raw garlic must be crushed and left for 10 min first), which helps maintain insulin in circulation, stimulates insulin production and improves glucose control.

While hyperlipidemia and an excess of inflammatory omega 6 fatty acids are common in T2DM, diabetics can improve their nutritional status by increasing their intake of omega 3 and mono-unsaturated fatty acids, which are insulin-protective. Omega 3 is highly anti-inflammatory; it is needed to counterbalance the typically high omega 6 diet, and it is rather hard to get in the

standard Western diet. It is most abundant in fish oil, wild salmon, sardines, mackerel or herring. Monounsaturated fatty acids are abundant in avocado and olives, and healthy sources of polyunsaturated fats are nuts and seeds.

Sugar and Fiber

While “sugar” has been demonized by the media, we thrive on it. But let’s clarify. Glucose, the simplest sugar (carbohydrate) molecule, is the preferred energy fuel for our cells and the exclusive fuel for the brain. Not only is a low carbohydrate diet not advised for a diabetic, but it is not sustainable long term for a healthy human population either. The most desirable sugar, however, is the one that is slowed down by fiber.

The daily consumption of especially soluble fiber such as hemicelluloses, mucilages, gums, or pectins (as in legumes), steel cut oats, nuts, seeds, pears, apples and most vegetables significantly slows down digestion and absorption preventing rapid glycemic rises, increasing tissue insulin sensitivity, and improving uptake of glucose by muscles. This is how we are designed to eat whether we have diabetes or not.

Whole grains such as amaranth, barley, buckwheat, millet, oats, quinoa or brown rice also provide significant bulk and fiber in the diet and therefore should be a substantial part of everyone’s daily nutrition program. Whole wheat is not included in this list due to an unexpectedly high glyce-

mic index of 71 (higher than table sugar at 65), which means that it does not support glucose control. Research confirms that whole grain intake is inversely associated with risk of type 2 diabetes, especially due to the intact bran in the grains. Findings from prospective cohort studies consistently support increasing whole grain consumption for the prevention of DM2.⁹

Barley in particular has an outstanding reputation for helping improve or even reverse early diabetes because of its especially high soluble fiber content, which is four times as high as the more familiar oats. In a study conducted by the Agricultural Research Service at the Diet and Human Performance Laboratory in Beltsville, MD, barley was much more effective in reducing both glucose and insulin responses than oats. Like other cooked and unadulterated grains, barley berries are also high in magnesium, manganese and zinc, the very nutrients often lacking in a diabetic, as well as many B vitamins and other nutrients. And while the brain does not care whether the glucose comes from a candy and pretzels or a bowl of cooked barley, we should!

The targeted daily fiber should be at least 35g, while the US average is less than 12g. Here are some examples of fiber content in foods: a pear: 4.5g, an apple: 3 g, 1 cup cooked pearled barley: 6g, ½ cup cooked lentils: 8 grams, and ½ cup cooked beans: 6 g. 1C cooked collard greens=5g while 1 cup raw spinach less than 1 g. As you can see, in terms of fiber and glucose management, a cup of lentil stew or cooked collard greens will go much further than a cup of raw spinach salad.

Planning a Day

For a diabetic, the goal is to create a routine pattern of three meals and snacks between the meals. Skipping a meal is not optional and a cup of coffee and a donut is not considered breakfast. The glucose-

containing meal must be high in fiber in order to prevent glucose from spiking and then crashing. Fiber slows down the uptake of glucose, allows time for the pancreas to produce enough insulin, and thus keeps the glucose level steady.

What else can be done to further slow down the glucose elevations: make sure that the carbohydrates in every meal or snack are balanced with the addition of some protein and a healthy fat. For example, one can add a handful of walnuts to a bowl of steel cut oats or garbanzo beans and a few chopped olives to a small bowl of brown rice pasta. If one is stranded in com-

mute traffic, the apple or the pear will last much longer if dipped in almond butter or eaten with a handful of nuts.

In conclusion, although diabetes takes a long time to develop and is difficult to treat, since dietary factors are the single most important cause of this disease, dietary manipulations also remain its most effective solution.

It is not carbohydrates alone that are responsible for diabetes but the diet high in saturated fat, meat and refined carbohydrates that lack fiber is the culprit. What is most alarming is the recent scientific evidence that links diabetes to environmental pollution and lipotoxicity. Since such envi-

ronmental toxicity has been increasing at an unprecedented rate over the past century, this may have been an important factor in the present epidemic and a factor that has been hidden from both physicians and our diabetic patients until recently. ■

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Note: References for this article are posted at www.mdafp.org; Publications tab. CME questions for this article are posted at www.mdafp.org; CME Quiz tab, Summer, 2014.



Diabetes: Reflections of a Family Medicine Resident in Baltimore City



Janna Becker, M.D.

I met Mr. J on the first day of my intern year. He was an overweight man in a plaid shirt and jeans that were a bit too tight; a fellow who was relatively grumpy on a good day. He looked slightly older than his actual age of 52. He slouched into my exam room grasping a handful of papers and with his spouse coming right behind, carrying a Ziplock bag filled with insulin vials. I walked in and extended a hand to introduce myself, but before I could get

a word in, Mr. J blurted out “Doc, my diabetes is going to kill me and the insulin is hurting my toe.” Well, my extensive medical education had certainly not adequately prepared me with any sort of response to this complaint!

As it was my first day as a resident in the outpatient setting, I had very few patients booked and therefore had ample time to spend with Mr. J. After completing my introduction, I asked him to please tell me HOW his diabetes was going to kill him. He shared the story of his friend with diabetes. As he understood it his friend’s insulin treatments had “caused his foot to die” leading to an amputation. His friend eventually died from his diabetes and without a foot all because of the insulin. Honestly, I did not know where to start.

It was during that hour long patient encounter that I learned of the challenges that face our patients after they leave our

offices. He took me through every struggle he could remember since his diabetes diagnosis 6 years before. It took me by surprise. Some of the roadblocks he faced had never occurred to me. Some of the assumptions I had made were entirely incorrect. Some of the life situations he described made me feel helpless, as I realized so much was beyond my, or his, control.

Six years prior to meeting me, Mr. J. had developed cellulitis. During a 4 day hospital admission, he was given insulin to control his blood sugars as well as IV antibiotics for his infection. That was the first time he ever heard the term diabetes applied to him. The orthopedic surgeons rounded in his room every day and looked gravely at his infected foot while discussing the pros and cons of amputation! Mr. J was horrified. All he knew was he had an infection, and then “they” started by giv-

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