A Plant-Based Diet Approach to Diabetes

Jennifer Mimkha, MPH, RD, LDN, CLC, CLT

There is growing interest in plant-based diets (PBDs) for their role in managing various chronic diseases such as obesity, cardiovascular disease, and both type 1 diabetes and type 2 diabetes. For this article, a PBD will be defined as a diet rich in whole, plant foods (fruits, vegetables, tubers, whole grains, legumes, and small amounts of nuts and seeds) and devoid of animal products (including meat, dairy, fish, eggs) as well as processed and refined foods. This way of eating is also commonly referred to as a low-fat vegan diet. Individuals with diabetes should consider adopting a whole-foods PBD for optimal health and glycemic control.

When consuming a whole-foods PBD, 75% to 80% of calories will come from carbohydrates. While this may alarm some health professionals, studies show that the lowest rates of diabetes worldwide are found among populations that consume the most carbohydrates. On average, fruits and vegetables contain about 80% to 90% water. Water, like fiber, can increase the volume of foods without adding calories. Experiments have shown that regardless of calorie count, people tend to eat the same amount of food at a meal. This is likely a result of the signaling that occurs from stretch receptors in the stomach to the brain after a certain amount of food has been consumed. The majority of a PBD consists of low-calorie components that are rich in fiber and water, meaning individuals can eat more food without gaining weight. In fact, people who eat meat-free diets consume an average of 364 fewer calories per day. Those who eat PBDs may even have an 11% higher resting metabolic rate, possibly due to higher gene expression of the fat-burning enzyme carnitine palmitoyltransferase. PBDs have also been shown to have a greater positive effect on both quality of life and mood in comparison to those who consume a conventional diet. This was demonstrated by the results of a recent weight-loss trial, in which diabetics were randomized to consume either a conventional diabetic diet or a PBD. At the end of 6 months, participants in the PBD group reported feeling less constrained with their diet than those in the conventional diet group. Interestingly, the participants in the PBD group also had decreased disinhibition scores, indicating that a PBD may be a more sustainable long-term intervention.

As humans, we have an unlimited capacity to store fat in the form of adipose tissue. This ability to store fat, combined with an excess intake of calories will result in lipotoxicity,
Editor’s Notes

All of the inspiration, learning, and project creation that FNCE® brings seems to steamroll into the holidays, making the last part of the year extremely busy. Although our lives and technology are deeply co-dependent, there’s no substitute for the energy of a face-to-face conversation, dancing with friends and colleagues, and the fresh perspective of changing your environment. I hope the transition to this new year gave you some time to take a collective deep breath, somewhat decompress, and recharge.

This newsletter issue is particularly full. If you missed the DIFM symposium, our talented nutrigenomics co-editor, Janie Jacoby, volunteered to write a well-rounded review of what was a day of cutting-edge information and stellar speakers from the best in their respective fields. PPW was smartly and strategically scheduled after FNCE®, which duly gave more attention to an overlooked area of public health. Please check out our student contribution from PhD/DI candidate and former White House Intern Taylor Newman’s article on her impressions of the day.

Theme-based newsletters have historically been our format; this winter we focus on diabetes. It escapes no one in our community that type 2 diabetes is a national and global epidemic. It’s impossible to practice or even live in the US without being affected by this disease. Tragically, conventional diets and medications that have focused on “management” have done nothing to decrease its prevalence. Further, a 2013 Review states that “the level of evidence for the clinical efficacy of antidiabetic drugs is disappointing and does not support the millions of prescriptions being written for them.” Another study followed 6500 diabetics for 3 years and concluded that for every 1 unit of increase in insulin, there was a 54% increase in all-cause mortality, 37% increase in major cardiovascular events, and a 35% increased risk for cancer. IFM practitioners understand that the body’s many biological systems work in concert, striving for harmony, and that what we call diabetes is a symptom, not just a blood sugar issue, with a multifactorial etiology that may have its roots in nutritional, inflammatory, metabolic, hormonal, and environmental stresses. The fact is, practitioners applying individualized diet and lifestyle principles have been and are currently helping people prevent and reverse diabetes. Dr Neal Barnard and other researchers have had great success with diabetics on a plant-based/vegan diet and, after realizing that diabetics having had gastric bypass surgery reverse their diabetes 90% of the time, Dr Jason Fung has championed a low-carbohydrate diet with intermittent fasting. According to Fung, diabetes may be reversed up to 70% of the time. With personalization as a guiding principle, IFM dictates that there may be as many solutions to diabetes as those afflicted. A true scientist always questions the prevailing hypotheses, checks their own bias, and is open to “new” evidence. It’s time to change the paradigm and as nutrition experts, IFM RDNs are uniquely positioned to do just that. It follows then, that it is our responsibility to first become aware and then knowledgeable about the various interventional paths. Paths that intersect with current and relevant science, our knowledge and expertise as practitioners, and the individual’s specific biology and preference. The integration of all three is true evidence-based medicine.

Here we include articles on the vegan/plant-based approach to diabetes, keto/low carb as dietary intervention, a comprehensive functional medicine perspective, and an in-depth discussion of integrative mind-body practices that can positively affect those with diabetes or any chronic condition. Much gratitude to our diverse group of contributing authors, hard-working editors, our DIFM leadership team, and importantly to you, as members, who inspire us to keep digging and diving to bring you up-to-date information on what is happening on the front lines of nutrition! As always, please email me at jenas_mailbox@yahoo.com or find me on Instagram @jenagrd with any suggestions, comments, or contributions you’d like to make.

Empowering members to be leaders in integrative and functional nutrition.
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Chair’s Corner

Danielle Omar, MS, RDN

Every January, instead of creating resolutions, I decide on three words. These three words become a theme for my efforts in the year to come. They help me to know when to say yes to projects, make important decisions, and show me how to spend my time. I keep the words on my computer or near my desk, and they prompt me to make a focused choice. My three words this year are Compassion, Forgiveness, and Ground. I hope they serve me well!

As I move into the second half of my term as Chair, I am so proud of what we’ve accomplished thus far. We had an amazing FNCE® that included our “Extinguish the Flame” symposium and 20-year birthday bash! We had so much fun taking photos and dancing until midnight under the disco lights! We had six DIFM past chairs in attendance, and it was such an honor for me to be supported by our amazing and dedicated Leadership Team during the entire weekend. We came together, we worked hard, and we made a huge impact!

We also have so many great learning opportunities planned for you in 2019! Our Professional Advancement team kicked off the year with a sold-out three-part GI Webinar Series, and our Marketing team is planning another Facebook Book Club for the spring. Check the website for details to join us!

We are also in the process of updating the Standards of Practice and Standards of Professional Performance (SOP/SOPP) for RDNs in Integrative and Functional Medicine. The DIFM team members and reviewers have been working with the authors and the Academy to update the document from its last publication eight years ago, and we are hoping to have an update and more publication news for you in February! This document will be pivotal as a tool for you in 2019 as you see how integrative and functional medicine is practiced in all areas of dietetics. It’s very exciting!

I hope 2019 has started off well for you and I look forward to seeing all our initiatives come to fruition this year!
which is one of the greatest drivers of chronic diseases such as type 2 diabetes. As follows, type 2 diabetes is characterized by insulin resistance related to intramyocellular lipid accumulation. While diets high in refined carbohydrate are known to increase triglyceride concentrations, high-fiber foods appear to have the opposite effect.6 One study published in Diabetes Care used a randomized controlled trial of a vegan diet to demonstrate the effects on glycemic control, plasma lipids, and weight control in individuals with type 2 diabetes; exercise was held constant. Their results showed significantly greater reductions in hemoglobin A1c (HbA1c), waist circumference, body weight, body mass index, total cholesterol, and low-density lipoprotein (LDL) cholesterol with the vegan diet than with the group using the current American Diabetes Association (ADA) guidelines.7 Low saturated fat content, the absence of dietary cholesterol, and the cholesterol-reducing effect of soluble fiber are what lend vegan diets their ability to lower plasma lipids. Given that the primary cause of morbidity and mortality in diabetes is cardiovascular events, this effect is particularly important to acknowledge. The use of PBDs to successfully treat type 2 diabetes dates back to the 1930s, with a study providing “incontestable evidence” that this way of eating is effective in controlling diabetes.8 A much more recent study found that eating large amounts of animal protein increased the risk of diabetes by 13%, while replacing just 5% of animal protein with plant protein decreased diabetes risk by 23%.9 Research also supports the effectiveness of PBDs to improve diabetic complications such as neuropathic pain.10

In 1990, the World Health Organization (WHO) identified two food groups that contribute to disease: processed foods and animal foods high in saturated fat.11 Palmitate, the saturated fat found mostly in meat, eggs, and dairy, causes insulin resistance. On the other hand, oleate, the monounsaturated fat found in plant foods such as avocados and nuts, may actually protect against the harmful effects of saturated fat.12 Although saturated fat is in all foods including vegetables, the amount of saturated fat in plant foods is negligible, compared to that of meat, which contains about 40% saturated fat. Proponents of the ketogenic diet will argue that a decrease in carbohydrate consumption results in a lower requirement of insulin production (or use, in the case of type 1 diabetes), and therefore individuals will experience improvements in their HbA1c scores, as well as weight loss. It could be argued that while patients may very well experience short-term weight loss on a ketogenic diet, the price comes at too high a cost. Forcing the body to produce ketones requires a significant reduction in carbohydrate consumption (~15-20 grams per day). Gluconeogenesis could result in someone being “kicked” out of ketosis; therefore protein is also restricted on a ketogenic diet to 6% to 8% of total calories. The remaining 90% of calories is derived from fat in sources such as meat (which is considered a group 1 carcinogen13), cheese, poultry, fish, oil, and low-calorie leafy green vegetables. Research shows that saturated fat is every bit as destructive as sugar, so replacing refined carbohydrate with saturated fat does not help reduce the risk of disease; it actually increases LDL cholesterol levels.10 However, replacing refined carbohydrate with unrefined carbohydrate, polyunsaturated, or monounsaturated fat will lower the risk of disease.10

In 2013 a meta-analysis looked at 13 randomized controlled trials (RCTs) comparing low-fat diets to ketogenic diets. The results showed a reduction in triglycerides and an increase in high-density lipoprotein (HDL) cholesterol with the ketogenic diet.14 An earlier RCT in 2004 showed similar results, but all reports showed that LDL was increased (~30%) in some participants, and one individual was even diagnosed with coronary heart disease.15 High-fat diets appear to down-regulate the genes required for mitochondrial oxidative phosphorylation in skeletal muscle. Insulin resistance related to intramyocellular lipid accumulation is due to a reduction in mitochondrial activity that is identifiable several years before diabetes manifests.7 One case-control study found that intramyocellular lipid concentrations were significantly lower in a vegan group compared with the omnivore group.7 High-fat diets will cause more damage to patients in the long run by fueling inflammation, contributing to gut dysbiosis, and glucotoxicity resulting in oxidative stress. Practitioners need to consider all of these long-term factors when counseling their patients with diabetes. The concern for impaired microbiota with the use of a high-fat diet should be addressed, due to the microbiome’s varied and significant role in human health. Short-chain fatty acids (SCFAs) are produced by gut microbes via carbohydrate fermentation, and deficiency in SCFA production is associated with type 2 diabetes.16 SCFAs help to nourish the cells that line the gut, reduce inflammation, and regulate hunger. Through consumption of a high-fiber diet, SCFAs can create a more acidic pH in the gut and reduce the number of unwanted bacterial species, leading to an increase in insulin production and improved glucose regulation.16

Individuals following a PBD have been shown to have a 46% to 47% lower prevalence of diabetes than omnivores.17 While improvements in beta-cell function are not typically a goal of diabetes treatment, there is research to support that dietary intervention using a PBD can improve beta-cell function and insulin resistance.17 This was demonstrated by researchers who altered the macronutrient composition (~75% of energy from carbohydrates, 15% protein, and 10% fat), with no limit on energy intake, in the diets of overweight individuals with no history of diabetes. The group that consumed a low-fat vegan diet showed marked improvements in glucose sensitivity, fasting insulin sensitivity, and a decrease in fasting plasma glucose.17 PBDs tend to promote weight loss and lower adiposity—factors that are highly protective against insulin resistance. In contrast, the consumption of meat and poultry is highly predictive of weight gain and obesity over time.18 Furthermore, advanced glycation end products, which are high in meat and low in plant-based foods, have been implicated in the pathogenesis of
type 2 diabetes. A diet low in these oxidant compounds has been shown to improve insulin resistance in people with type 2 diabetes.\(^\text{10}\)

Individuals with insulin-dependent diabetes can also benefit from following a PBD. According to a 2013 study published in *Diabetes Care*, dietary fat acutely increases glucose concentration and insulin requirements in patients with type 1 diabetes. Researchers provided 48 hours' worth of meals with identical carbohydrate and protein content but varying fat content (10 grams vs 60 grams). The high-fat meals required an average of 42% more insulin in order to bring blood sugar under control. When individuals with type 1 diabetes follow a low-fat, PBD, their blood glucose variability goes down, allowing their blood glucose levels to become more predictable.\(^\text{19}\)

Diseases that are caused by diet and lifestyle (type 2 diabetes) can be reversed with diet and lifestyle. While there is currently no cure for type 1 diabetes, individuals with both forms of diabetes will have marked improvements in their glycemic control by adopting a whole-foods PBD. Low-fat PBDs should be considered as part of a therapeutic intervention in individuals with risk factors for developing diabetes. The sugars in whole plant foods should be considered protective, due to their accompaniment of vitamins, minerals, antioxidants, phytochemicals, fiber, prebiotics, and probiotics that support human health. Therefore, it is important to recommend complex, unprocessed carbohydrates when encouraging a PBD.

**References**

Mounting evidence continues to identify therapeutic benefits of adherence to a ketogenic diet for individuals with type 2 diabetes. This article will discuss the ketogenic diet as an effective intervention for blood sugar management given the research demonstrating improvements in hemoglobin A1c (HbA1c) levels, insulin levels, and reductions in inflammation.

Nutritional ketosis is a metabolic state in which the body uses ketones as its primary source of fuel rather than glycogen. Aside from prolonged fasting, the only way to achieve a state of nutritional ketosis requires adopting a ketogenic diet. This leads to an increased production of ketone bodies (acetoacetate, β-hydroxybutyric acid, and acetone) by the liver. Adherence to this very low-carbohydrate, high-fat, and moderate-protein diet leads to circulating levels of ketone bodies in the bloodstream, which are utilized as an energy source by the central nervous system in place of glucose. In order to achieve a state of ketosis, carbohydrate intake is commonly encouraged to be less than 50 grams per day (or 25 grams of net carbohydrates per day), depending on age, gender, and activity.

The ketogenic diet has been used in a conventional setting for the management of seizures in epilepsy, specifically for children, since the mid 1900s. But researchers continue to demonstrate that the benefits of a ketogenic diet reach further than seizure management. In 1983, Phinney et al published one of the first research studies looking at the metabolic effects of a ketogenic diet in humans. Many studies have been published since that time. There appears to be a strong association between the ketogenic diet and weight loss through its ability to lower appetite, reduce lipogenesis, and increase metabolic efficiency. Other strong areas of research include improved outcomes for cardiovascular disease, type 2 diabetes, cancer, and neurodegeneration.2

Metabolically, eating very few carbohydrates and moderate levels of proteins for individuals with blood sugar dysregulation appears to be a logical choice. A person with type 2 diabetes experiences elevations in blood sugar after eating carbohydrates, including whole grains and starchy vegetables. Arguably, fiber in the whole grains and starchy vegetables does help decrease the absorption of sugar but not enough to cancel it out, which is why it’s important for clients to understand the concept of net carbohydrates. Net carbohydrates are the total number of digestible carbohydrates in a food which can be calculated by subtracting fiber from the total carbohydrates. Proteins also have the ability to increase blood sugar levels given that they are converted to carbohydrates through gluconeogenesis. The third macronutrient, dietary fat, is the only group that does not cause an increase in blood sugar levels. Therefore, reducing foods that cause elevations in blood sugar levels and relying primarily on dietary fat leads to enhanced glycemic control in individuals with type 2 diabetes. In some regards, it is an effective root-cause nutritional intervention.

Two of the primary underlying features of type 2 diabetes are insulin resistance and inflammation. In the case of insulin resistance, the muscle cells are not able to take up circulating blood glucose. The body sends a larger amount of carbohydrates to the liver where it is converted to fat through de novo lipogenesis. Consequently, higher levels of saturated fats enter circulation, which further increases the risk of cardiovascular disease and type 2 diabetes. In addition to insulin resistance, inflammation also plays a participatory role in the pathogenesis of type 2 diabetes. Proposed inflammatory mechanisms that are involved with the disease include the activation of the nuclear factor-κB (NF-κB) pathway, the JUN N-terminal kinase (JNK) pathway, and interleukin 1β (IL-1β).3

Studies on the use of the ketogenic diet for treatment of type 2 diabetes have demonstrated reductions in HbA1c and inflammatory markers such as C-reactive protein, in addition to improvements in insulin sensitivity.4 Research has also shown that individuals are commonly able to lower their use of diabetes medication such as insulin, sulfonylureas, SGLT-2 inhibitors, DPP-4 inhibitors, and GLP-1 receptor antagonists, in addition to metformin when in a state of ketosis.5 Much of the benefits of a ketogenic diet can be explained by lowering carbohydrate and glycemic intake, but it appears that entering ketosis may have additional glycemic benefits. One study compared a low-glycemic diet with a low-carbohydrate/ketogenic diet and found that both groups led to reductions in use of medication and lower levels of HbA1c, fasting glucose, fasting insulin, and enhanced weight loss. However, the ketogenic group had more profound improvements compared to the low-glycemic group with 95.2% reducing or eliminating their medication compared to 62% of the low-glycemic group.6

A recent 2018 trial prospectively observed 349 adults with type 2 diabetes, some of which enrolled in the continuous care intervention (CCI) while the rest remained with their usual care (UC). The CCI group had access to a primary care physician, health coach, biomarker tracking, and blood glucose testing 1 to 3 times per day. They were also
Given individualized ketogenic diets with the goal of reaching nutritional ketosis between 0.5 to 3.0 mmol/L blood ß-hydroxybutyrate. After one year, researchers found promising outcomes in the ketogenic CCI group. Those in the intervention lowered their HbA1c levels from 7.6% to 6.3%, lost 12% body fat, and reduced use of diabetic medicine including insulin. Participants from the UC group did not lose weight or have improvements in their biofeedback markers. While the study was not a randomized controlled trial and results were not statistically significant, the research provides insight into the tremendous benefits that may exist for the regulation of blood glucose levels with a ketogenic diet in people with type 2 diabetes.4

Ketogenic dietary interventions have shown promising outcomes both clinically and in research. While exciting research has been published, however, more is needed, especially regarding the safety of long-term ketogenic interventions. Like any other approach, there needs to be personalization and it may now work well for everyone. For example, those without a gallbladder may have more difficulty with a high fat intake, it may be too stressful for individuals with adrenal dysfunction, histamine intolerance, athletes, and those with disordered eating patterns or eating disorders. It is important to monitor patients closely, encouraging the use of a glucose and ketone meter. Decreases in blood sugar can occur within just a few days of adopting this nutrition plan. Coordination of care with a physician is essential in order to ensure that blood sugar medications are adjusted appropriately. Equally important is the monitoring of electrolytes and mineral intake, fiber consumption, and hydration status.

### References


A Functional Medicine Approach to Diabetes

Melissa Groves, RDN, LD

Introduction

From a functional medicine perspective, treating type 2 diabetes means addressing its root causes—primarily insulin resistance and inflammation. More recent research suggests that biochemical pathway disruptions and lifestyle factors such as a lack of sleep and chronic stress may also be at play.

Studies have shown that insulin levels begin rising up to a decade before fasting blood glucose and hemoglobin A1c levels result in a diagnosis of diabetes, suggesting a prediabetic continuum that may not be captured by conventional lab work until it is too late.1,2

Similarly, the role of inflammation in the development of diabetes has long been known. Elevated inflammatory markers such as C-reactive protein and interleukin-6 can predict the development of diabetes.3,4 Additionally, inflammation of the islet cells in the pancreas may contribute to their dysfunction.5

A multi-pronged, personalized approach incorporating diet and lifestyle changes and targeted supplementation may help reverse the progression of the disease.

Testing

Insulin resistance can be measured using a variety of methods. The gold standard is a test called the hyperinsulinemic euglycemic clamp (HEC), which is invasive and costly, so surrogate measures are often used.6 These can be based on the results of an oral glucose tolerance test (OGTT) or fasting blood tests and include the homeostasis model of insulin resistance (HOMAIR), the quantitative insulin sensitivity check index (QUICKI), and the fasting insulin resistance index (FIRI), which researchers have concluded correlate with the HEC.6

Inflammation is most commonly measured using high-sensitivity C-reactive protein (hsCRP), but other markers of inflammation include tumor necrosis factor alpha (TNF-α), interleukin-6, and ferritin. New inflammatory markers linked to the progression of diabetes are still being identified.7

Problems with Current Treatments

The use of exogenous insulin in type 2 diabetes may actually worsen insulin resistance. In animal models, administration of insulin lowered blood sugar at first, but after 10 days of insulin therapy, the rats showed signs of insulin resistance and glucose intolerance.8 This may occur due to insulin’s inhibitory effect on AMP-activated protein kinase (AMPK), which modulates GLUT transporters that allow glucose into cells.9

In contrast, the drug metformin works by suppressing hepatic glucose production and, to a lesser extent, by activating AMPK in the liver and muscle cells, which increases cellular glucose uptake.10 However, the benefits of metformin do not come without side effects. Gastrointestinal disturbances including gas and nausea are common, and long-term use can lead to deficiency in vitamin B12.

Diet

An eating pattern that targets the underlying root causes of diabetes should be implemented. Anti-inflammatory diets such as the Mediterranean diet have been shown to lower blood glucose, BMI, and cardiovascular risk factors in people with type 2 diabetes.11

Diets high in plant phytoneutrients are also beneficial. Anthocyanins have been shown to improve insulin resistance via multiple mechanisms, including increasing AMPK, increasing the number of GLUT receptors in cell membranes, and decreasing hsCRP.12 Quercetin, a polyphenol found in onions, apples, green tea, and other fruits and vegetables, has been shown to decrease inflammatory cytokines.13

Low-carbohydrate diets are another strategy that may be effective in managing type 2 diabetes. A systemic review found that low-carbohydrate diets were at least as effective, and in some cases more effective, at achieving glycemic control, decreasing body weight, and improving cardiovascular risk markers as low-fat diets.14

In one study, a low-carbohydrate (< 50 g/d), low-saturated-fat diet was compared to a high-carbohydrate diet in people with type 2 diabetes for 1 year. The study found that participants following the low-carbohydrate diet achieved greater improvements in lipid profile, better glycemic variability, and lower diabetes medication requirements compared with the high-carbohydrate diet group. Weight loss was similar across groups.15

Finally, intermittent fasting may have a role in treating people with type 2 diabetes. Animal studies have suggested that intermittent fasting may improve insulin sensitivity and preservation of pancreatic beta cells.16 Additionally, intermittent calorie restriction may increase AMPK signaling and decrease inflammatory markers.17

Supplements

There are several supplements that may useful in the treatment of type 2 diabetes by supporting glucose metabolism, improving insulin sensitivity, and reducing inflammation.

Berberine: Berberine is a plant alkaloid that may help increase

Melissa Groves, RDN, LD, is the owner of Avocado Grove Nutrition & Wellness in Portsmouth, NH, where she specializes in women’s health and hormones, with a focus on PCOS and fertility. She is also a contributing author for Healthline and other publications. She is the current DIFM Social Media Chair and is also on her state AND board as Professional Development Co-Chair. She received her BA in English and Dance from Hofstra University and worked in NYC as an advertising copywriter for 15 years before going back to school to become a dietitian. Melissa can be reached at contact@avocadogrovenutrition.com.
glucose uptake into cells by upregulating AMPK and increasing the activity of GLUT transporters. Animal studies have shown that berberine lowers blood glucose and decreases weight in diabetic rats. Furthermore, berberine has antioxidant and anti-inflammatory properties. Dosing for type 2 diabetes in studies ranges from 0.2 to 10 g/day.

Chromium picolinate: Chromium is a mineral essential for carbohydrate metabolism. Studies have shown it can lower fasting blood glucose and hemoglobin A1c in people with type 2 diabetes. Doses above 200 mcg/day may be more beneficial.

Alpha lipoic acid (ALA): ALA is an antioxidant that improves glucose uptake and has anti-inflammatory properties. It may be beneficial in preventing and treating diabetes and reducing the risk of complications such as retinopathy, neuropathy, and cardiovascular disease. Doses used in studies range from 300 to 600 mg.

Cinnamon: Cinnamon has been shown in studies to lower fasting glucose and hemoglobin A1c levels in people with diabetes. In a review of the research, doses ranged from 120 to 6000 mg a day, and all studies showed some glycemic control benefits. However, it appears that cinnamon alone may not be enough to achieve treatment goals recommended by the American Diabetes Association (fasting glucose < 130 mg/dL and/or HbA1c < 7.0%). Therefore, it may best be used in combination with other treatments or as a culinary spice.

Inositol: Inositol may play key roles in the development of diabetes and its complications. Inositol is produced naturally in the body, with highest expression in the testes, ovaries, pancreas, heart, and placenta. Diets high in refined carbohydrates and vegetables are low in inositol. Additionally, inositol dysregulation has been identified in several conditions associated with glucose dysregulation, such as polycystic ovarian syndrome. Furthermore, high glucose levels inhibit inositol availability. Animal studies have suggested that inositol supplementation may reduce blood glucose and insulin resistance. A small study in humans showed a reduction in hemoglobin A1c with 1 gram of d-chiro-inositol plus 400 mg of folic acid daily for 24 weeks.

Gymnema sylvestre: Gymnema sylvestre is an herb with a long historic use in Ayurvedic medicine for diabetes. Studies have shown that it has hypoglycemic and anti-inflammatory effects and may work by stimulating pancreatic beta cells to increase insulin production. Small human studies have shown a reduction in postprandial glucose levels and hemoglobin A1c with a dose of 1 g/day.

Bitter gourd: Bitter gourd (Momordica charantia) is another herb that has been used in Ayurvedic medicine as well as in parts of Asia, South America, and East Africa. Studies have shown that it has hypoglycemic and lipid-lowering properties and may work by repairing damaged pancreatic beta cells to improve insulin production. It also may improve insulin sensitivity. In one study in 95 people with type 2 diabetes, bitter gourd (dosed at 2 grams or 4 grams a day) was found to show significant reductions in hemoglobin A1c and fasting plasma glucose, although the reductions were less than those seen with the diabetes medication glibenclamide. However, while the bitter melon groups showed improvements in cardiovascular risk factors including blood lipids, body weight, and blood pressure, people in the medication group showed worsening in these measures over the 10-week study.

Other supplements: Other supplements that may be of use in the treatment of diabetes include biotin and other B vitamins, vitamin D, magnesium, zinc, omega-3 fatty acids, mangosteen, curcumin, and fenugreek, although more research is needed. Additionally, nutraceuticals including resveratrol, quercetin, and EGCG may help activate the AMPK pathway, increasing glucose uptake through GLUT transporters.

Lifestyle Recommendations

Functional medicine practitioners take a holistic approach to wellness and often counsel patients on the importance of lifestyle changes for a whole-body approach to health. In the case of type 2 diabetes, exercise, sleep, and stress management are key.

Exercise: The link between physical activity and improvements in diabetes is well known. Furthermore, sedentary behavior has been strongly associated with the risk for developing type 2 diabetes. Studies have shown that regular physical activity improves insulin sensitivity by increasing AMPK activity. Additionally, exercise lowers inflammation in the body directly by lowering inflammatory cytokines and indirectly by effecting changes in body composition.

Sleep: Regular sleep may be linked with a lower risk for developing type 2 diabetes. Duration of sleep and risk for diabetes show a U-shaped relationship, with the most protective effects occurring with 7 to 8 hours of sleep per night. Too little or too much sleep was associated with a higher risk for developing the disease. Additionally, long-term sleep debt has been associated with long-term metabolic disruption and insulin resistance. In a prospective study in people with early type 2 diabetes, those with weekday sleep debt were 72% more likely to be obese at baseline. At 12 months, for every 30 minutes of weekday sleep debt, the risk for obesity rose 18% and the risk for insulin resistance rose 41%.

Stress management: Chronic stress has been linked to a higher risk for developing type 2 diabetes. In particular, high levels of nighttime cortisol have been linked to higher fasting plasma glucose, hemoglobin A1c, and higher 2-hour plasma glucose. A flattened diurnal cortisol curve was also associated with a higher risk for developing the disease.

Yoga is one popular stress management technique that may show benefit for type 2 diabetes. In a systematic review and meta-analysis of studies on adults with type 2 diabetes, yoga significantly improved hemoglobin A1c levels as well as lipid profiles, BMI, blood pressure, waist-to-hip ratio, and cortisol levels.

Meditation has also been shown to improve glycemic control
in people with diabetes. In a small study, participants who completed a Buddhist walking meditation on a treadmill were compared with those who walked on a treadmill without meditating. After 12 weeks, both groups showed significant reductions in fasting blood glucose, but reductions in hemoglobin A1c, blood pressure, and cortisol levels were seen only in the meditation group.

Conclusion

Type 2 diabetes is a multifactorial disease process stemming from insulin resistance, inflammation, sedentary behavior, sleep deficits, and chronic stress. Additionally, biochemical pathway dysregulation has been identified, especially a decrease in activation of the AMPK pathway, which mediates cellular glucose uptake in an insulin-independent manner. From a functional medicine perspective, dietary strategies, nutritional supplements, and lifestyle recommendations that encompass exercise, sleep, and stress management may all be necessary to improve markers of type 2 diabetes and decrease risk for complications.

References


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The study found that the men who drank pomegranate juice maintained more of their post-exercise arm strength when compared to the placebo group. A similar trend was seen in the knee though it did not reach statistical significance. Although this research is promising, additional clinical research is needed to establish causation and the potential impact of pomegranate polyphenols on exercise.

[1] Seeram et al., 2008
[2] Trombold et al., 2011

*Not a low calorie food, see nutrition information for sugar and calorie content
Positive Impacts of Meditation and Relaxation Practices on Diabetes

Lisa R Schmidt, MS, CN, CYT, SEP®
Mindful Wellness Dietitian Nutritionist/Consultant/Researcher

Lisa Schmidt is a Professor at Arizona State University and a private practice dietitian located in Scottsdale, Arizona. Her specialized training in mindfulness-based stress management and mindful eating includes two MS degrees in Nutrition and Clinical Health Psychology from Bastyr University and advanced training and certification in yoga, meditation, and Somatic Experiencing. Ms Schmidt teaches courses on stress management and mindful eating at Arizona State University, and is the author of two books: Sustainable Living and Mindful Eating (2015, Kendall Hunt Press) and Twelve Weeks to Mindfulness: A Worksite Wellness Program (2015, Mindful Benefits). Current research-based projects include development and validation of a Mindful Eating scale. Contact information: Lisa.R.Schmidt@asu.edu, or www.lisascmidtcounseling.com/contact.

Introduction

Stress is a potential contributor to chronic hyperglycemia in diabetes. Stress has long been shown to have major effects on the body’s ability to self-regulate metabolism. Energy mobilization through the secretion of glucocorticoid hormones is a primary result of the fight-or-flight response. Stress stimulates the release of up to 60 hormones, which often lead to elevated blood glucose levels. Although this is of adaptive importance in healthy individuals, in diabetes, as a result of the relative or absolute lack of insulin, stress-induced increases in glucose cannot be managed metabolically. In addition, evidence shows that regulation of these stress hormones may be difficult or impossible in diabetes. Studies with humans have shown consistent evidence regarding the role of stress in type 2 diabetes. Mindfulness practices, including relaxation training and meditation, are shown to improve blood glucose control in diabetic and healthy individuals. A mind-body integrative approach which includes daily meditation practices shows promise in improving outcomes for those with diabetes.

Emotional and physiological stress cause the body to secrete stress hormones into the bloodstream. For healthy individuals, the stress-induced blood sugar rise is followed by an increase of insulin secretion which keeps the moderate and temporary blood sugar rise in check. For those with diabetes, stress can cause a significant and prolonged increase in the blood sugar level. Over time, living with chronic stress impairs blood sugar control and exacerbates the body’s attempt to self-regulate. Whether or not one is living with diabetes, blood sugar control can be enhanced by intentional practices to support stress management.

Living with a diabetes diagnosis is stressful. Individuals must cope with different behaviors in order to manage their chronic health condition, including medications, adopting different eating regimens and exercise habits, and even injecting insulin. Living with diabetes requires significant adaptation and excellent coping skills. These changes are correlated with a high prevalence of anxiety and depression in diabetic individuals, with depression specifically often severe but ignored and unaddressed.

The practice of mindfulness holds promise for mitigating negative effects caused by stress. With measurable outcomes such as improvements in self-reported quality of life, lowered incidences of depression and anxiety, increased resilience, improved mood and individual resilience, and gains in physical health, an effective mind/body/spirit program as an adjunctive treatment for diabetes is a smart addition to a patient-care treatment plan.

For the integrative dietitian, experiencing science-based mindful interventions and noticing the physical and emotional effects demonstrate how to practice and teach interventions to clients. This improves client health outcomes, creating an integrative approach.

![Figure 1. Effect of Mindfulness Mediation on Various Domains of Diabetes Care. Reprinted with permission under CC BY-NC.](image-url)
to benefit the diabetic client’s experience with traditional dietetic treatment plans.

**What is Mindfulness?**

Mindfulness is about being fully aware of whatever is happening in the present moment, without filters or the lens of judgment. It can be brought to any situation. Put simply, mindfulness consists of building awareness of the mind and body and living in the here and now. This universal practice can be thought of as “mental training” where we learn how to notice and pay attention to our thoughts and feelings before they move into habit patterns that may cause stress and impact our relationships at work, home, or with family members.

Mindfulness is observing, watching, examining. You are not a judge, but a scientist of your own mind. This practice can profoundly impact stress levels, with positive results. Figure 1 describes the effects of mindfulness meditation on the various domains of diabetes care.

There are many ways to practice mindfulness. Some forms, such as meditation, body scanning, breath awareness, and focusing the mind on a word or an object, have been practiced for nearly 5000 years. Other mindful relaxation methods such as body-focused yoga, tai chi, qi gong, and progressive muscle relaxation are more recent adaptations of the practice of paying attention to the present moment. The practice is of calming the mind, noticing the body, and learning the signals the body sends when it is under duress. Through patient and diligent practice, one can train the mind to mitigate the effects of stressful situations, opening up one’s life to less emotional reactivity, increased stress tolerance, and fewer interruptions from intrusive, distressing thoughts. This improved self-awareness may support the diabetic patient’s ability to regulate and respond to self-care practices which support diabetes management.

**Life and Stress**

Living with stress and anxiety is much more prevalent than one might imagine. Millions of people are burdened by life’s challenges every single day—from difficult life events and balancing professional and personal responsibilities to acute pain, illness, and chronic health conditions. For the diabetic client, stress from the physiological demands of the illness as well as the psychobiological issues related to testing, monitoring, and regulating blood sugar can be profound. Most clients do not want to talk about stress and anxiety nor wish to face its causes. Stress is carried around in ways that exacerbate life challenges. Typical is the tendency to minimize, avoid, or altogether deny normal fears and feelings, resist talking about difficulties in problem-solving ways, or even practice ways to mitigate stresses. It is almost as if mental and emotional difficulties are a “no-go” zone, which is ironic, since all people universally face difficulties.

Emotions, such as stress, anxiety, tension, and fear, are all part of the human experience. But life experiences also contain positive emotions, such as love, comfort, relaxation, safety, and pleasure. Although most may prefer comfortable experiences to stressful ones, the nervous system helps us deal with anxiety-inducing experiences in a successful and balanced manner. Learning more about the nervous system, the way it helps us navigate life’s diverse experiences, and the ways we can help our nervous system change, learn, and adapt are ways to improve stress resilience and health outcomes.

Learning about the significant link between mindfulness and stress reduction by studying the mind-body connection helps improve awareness of promising stress interventions. As neuroscientists learn more about the brain and how neural pathways connect thoughts and emotions to the body, one can understand the stress response and how it can harm over time. On a positive note, the science of mindfulness provides ample tools to help increase understanding—and potentially change—the unconscious responses to stress. Physiological changes in the brain, which include increases in tissue volumes in some areas, occur through mindfulness practices. Other benefits include improved thinking skills, faster reaction times, and less inclination toward various forms of stress.10

**The Nervous System**

Knowing how the nervous system is designed can help one work with it more easily and more successfully. Working with the nervous system means having some impact over the biological stress response. The two main parts of the nervous system are the central nervous system (CNS), which is comprised of the brain and spinal cord, and the peripheral nervous system (PNS). See Figure 2. The PNS has two branches or divisions: the voluntary nervous system and the involuntary nervous system. Since one has both voluntary and involuntary controls built into the nervous system, it is possible to learn how to work with these controls and consciously regulate between states of stress and relaxation.10

The sympathetic nervous system (SNS) increases the rate of body processes, preparing humans for a “fight, flight, or freeze” response to real or perceived danger. The SNS also helps control all organs. When the body perceives danger or comes under stress, the SNS responds by stimulating some organs to work faster (like increasing the rate of breathing, the release of blood sugar to fuel muscles to “fight or flee,” or the heart rate to pump blood) and others to slow down (like digestion). This mobilization of resources results in the release of up to 60 stress hormones, which prepare us to “run away” from danger. The stress response does not discriminate between real and perceived danger. Instead, the SNS operates all the time, constantly energized, alert,
and ready to respond defensively at the first sign of danger. Whether life is truly threatened—or one is just angry about their chronic illness—the biological response is the same. Figure 2 shows the two branches of the nervous system, as well as the branches of the PNS.

The parasympathetic nervous system's job is to promote rest, which is key to healing and well-being. Think of the SNS as the “gas pedal” pushing humans forward in response to stress; the parasympathetic nervous system acts like the “brake.” As a complement to the SNS, the parasympathetic nervous system works in concert to restore equilibrium by adjusting whenever something pushes humans out of balance.

The SNS slows down when it is interrupted by the parasympathetic nervous system. Through the parasympathetic nervous system, one can intentionally develop the ability to shift the body from the

**Figure 2.** Parts of the Nervous System. Reprinted with permission.10

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**ACTIVITY PRACTICE: THREE-MINUTE GUIDED BREATH PRACTICE**

As we begin to pay attention to sensations in our bodies, we can learn how to return our distracted minds to the present and achieve greater awareness, compassion, and peace. Focusing on breathing is one way to anchor the mind; another is working to accept things the way they are. This might mean simply noticing and acknowledging stress or anxiety rather than repeating old patterns of running away from it. You may discover that by embracing your fear, you heal your heart. This is called the practice of mindfulness.

All the “practices” that we do in our mindful activity are simply that: practices, not “perfects.” Through practice, we become more skilled at noticing sensations in the body, thoughts in the brain, and habits of the mind. This gives us the chance to move away from “automatic pilot” and respond to stress with more skill. Learn to “feel” what you are hearing by

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**Figure 3.** Examples of Physiological Changes Resulting from Circulating Stress Hormones. Reprinted with permission.10
trying the following breath exercise.

**MINDFUL BREATHING**

Make yourself comfortable in your chair. When you do this exercise at home, you can sit in a chair, lie down, or sit on the floor in any comfortable position.

Take a few moments to settle in and become still. Congratulate yourself for taking time to practice self-care and mindful awareness.

Focus on your breathing wherever you feel it most prominently in your body. It may be at the nose, neck, chest, belly, or somewhere else. As you breathe in normally and naturally, be aware of breathing in; and as you breathe out, be aware of breathing out. Simply maintain this awareness of the breath, breathing in and breathing out.

There is no need to visualize or count your breaths; just notice your breathing in and out. Without judgment, watch the breath ebb and flow, like waves in the ocean. There is no place to go and nothing else to do—just be in the present, noticing the breath, existing simply one inhalation and one exhalation at a time. As you breathe in and out, be mindful of the breath rising on the inhalation and falling on the exhalation. Ride the waves of the breath, moment by moment, breathing in and breathing out.

From time to time, your attention may wander from your breathing. This is normal. When you notice this, simply acknowledge where you went and then gently bring your attention back to the breath. Breathe normally, naturally, and without changing the breath in any way. As you breathe in, think “soft”; and as you breathe out, think “belly.” Again, notice where you feel the breath in your body.

Think only about where you feel the breath. Repeat “soft” on the inhale and “belly” on the exhale. Use the words as an anchor for your mind. Soften - breathe - allow.

Mindfulness and Resilience

A study highlighting the link between mindfulness and resilience in the journal *Personality and Individual Differences* found that mindful people can better cope with difficult thoughts and emotions without becoming overwhelmed or shutting down emotionally. Pausbing and observing the mind may help us resist getting stuck in our story and as a result empower us to move forward. The qualities of resilience may be most strongly related to improvements in diabetic blood sugar control compared to other qualities.

Difficult emotions such as fear or anger are not the enemy. It is the reactivity toward these difficult emotions that is most harmful. Often when anger or fear is here, the lower brain is in charge. The lower brain is the oldest, most primitive part of the brain where the fight-flight/freeze response originates. It is responsible for maintaining survival. The more one goes over the scary or angry story, the more anger and/or fear one will feel and thus get caught up in reactivity. The lower brain does not have control over human actions—that is the job of the frontal cortex, the home of executive functioning.

When mindfulness is present, one supports the higher brain to see the bigger picture with calmness and clarity.

Mindfulness-based practices enhance client self-regulation of thoughts, emotions, and behavior, linking to higher compliance with diabetes self-management and individual well-being. In addition, mindfulness enhances social relationships, making individuals more resilient in the face of challenges, increasing task performance, and improving relationship quality, resilience, and decision making.

**Build a Diabetic Mindful Tool Kit**

What should one consider if you are interested in offering, promoting, or creating a mindfulness-based intervention for your diabetic clients?

Consider this: Practice yourself. If you think mindfulness for clients is a good idea, build your own personal practice and self-evaluate the benefits.

Implementation tools exist including Headspace® and Calm. Both are available online and as apps. Mind-Body STREAM, a 12-hour learning program available from The Ohio State University College of Medicine, is another potential way to provide a start for many
clients. Additional free meditation programming and learning tools are provided by the University of California at Los Angeles in podcast format.\textsuperscript{14} Consider a curriculum-based approach,\textsuperscript{10} either soft-copy or online delivery, customized for your clients. Finally, invest some time and resources with a consulting dietitian nutritionist skilled in both client mindfulness delivery as well as personal mindfulness practice. Design an intervention for your clients that addresses stress at its root cause. If all else fails, your own practice may be all you are able to control, and that gift to yourself may serve in ways that change your life, and your health, for the better.

References


Manufacturer of Hypoallergenic Nutritional Supplements

Zero Compromises. Pure Results.

FREE FROM:
- Wheat & gluten
- Egg
- Peanuts
- Trans fats & hydrogenated oils
- GMOs\textsuperscript{†}
- Magnesium stearate
- Artificial colors, flavors & sweeteners

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†Visit our website for more information on our GMO policy.
‡These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
A"s videos showed the shuffling gaits of multiple sclerosis patients being transformed into confident strides, the audience at the 2018 DIFM Symposium spontaneously burst into applause. These before-and-after videos were from the research lab of Dr Terry Wahls, one of the speakers at this year’s symposium. It was incredibly inspiring to see tangible evidence of how a nutrition-based program can improve neurodegeneration. Yet, this was only one inspiring moment out of many in a day full of informative presentations. The topics spanned cancer, neurodegeneration, research evaluation, and challenging case studies.

Mary Beth Augustine, RDN, CDN, FAND

Mary Beth Augustine spoke about DIFM’s new online tool, the Best Available Evidence Decision Tool. This tool helps RDNs evaluate the scientific research on a topic and provides guidance for how to proceed clinically based on the results. The tool does not itself contain literature or clinical recommendations; rather, it prompts the RDN to systematically search the literature to make the best possible clinical decisions.

Another key point of Ms Augustine’s talk was that out of all the recommendations in the Academy’s Evidence Analysis Library, most are not based on the highest levels of scientific evidence. In fact, about 22% are rated as Grade V, which is the lowest level of evidence. Grade V evidence includes case studies and expert opinion; it does not indicate whether something has been proven or disproven, it just means that there is limited evidence. Thus, gaps exist in all areas of practice, making it important to track clinical outcomes through ANDHII (Academy of Nutrition and Dietetics Health Informatics Infrastructure) to continually improve care.

Lise Alschuler, ND

Dr Lise Alschuler spoke about the metabolic drivers of cancer, starting with an overview of the biochemistry involved. As summarized in Table 1, tumors are made up of 2 types of cells: cancer cells, which are highly anabolic and proliferative, and stromal cells (ie, connective tissue cells), which are highly catabolic. The stromal cells support the cancer cells by providing them with energy substrates such as lactate and pyruvate—these substrates are products of upregulated glycolysis and autophagy (cell death). Unlike the stromal cells, which primarily use glycolysis, rapidly growing cancer cells use both glycolysis and oxidative phosphorylation (oxphos).

The cancer cells cannot survive without this support from the stromal cells. Upregulated glycolysis and autophagy in stromal cells are triggered by hypoxia and oxidative stress, as well as by cytokine signaling from the cancer cells themselves. While oxidative stress upregulates glycolysis in stromal cells, cancer cells are protected from oxidative stress by the upregulation of protective pathways. This metabolic pattern of tumors can be compared to an “unhealed wound”; upregulation of glycolysis in stromal cells to support the rapid growth of parenchymal cells is similar to what happens when there is a cut or wound that needs to be healed. However, in cancer this process does not stop and go back to normal.

Treatment Implications

So, what does this mean for treatment? Instead of just focusing on glycolysis, the key is to focus more broadly on inflammation and mitochondrial health. Dr Alschuler focused on metabolic stress, specifically obesity and insulin resistance, and how that can reduce inflammation. Key interventions described include caloric restriction, minimizing insulin resistance (IR), nutraceuticals, and botanicals.

Table 1. Metabolic Pattern of Tumor Cells

<table>
<thead>
<tr>
<th>Cancer Cells</th>
<th>Stomal Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Anabolic and proliferative</td>
<td>• Catabolic</td>
</tr>
<tr>
<td>• Both oxidative phosphorylation (oxphos) and glycolysis used</td>
<td>• Glycolysis is upregulated, oxphos is downregulated</td>
</tr>
<tr>
<td>• Trigger the stromal cells to upregulate glycolysis to supply energy sources</td>
<td>• Glycolysis and autophagy provide fuel substrates for cancer cell growth</td>
</tr>
<tr>
<td>• Protected from oxidative stress (eg, via NERF 2 upregulation)</td>
<td>• High oxidative stress → leads to upregulated glycolysis (eg, via HIF-1 upregulation)</td>
</tr>
</tbody>
</table>

The cancer cells cannot survive without this support from the stromal cells. Upregulated glycolysis and autophagy in stromal cells are triggered by hypoxia and oxidative stress, as well as by cytokine signaling from the cancer cells themselves. While oxidative stress upregulates glycolysis in stromal cells, cancer cells are protected from oxidative stress by the upregulation of protective pathways. This metabolic pattern of tumors can be compared to an “unhealed wound”; upregulation of glycolysis in stromal cells to support the rapid growth of parenchymal cells is similar to what happens when there is a cut or wound that needs to be healed. However, in cancer this process does not stop and go back to normal.
Interim Improves IR, reduces hepatic

Food sour

Impr

Not a drama

Selec

Most eff

Reduc

Most studies in animals

area of caloric restriction, based

on the work of Valter Longo. Water

fasting prior to chemotherapy causes
cells to protectively shut down.

However, cancer cells do not shut
down as easily, so normal cells are
preferentially protected. So far there
is little research, but early studies
suggest that STS leads to fewer
symptoms, including gastrointestinal

To reduce IR, caloric restriction is key! This is more important than the macronutrient profile of the diet; for example, research suggests that even a ketogenic diet is ineffective at lowering IR unless it is also hypocaloric. However, studies do show that diets with high glycemic load, high readily absorbed carbohydrates, and high ultra-

processed foods are all associated with worse cancer outcomes and worse IR. This may be because such diets are typically hypercaloric, low in nutrients, and, in the case of ultra-processed foods, may be associated with increased exposure to carcinogenic and endocrine-disrupting compounds (eg, from additives or packaging).

How to enact caloric restriction? Continuous caloric restriction is difficult and is not recommended during active cancer treatment; thus, strategies such as intermittent fasting, alternate day fasting, and overnight fasting are more promising options. Of these, overnight fasting of 13 to 16 hours may be the best option; it is accessible for patients, naturally leads to eating fewer calories, and has the added benefit of resetting the circadian rhythm.

Short-term starvation (STS) during chemotherapy is another area of caloric restriction, based on the work of Valter Longo. Water fasting prior to chemotherapy causes cells to protectively shut down. However, cancer cells do not shut down as easily, so normal cells are preferentially protected. So far there is little research, but early studies suggest that STS leads to fewer symptoms, including gastrointestinal

There is uncertainty in the area of ketogenic diets—although some studies show positive results, some aggressive cancer cells can efficiently use ketone bodies, and glucose deprivation may increase cancer adaptations that allow for survival in low-glucose environments. For these reasons, ketogenic diets may be best used only as a short-term strategy and as a strategy for brain cancer, which is especially dependent on glucose.

Nutraceuticals and Herbals

Dr Alschuler described a variety of nutraceuticals and herbs that can improve IR, briefly summarized in Table 2.

Dr Alschuler made a thorough case for metabolism dysregulation as central to carcinogenesis and that therapies targeting excess weight and IR are key. In addition to stress management, exercise, and mitochondrial support, key metabolic therapies include weight loss, caloric restriction, minimizing IR, and nutraceuticals. She provided a wealth of knowledge for improving cancer treatment and prevention, from a metabolic perspective.

Selected References (Lise Alschuler)


<table>
<thead>
<tr>
<th>Table 2: Nutraceuticals and Herbals to Improve Insulin Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Berberine</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Magnesium</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Cinnamon</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Gymnema sylvestre</strong></td>
</tr>
<tr>
<td><strong>Others: Fenugreek, green tea, blueberries</strong></td>
</tr>
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Dr Alschuler made a thorough case for metabolism dysregulation as central to carcinogenesis and that therapies targeting excess weight and IR are key. In addition to stress management, exercise, and mitochondrial support, key metabolic therapies include weight loss, caloric restriction, minimizing IR, and nutraceuticals. She provided a wealth of knowledge for improving cancer treatment and prevention, from a metabolic perspective.
The gut microbiome is disrupted in MS as compared to healthy controls and it is further disrupted in active MS versus stable MS. Thus, the diet is high in fiber and probiotic foods. Table 3 summarizes the components of the dietary intervention. Her overall protocol also includes meditation, stretching, and electrical stimulation to build muscle mass.

The studies published so far show that participants were able to adhere to the diet, with symptom improvement being a key motivation. Improvements were shown in fatigue, quality of life, mood, cognition, and motor function. So far these are small trials, but Dr Wahls pointed out that the improvements are among the largest yet seen in MS clinical research.

In addition to her MS research, Dr Wahls also runs a therapeutic lifestyle clinic at the University of Iowa VA hospital. Using a similar functional/paleo framework, the classes use a peer-support model to support diet and lifestyle changes for patients with a wide variety of conditions. They have seen significant improvements in blood pressure, hemoglobin A1c, and plasma lipids; many patients are able to reduce doses of narcotics and insulin. Despite the promising research results, her protocol is not recognized as a treatment for MS by mainstream organizations, and it is not validated by large trials. Dr Wahls noted that for those using this protocol in practice, it is important to be fully transparent about this with clients and with the public and to use disclaimers. As her research progresses, the protocol will hopefully gain mainstream acceptance as a promising treatment for MS and neurodegeneration.

Selected References (Terry Wahls)


Robin Foroutan discussed

Robin Foroutan talked about

Table 3. Modified Paleo Diet for Neurodegeneration

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving (varies based on appetite)</th>
</tr>
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<tbody>
<tr>
<td>Sulfur-containing vegetables (brassicas, alliums, mushrooms)</td>
<td>3 cups/day</td>
</tr>
<tr>
<td>Leafy greens</td>
<td>3 cups/day</td>
</tr>
<tr>
<td>Brightly pigmented veggies &amp; fruits</td>
<td>3 cups/day</td>
</tr>
<tr>
<td>Meat, poultry, fish, organ meats (vegetarians can have soaked &amp; pressure-cooked beans and gluten-free grains)</td>
<td>9-12 oz/day</td>
</tr>
<tr>
<td>Fermented foods, seaweed, nuts &amp; seeds, healthy fats and oils</td>
<td>Daily</td>
</tr>
<tr>
<td>NO gluten, dairy, eggs, processed foods, sugar</td>
<td>Avoid</td>
</tr>
</tbody>
</table>

Terry Wahls, MD

When Dr Terry Wahls first got into the field of multiple sclerosis (MS) and neurodegeneration, it was as a patient. After being diagnosed with MS in 2000, she dove into research, drawing from multiple sources to create a lifestyle and diet protocol that would ultimately take her from a reclining wheelchair to being able to walk, bike, and speak around the world about her work.

The dietary intervention she developed is based on a functional medicine and paleo diet framework with an emphasis on foods containing nutrients needed for neurological health. The diet is very nutrient dense. This is important due to a theory called “nutrient triage,” in which low micronutrient intake may not have an acute effect, but over time it can accelerate degenerative diseases.

Dr Wahls also emphasized that gut health is key to MS, due to the interactions between the gut, brain, and immune system. The gut

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how to approach challenging cases and presented several case studies. It is common knowledge that integrative and functional medicine is focused on finding the root causes of symptoms, but how should we go about doing this? Taking a very detailed health history is the most important step, as this helps identify clues; for example, did symptoms follow major stress or illness? Are there new food or chemical sensitivities? Did symptoms develop slowly, or suddenly? Is bloating in the upper or lower abdomen? Are there unusual cravings? Are symptoms cyclical? (Note: cyclical symptoms may be a sign of parasitic infections, which are surprisingly common in complex cases.)

Focusing on body systems is also important. The key systems include digestion, detoxification, oxidative stress/inflammation, immune function, hormonal balance, energy metabolism, cellular integrity, and nutritional status. These systems are all interconnected, which makes assessment a complex task. However, by identifying the core imbalances in these systems, further assessment, interventions, and evaluations can be planned. A key tenet of integrative and functional medicine is that “the body can heal itself”; however, sometimes it requires a lot of detective work to uncover underlying causes and help put the body back on the right path to health!

Conclusion

The 2018 DIFM Symposium featured excellent speakers and a wealth of information. It was inspiring to learn from integrative and functional medicine practitioners while surrounded by fellow DIFM RDNs. The tremendous potential of the integrative and functional approach was abundantly clear from the presentations, and it is exciting to see how this approach will continue to shape medicine and dietetics in the future.
Sharing Our Stories: Building Up Dietetics Through Advocacy

Taylor Newman, PhD/DI student from Tallahassee, FL, studying at the University of Georgia. Her research revolves around creating a sustainable fruit and vegetable prescription program that addresses both food insecurity and diet-related diseases in vulnerable populations. She truly believes that “food is medicine.” As a former White House intern, she is passionate about policy and will use her credentials as an RDN to advocate for better nutrition policies after graduation. Taylor is a member of the Academy of Nutrition and Dietetics and the Dietitians in Integrative and Functional Medicine practice group.

The security guards made me nervous. I checked the contents of my pockets out of paranoia once again before I climbed the steps into the Rayburn Building, but I was still uneasy. I pulled my blazer tighter around my waist to halt the October chill sweeping through the doors behind me. It made sense why I was anxious. It’s not unusual for RDNs to walk the halls of hospitals, schools, and corporations…but what about Capitol Hill? Do we belong there, too?

Despite my nerves, I say, “Yes.” I’ve been enchanted by policy since freshman year. After graduation, I interned at the White House under the Obama administration. Still, I felt like the black sheep as the lone dietetics student flanked by an infantry of political science majors. They were molded to be there—not me. I gained confidence, though, as I realized that nutrition is something that impacts all of us and that even as a student, I had a story to tell. I continued to pursue policy and recently served as the inaugural Student Representative of the Academy’s Legislative and Public Policy Committee. I hope to advocate for nutrition policies when I graduate with my PhD in Foods and Nutrition from the University of Georgia. Why? Because food—and people’s stories around food—matter.

Food and nutrition professionals dedicate their careers to food—something everyone engages with not only for survival, but for pleasure and comfort as well. Food is inexorably bound to our relationships and is therefore deeply personal. Our roles as RDNs, nutrition and dietetics technicians, registered (NDTRs), and dietetics students grant us access to that special relationship. We hear our patients’ and clients’ stories and see firsthand how the health care system is serving them—and how it is failing them. It’s our responsibility to take those stories and our experiences to legislators and provide a human touch to what can sometimes be a cold, regulatory policymaking process. These stories can shape how a policymaker casts a vote on issues that affect all of us, from food safety to the reimbursement of much needed preventive nutrition services. As story collectors, we also have the undeniable responsibility to be storytellers.

In October, I had the chance to be a storyteller with over 1400 nutrition professionals at the Academy’s Public Policy Workshop (PPW). PPW is an annual event that includes webinars around advocacy, a face-to-face training session, and a visit to Capitol Hill in Washington, DC, where Academy members meet with legislators or their staff to discuss critical nutrition-related issues. PPW immediately followed FNCE® for the first time in 2018.

This was my second visit on the Hill advocating on behalf of the Academy’s priority issues. This year, we were speaking to our state representatives and senators about the prevalence of malnutrition, the impacts it can have on patient outcomes, and how RDNs and NDTRs are critical, cost-effective players in its treatment and prevention. With a tense election only a few weeks away, the goal of our visit was simply to educate policymakers about malnutrition and lay the foundation for future conversations. We shared that patients experiencing malnutrition are 5 times more likely to die in the hospital and have a 54% increase in readmissions compared to non-malnourished patients. Further, hospital costs may be up to 100% higher for malnourished patients (eg, $25,000 vs $12,500).1

While the statistics were startling, the stories we carried with us from back home were what legislators and their staff would remember. I shared a story about an elderly man who was too malnourished after a gastrointestinal bleed to be discharged to a rehabilitation facility; after a nutrition intervention, he finally gained his strength back and had a chance to return to the independent life he enjoyed prior to admission. I shared how I entered a hospital room as a dietetic intern and saw a man with emaciated arms, loopng my fingers around my wrist to show the staffer just how small in circumference they were. My own family has not been spared from malnutrition. A long-time family friend was readmitted shortly after a hip replacement because he wasn’t consuming nearly enough nutrition to heal properly. These stories resonate in their rawness and relatability.

Our mere presence in a legislator’s office amplifies our role as RDNs, even if that’s not what we’re there to do. After talking with one staffer, a fellow Academy member and I asked if we could answer any other questions, expecting something related to malnutrition. Instead, they peppered us with questions on potential solutions to the childhood obesity crisis and what nutrition therapy for disordered eating looks like. They asked where RDNs work and what I wanted to do with my career when I graduated. Another staffer wondered how RDNs could address food access issues for their rural constituents. That’s when I realized our expertise is valued on Capitol Hill. Legislators and their staffs are interested, eagerly so, to learn more about what we do and how we can help the people they serve.

RDNs, NDTRs, and dietetics students belong in the halls of Capitol Hill. We leave a void for someone else to fill when we don’t speak up. Worse, by not advocating, we encourage silence.

I left this experience thankful for the Dietitians in Integrative and Functional Medicine practice group for supporting my time on the Hill and reaffirming my commitment to a career in public policy.

Reference:
What's New - Journal Reviews and Resources

Effects of Pharmacological Treatments on Micro- and Macrovascular Complications of Type 2 Diabetes: What is the Level of Evidence?

This nonextensive review of the literature suggests that, when compared with placebos in double-blind randomized control trials, antidiabetic drugs available on the market today do not have any clearly proven superiority in terms of reducing clinical events. These antidiabetic drugs have shown to reduce HbA1c levels, however, without showing a corresponding reduction in clinical effectiveness.


Light Exposure During Sleep May Increase Insulin Resistance

In a recent preliminary study at the Northwestern University Feinberg School of Medicine, 20 healthy adults, aged 18-40, were randomized into 2 groups (1 with light exposure, 1 without) for 3 days and 2 nights. The experimental group (DL group) slept 1 night in a darkened room (< 3 lux) and the other night in a room with an overhead light (100 lux). The control group (DD group) slept both nights in a darkened room (< 3 lux). Every morning following sleep, both groups had oral glucose tolerance tests performed. The results of insulin resistance were significantly higher (p < 0.05) in the DL group compared to the DD group; this effect was caused by increased insulin levels in the DL group compared to the DD group. This result suggests that just 1 night of light exposure can have an acute impact on insulin resistance. Insulin resistance occurs when the body’s cells are unable to respond to insulin to transport sugar out of the blood and into the cells and often precedes the development of type 2 diabetes. More research is needed to determine the impact of chronic overnight light exposure during sleep on metabolic function, specifically insulin resistance.


Effects of Probiotic Lactobacillus brevis KB290 on Incidence of Influenza Infection Among Schoolchildren: An Open-Label Pilot Study

The purpose of this open-label, parallel-group pilot study was to determine the effect of consuming a probiotic on developing influenza. The study was conducted in 15 elementary schools in Japan on over 1700 children ages 6-12 years old. The children were divided into 2 groups for the intervention. The treatment was a probiotic strain called Lactobacillus brevis KB290 containing 6 billion colony-forming units, isolated from a traditional Japanese pickle called “Suguki” and served in a nutrient mixture. Group A received the drink at school 5 days a week for 8 weeks in the first period and received no treatment in the second period. Group B received the drink for the same amount of time in the second period, but not the first. It was recommended that the subjects abstain from drinking the probiotic mixture (which is commercially available in Japan) outside of having it at school, and if they did drink it, they were required to state this in a study questionnaire. The questionnaire also asked whether the child had received the influenza vaccine, how many times the child consumed the probiotic drink, whether the child was diagnosed with influenza during the study, and whether the child was diagnosed with a cold or gastroenteritis. The results for the first period showed no significant difference between the two groups; however, it was determined that the first period (mid-October to mid-December...
of 2013) was an inadequate time frame to evaluate for the presence of influenza, as the influenza epidemic in the Japanese prefecture, in which the study was conducted, was reported as occurring from the end of January to the beginning of February 2014. The second period was conducted from mid-January to the beginning of March 2014, so this time frame was determined to be the appropriate time frame in which to perform statistical analysis. The groups were stratified into those that were vaccinated and those that were not. Of those that were not vaccinated in the second period, 23.9% of subjects were diagnosed with influenza in Group A (those that did not consume the probiotic) compared to 15.7% of subjects in Group B that were diagnosed (the group that was given the probiotic). There was a significant difference between the groups (p < 0.001), suggesting that regular consumption of the KB290 probiotic strain may help reduce the incidence of influenza during the flu season.


Hot Nutritional Genomics Topics


Gene variants which can affect risk of heart failure, peripheral atherosclerosis, and/or abdominal aortic aneurysm are described, including variants in the GPX4, SELENOP, and SELENOs genes.


For those with a higher genetic risk score/predisposition to high blood pressure, higher coffee intakes of > 3 cups/day were associated with a further elevation. Variants within or near the following genes were considered for this study: CYP1A1, CYP1A2, CPLX3, ULK3, and MTHFR.


This is a summary/description of presentations and discussions during a 1-day public workshop on nutritional genomics and epigenetics. This includes potential impacts on health maintenance and prevention, plus ethical and policy considerations. (Within PubMed, the various section headings shown there serve as links to their respective textual descriptions.)


Evidence was found that vitamin D may be helpful for prevention of muscle atrophy, such as sarcopenia, which can involve FOXO1 gene expression.


The potential of vitamin D to help protect insulin-secreting (beta) cells is described, including discussion of the following: VDR, BRD7, BRD9, and BAF chromatin remodeling complexes.


Gene-environment interactions are described in relation to food allergies/hypersensitivities, including a listing of monogenic disorders in Table 1 which are related to food allergies.


The emergence of genomics and other omics technologies are discussed in relation to P4 medicine (preventive, predictive, personalized, and participatory) for both diagnosis and treatment. Besides identification of potentially actionable gene variants/mutations, active patient participation is also considered.


The authors report on their successful efforts at genetics/genomics-related education among community health workers in Texas who are “indispensable” for public health outreach.

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Food Sobriety

By Dan Fenyvesi, MS, RDN
Paperback: $12.95
ISBN: 9780999593424

Dan Fenyvesi is a registered dietitian nutritionist with several years of experience helping clients and patients lose weight. Through his experiences, both as a graduate student and Fulbright Scholar in Nicaragua, Dan learned to recognize the different ways in which our modern food culture has departed from the simple ways of eating that were once common to food habits that glorify the ultraprocessed, catchy-sounding foods and fads displacing the nutrient-dense ordinary foods, such as vegetables, grains, and fruits—which are nourishing, simple to eat, and easy and come by.

The definition of sobriety, according to the Merriam-Webster dictionary, is “a mental state free of jesting or trifling, a voluntary restraint in the satisfaction of one’s appetites.” In the context of our neurotic modern food culture, the title Food Sobriety hits the nail on the head. In this book, Dan insightfully narrates the lessons he learned as a nutrition practitioner and educator in the impoverished Latin American country of Nicaragua; and he touches on almost every potential cause for the rise in obesity and chronic health issues that now affect this part of the world. The book is arranged in three parts. The first section contains the retelling of his personal weight loss journey, his path to becoming a registered dietitian, and the foundations to his proposed eating plan—what he coins “food sobriety.” In the second section, he simplifies the labyrinth-like world of nutritional science and provides the reader with a witty, easy-to-understand foundation of knowledge that empowers the layperson to be able to make the right choices when it comes to food. Dan reminds us that our relationship to food should be one that is mindful of the value of nourishment provided by simple foods and less susceptible to the flirtatious gratification of overly processed foodstuffs. He also exposes the modern foodscape and its tendency to overstimulate us with superfluous foods and targeted marketing campaigns, making the case that there is no need to overcomplicate our culinary experience or send our taste buds into hyperdrive. In the third part of the book, he shares his view on various societal aspects of the foodscape in Nicaragua and how it has affected the health of this and other countries in Latin America. He encourages us to consider the social aspects of our own food culture: where the food comes from, who the growers are, and how economical and societal beliefs and influences determine what ends up on people’s plates. Every chapter contains amusing illustrations to aid in the understanding of these various topics, eye-opening photographs from Dan’s time in Nicaragua, and other captures of life from this part of the world. From the preface to the last chapter, Dan’s engaging writing makes it hard to put the book down. Although Food Sobriety does include an eating plan and various diet tips, this is definitely not just another diet book—it is so much more that that! This is a book that you will wish all your patients, clients, and friends would read, too.

Anita is Student Member Services Co-Chair for DIFM and also helps with our social media marketing, previously with Instagram and currently with Twitter. She volunteers locally for the North Suburban Academy of Dietetics in the Northwest suburbs of Chicago. Anita completed her didactic program in dietetics and graduated with a bachelor’s degree in Food and Nutrition from the University of Alabama in 2015; she registered as a Nutrition and Dietetics Technician last year. Her area of practice is community nutrition. She is employed at a suburban Chicago food pantry as a nutrition programs assistant. Contact Anita at anitadavila2@gmail.com.
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2eatwell@gmail.com

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dana.eliardn@gmail.com

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marypurdyrd@gmail.com

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hepsalivinghealthy@gmail.com

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DelegateDIFM@gmail.com

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