



Vegetarian Nutrition

a dietetic practice group of the

eat right. Academy of Nutrition and Dietetics

RD Resources for Professionals:

Plant-based Diets in Diabetes

Approximately 25.8 million people in the United States, or 8.3% of the US population¹, have diabetes. Diabetes incidence has tripled between 1980 and 2010¹.

In addition, an estimated 79 million Americans age 20 years or older have pre-diabetes, a condition that increases risk of developing type 2 diabetes, heart disease and stroke.¹ Diabetes is associated with multiple health complications, including heart disease and stroke, blindness, kidney disease and non-traumatic lower limb amputations. Vegetarian diets are associated with a number of health benefits, including a reduced risk of developing type 2 diabetes.² The Academy of Nutrition and Dietetics' Evidence Analysis Library (EAL) Vegetarian Nutrition Evidence-Based Nutrition Practice Guidelines state that a therapeutic vegetarian diet may be beneficial in treating type 2 diabetes and may reduce co-morbidities.³

Medical Nutrition Therapy (MNT) is important for the prevention and management of diabetes, as well as for the prevention or slowing of diabetes complications.⁴ The goals of medical nutrition therapy for people with diabetes are:

- Achieve and maintain optimal blood glucose, lipid and blood pressure levels.
- Prevent or slow the rate of development of chronic complications of diabetes by modifying nutrient intake and lifestyle.
- Address individual nutrition needs while respecting personal and cultural preferences and readiness to change.
- Maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.

Both vegetarian and vegan diets can easily satisfy these goals and may offer the following additional benefits:

- 1. Lower total cholesterol and LDL levels, lower blood pressure and a reduced risk for cardiovascular and ischemic heart disease.²** These benefits are particularly advantageous to people with diabetes as it is one of the top risk factors for cardiovascular disease. The benefits of vegetarian diets in reducing the risk of cardiovascular disease are likely due to a myriad of factors including reduced intake of saturated fat and cholesterol, and greater consumption of phytochemicals (such as flavonoids and isoflavones), potassium, dietary fiber, nuts, soy and plant sterols. Vegetarian and vegan meal plans have been successfully used as interventions for heart disease.³
- 2. 50-100% higher fiber intake than non-vegetarians.²** High-fiber vegetarian diets are associated with improved blood glucose in people with diabetes. Another advantage of high fiber meals is an increase in the feeling of fullness and delay of hunger by delaying gastric emptying, which can aid in weight loss. Additionally, soluble fiber has been shown to result in a decrease in blood lipids.
- 3. Lower body weight.²** Vegetarians are generally leaner than non-vegetarians and vegans have been shown to have a lower body mass than all other diet groups.² Obesity increases the risk for type 2 diabetes and just 5-10% loss of excess body weight is associated with improved blood glucose control in people with diabetes. Vegetarian diets are effective for both short-term (less than a year) and long-term (more than a year) weight loss.³

4. Lower saturated fat intake which can reduce insulin resistance. Intake of saturated fatty acids is associated with markers of insulin resistance and increased risk of type 2 diabetes. In clinical trials, saturated and trans fats have been shown to cause insulin resistance, whereas mono-, poly- and omega-3 fatty acids do not have an adverse effect.⁵

Planning Vegetarian Diets for Clients with Diabetes

At the initial meeting with a client, it is important to assess their knowledge and beliefs on vegetarian diets as well as their motivation for making the change to or following a vegetarian lifestyle. Research indicates that dietary patterns based on health beliefs may not be as strictly followed as those dietary patterns based on religious or moral convictions.³ The Registered Dietitian (RD) should support the lifestyle choices of the client and provide guidance to meet their nutrition needs. According to the EAL, adherence to therapeutic dietary changes and health outcomes improve with intensive support including frequent visits with the RD, cooking demonstrations, and incentives (such as savings cards at local markets). The Academy’s Vegetarian Nutrition Tool Kit can provide valuable guidance on planning nutrition education for the vegetarian client.⁶

The foundation of a diabetes meal plan is consistent carbohydrate intake throughout the day (especially for those not on insulin), lean protein and a small portion of healthy fat at each meal. For the vegetarian client with diabetes, this is still the base meal plan, however, care is given to substituting plant proteins for animal proteins. Choosing higher fiber carbohydrate foods will reduce impact on postprandial glucose levels. Each person with diabetes should receive an individualized eating plan.⁴

Carbohydrates

Carbohydrate is the nutrient with the greatest impact on postprandial glucose levels. It is a common belief that a low-carbohydrate diet is the ideal way to manage diabetes. However, low carbohydrate diets have not been shown to improve glycemic control.⁷ Carbohydrate foods are rich in energy, fiber, vitamins and minerals and are generally considered an important part of a healthy, satisfying diet. The minimum amount of daily carbohydrates per the Dietary Reference Intake is 130 grams/day.⁸ Encourage clients to choose nutrient-dense carbohydrate choices such as fruits, vegetables, legumes and whole grains on a regular basis.⁴ Choosing higher fiber carbohydrates

Sample Vegetarian Meal Plan with 45-60 grams carbohydrate per meal

1800 – 2000 calories depending on brand of items and snack choices

Meal	Menu	Carbs
Breakfast	4 ounces scrambled tofu	9 grams
	½ cup diced potatoes	15 grams
	½ cup diced bell peppers	2 grams
	Small orange	15 grams
	Breakfast soy sausage patty	3 grams
	One slice whole grain toast	15 grams
	1 teaspoon margarine	0 grams
	Tea or coffee (without sugar)	0 gram
Lunch	1 cup vegetarian chili	30 grams
	6 whole grain crackers	15 grams
	2 cups tossed salad with mixed veggies	5 -15 grams
	1 tablespoon vinaigrette salad dressing	0 grams
	Carbohydrate-free beverage	0 grams
Dinner	1 cup sautéed mixed low carbohydrate vegetables	15 grams
	2/3 cup cooked quinoa	30 grams
	2 teaspoons olive oil	0 grams
	4 ounces stir-fried seitan	15 grams
	No or low-carbohydrate beverage	0 grams
Snack Ideas	17 grapes	15 grams
	1 ounce nuts	4 grams
	Raw carrots with 2 tablespoons hummus	4 grams
	¾ cup soy low fat yogurt	15 - 20 grams
	1 stalk celery with 1 tablespoon natural peanut butter	4 grams

Table 1: Sample Vegetarian Meal Plan with 45-60g carbohydrates per meal

(whole grains, legumes, beans, vegetables, fruits) can slow postprandial glucose rise.

To develop a vegetarian meal plan utilizing carbohydrate counting, work with the client to come up with a reasonable carbohydrate ‘budget’ in grams or servings/choices and emphasize minimally processed, high fiber food choices to lessen postprandial glucose rise. Consistent carbohydrate spacing throughout the day is generally recommended to ensure less variability

RD Resources for Professionals: Plant-based Diets in Diabetes

in postprandial glucose readings. Three meals a day, plus snacks as needed, containing high quality carbohydrates is the basis of a well-balanced meal plan. The use of glycemic index (GI) and glycemic load may be beneficial in managing glucose as the lower glycemic foods raise glucose more slowly, but research has not been sufficient to adopt this approach for all clients.⁴ However, vegetarian diets can easily contain low GI foods when choosing whole plant foods and legumes, because of their high fiber content. Carbohydrate choices should be individualized to meet the needs and preferences of the client – remember that there is no single ‘diabetes diet.’

A common MNT diabetes education meal planning tool is the ‘Plate Method.’ This can be used for vegetarian meal planning as well by simply exchanging plant protein for the animal protein section and offering suggestions for alternate dairy sources.

Pre- and post-meal glucose monitoring is a valuable tool to determine effects from various carbohydrates foods. Table 1 provides a sample day’s vegetarian/vegan menu consisting of about 45-60 grams of carbohydrate per meal and 15-30 grams carbohydrate per snack. This menu can be used as a template to make other menus by substituting alternate protein sources, various grains and assorted fruits or vegetables. The Academy’s Nutrition Care Manual provides excellent client materials on vegetarian meal planning and offers a sample vegetarian one day menu.⁹

Fat

Diets for people with diabetes should be restricted in saturated fat, trans fat and cholesterol to reduce the risk for coronary artery disease. The American Diabetes Association (ADA) recommends <7% total energy from saturated fat, <200 mg cholesterol and minimal trans fatty acids daily. Vegetarian and vegan diets are typically lower in saturated fat and cholesterol¹⁰ and vegan diets are free of cholesterol. Reduction of total fat can be helpful if weight loss is a goal.¹¹ Very low fat diets have been used with some success to reduce insulin needs in patients with diabetes.¹² However, there is some evidence that an increased intake of monounsaturated fats may improve triglyceride metabolism, reduce blood cholesterol levels without lowering HDL-cholesterol levels, improve blood glucose control and reduce insulin resistance. Nuts, olives, canola and olive oils and avocados are high

in monounsaturated fats. Omega-3 fatty acids may help to lower triglyceride levels.¹⁰ Plant sources of the omega-3 fat alpha-linolenic acid include flaxseeds, flaxseed and canola oils, chia seeds, soy and walnuts. A plant source of long chain omega-3 fats, DHA and EPA are algae supplements.

Protein

Vegetarians typically consume diets that are between 10-14% protein.¹⁰ Dietary protein needs can be adequately met in vegetarian and vegan meal plans.⁹ Consumption of complementary proteins at the same meal is not necessary; a variety of plant foods should be eaten throughout the day in order to provide all of the essential amino acids.⁹ While protein foods are generally not counted in the carbohydrate ‘budget’ for those with diabetes, be aware that some plant proteins may also contain carbohydrate (combination foods such as legumes) and should be counted as such. The limiting amino acids in cereals are lysine and threonine. In the case that a client is vegan and relies primarily on grains, the recommendation is to increase intake of legumes, soy foods and other high lysine plant foods such as quinoa and pistachios.⁹

Many of the plant-based protein sources have beneficial qualities for those with diabetes:

Legumes: Legumes, also known as beans, are not only an excellent, affordable source of plant protein, but are also a rich source of soluble fiber (aids in reduction of cholesterol and blood glucose), naturally low in fat, cholesterol-free, and high in vitamins and minerals. Legumes contain resistant starch which resists digestion and ferments into short-chain fatty acids, which have potential health benefits, including helping with glucose control and insulin sensitivity.¹³ A diet rich in legumes can improve many aspects of diabetes control, including blood glucose and lipids.¹⁴ The soluble fiber in beans slows the passage of glucose from food into the bloodstream and slows the postprandial rise in blood glucose. The improvement in blood lipid levels can help prevent heart attacks and strokes, a common risk in people with diabetes. In spite of contributing protein, keep in mind that beans contain carbohydrate. One half cup of cooked beans contains about 15 grams of carbohydrate.

Soy: Soy products are associated with reduced LDL cholesterol levels,¹⁵ contain soluble fiber which improves blood glucose levels, and provide soy isoflavones which may help reduce inflammation related to heart disease. Soy protein is available in a

RD Resources for Professionals: Plant-based Diets in Diabetes

variety of forms including soy beans, soy milk, yogurt and cheese, soy nuts, tofu, tempeh (fermented soy beans), soy nuts and nut butters, textured soy protein and meat substitutes.

Meat Substitutes: Many varieties of meat substitutes are available for vegetarians. One does not have to eat meat substitutes to obtain adequate protein in their diet, but for some, these 'faux' meats help add variety, texture and can help ease the transition to a plant-based diet. They are becoming much more mainstream and are frequently available and affordable at most local and national grocery stores as well as natural food stores. In addition to soy, meat analogs can be derived from gluten (seitan or 'wheat meat') or mycoprotein (Quorn). Most meat substitutes are lower in saturated fat and cholesterol than their meat counterpart, and therefore, are excellent choices for those with diabetes. Sometimes meat substitutes contain carbohydrates (such as a veggie burger made from grains), so it is important to check labels for content. Be aware that not all meat substitutes are vegan (may contain animal products such as eggs or cheese).

Special Needs

Vegetarian diets can be developed to meet the needs of children with diabetes and for women with diabetes during pregnancy and lactation.

Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable severity with onset or first recognition during pregnancy. During pregnancy, it is important to promote adequate energy intake and to achieve and maintain normoglycemia and the absence of ketones. Meal planning for women with GDM includes carbohydrates throughout the day (often 3 meals with 3-4 snacks). Vegetarians with GDM should increase intake of low carbohydrate plant proteins (soy, cheese, nuts) and fiber (20-35 grams daily).^{16,17} A vegetarian diet can be used successfully in GDM, however, consultation with a registered dietitian is strongly recommended to ensure that individual needs are met.

Metformin and Vitamin B12¹⁸

Metformin (also called Glucophage) is a common oral medication used to treat type 2 diabetes (and occasionally pre-diabetes). Metformin has been shown to decrease intestinal absorption of B12 in some

patients and may also lower B12 serum concentrations. In order to prevent deficiency since there is no plant source of vitamin B12, vegans should include a reliable source of B12 such as fortified foods or supplements; for vegetarians, reliance upon B12 lab values can be the deciding factor of whether to supplement. More information about vitamin B12 can be found in the RD Resource, Vitamin B12 in Vegetarian Diets.¹⁹

Making the Transition to a Vegetarian Diet

Clients with diabetes transitioning to a plant based diet for varying reasons will need assistance choosing new and different foods, learning how to prepare these foods and where to shop for them. A list of local stores that carry a variety of vegetarian foodstuffs can be very helpful, as well as advising on websites that offer recipes for their new way of cooking. Table 2 provides resources for vegetarian and diabetes information.

It is important to remember that there are many ways to manage diabetes and the optimal mix of macronutrients for meal plans varies from individual to individual.²⁰ Monitoring carbohydrate remains a key strategy to reach glycemic control. The RD should work with the patient to determine what best suits his/her needs.

While shifting to a more plant-based diet can certainly be advantageous to the person with diabetes, when people using oral medications or insulin to manage their diabetes make any type of dietary change, close monitoring of blood glucose is crucial. If changes are made gradually, the person can monitor blood glucose and work with their doctor to make changes in medication accordingly. A sudden change in diet may produce immediate changes in insulin needs. In this case, the diabetes care team may choose to reduce insulin or oral medications prior to the dietary changes.

The RD, as a valuable member of the diabetes care team, can assist clients in following a diabetes-friendly vegetarian meal plan and enable them to be confident in their vegetarian lifestyle. The RD can also make suggestions to the team or physician about medication adjustments that may be needed as their clients make dietary changes or improve glycemic control as a result of their new lifestyle.

Resources

AND Nutrition Care Manual www.nutritioncaremanual.org

Vegetarian Nutrition DPG www.vndpg.org

Vegetarian Nutrition DPG Consumer website www.vegetariannutrition.net

AND Diabetes Mellitus Toolkit www.eatright.org

AND Vegetarian Nutrition Toolkit www.eatright.org

Vegetarian Resource Group www.vrg.org

Physician's Committee for Responsible Medicine www.pcrm.org

Vegetarian Recipes www.vegweb.com

American Diabetes Association www.diabetes.org



References

- Centers for Disease Control and Prevention. 2011 National Diabetes Fact Sheet. <http://www.cdc.gov/diabetes/pubs/estimates11.htm>
- Craig WJ, Mangels AR Position of the American Dietetic Association: Vegetarian diets. *J Am Diet Assoc.* 2009;109:1266-1282.
- Academy of Nutrition and Dietetics Evidence Analysis Library (EAL), Vegetarian Nutrition Evidence-Based Nutrition Practice Guidelines.
- American Diabetes Association (ADA) position paper on Nutrition Recommendations and Interventions for Diabetes, Medical Nutrition Therapy. *Diabetes Care.* January 2008 vol. 31 no. Supplement 1 S61-S78.74.
- Vessby et al. Substituting dietary saturated fat for monounsaturated fat impairs insulin sensitivity in healthy men and women: The KANWU study. *Diabetologia* 2001;44:312-319.
- Academy of Nutrition and Dietetics Vegetarian Nutrition Toolkit (due Spring, 2013)
- Kodama et al. Influence of fat and carbohydrate proportions on the metabolic profile in patients with type 2 diabetes: a meta-analysis. *Diabetes Care.* 2009; 32:959.
- USDA Food and Nutrition, National Agricultural Library, DRI Tables. http://www.iom.edu/Global/News%20Announcements/~/_media/C5CD2DD7840544979A549EC47E56A02B.ashx. Accessed 11/15/12.
- Academy of Nutrition and Dietetics Nutrition Care Manual. www.nutritioncaremanual.org.
- Mangels, R, Messina M, Messina V. *The Dietitian's Guide to Vegetarian Diets*, 3rd Edition. Jones & Bartlett Learning, LLC, 2011.
- Diabetes Prevention Program Research Group. Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin. *N Engl J Med* 2002; 346:393-403.
- Barnard ND, Cohen J, Jenkins DJ, et al. A low-fat, vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. *Diabetes Care.* 2006;29(8):1777-83.
- Robertson MD, Wright JW, Batt J, Russell-Jones D, Umpleby AM. Dietary resistant starch as an insulin sensitizer. *Diab Med.* 2009;(supp1):1-28. Abstract A37.
- Jenkins DJ et al. Effect of legumes as part of a low glycemic index diet on glycemic control and cardiovascular risk factors in type 2 diabetes mellitus. *Arch Intern Med.* 2012;172(21):1653-1660.
- Zhan, S, Ho SC. Meta-analysis of the effects of soy protein containing isoflavones on the lipid profile. *Am J Clin Nutr.* 2005;81:397-408.
- California Diabetes and Pregnancy Program. Guidelines for Care. State Program Guide. Maternal and Child Health Branch, State of California, 2005.
- Chatterjee, Sharmila, Use of a Vegetarian Diet in Gestational Diabetes. *Vegetarian Nutrition Update*, Volume XX, Number 4, 2012.6. Vegetarian Nutrition DPG, RD Resource for Professionals: Vegetarian Diets in Chronic Kidney Disease.
- McCulloch, D. Metformin in the Treatment of Diabetes Mellitus. <http://www.uptodate.com/store>. Accessed 09/30/12.
- Vegetarian Nutrition DPG, RD Resource for Professionals: Vitamin B12 in Vegetarian Diets. 2012.
- American Diabetes Association. Standards of Medical Care in Diabetes 2011. *Diabetes Care.* 2011;34:S11-S61.