

# Primary Care Reports™

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**Editor's Note**—*The field of diabetology is changing rapidly. Many new therapies are entering the health care market with amazing speed. Many primary care physicians (PCPs) find it difficult to keep up with the new options available for patients with both type 1 and type 2 diabetes mellitus (DM). Nutrition management is no different from this trend in pharmacology. Philosophies have changed, new products are available, and the whole arena of nutraceuticals has exploded in regard to nutrition in diabetes. This article will discuss the recent changes in philosophy in nutritional management in DM, the use of herbal supplements in DM, and nutrient-specific changes in nutritional guidelines in DM. Practical recommendations will be discussed in regard to how PCPs may best manage their patients with both types of DM in regard to nutrition care.*

## Changes in Philosophy Regarding Diabetic Diets

According to the latest clinical practice recommendations published in *Diabetes Care*, a professional journal of the American Diabetes Association, there is no such thing as a "diabetic diet" anymore.<sup>1</sup> Meal plans are tailored for individual patients based on nutritional assessment, diet histories, preferences including ethnic or regional preferences, and readiness to change dietary behavior. Many of the old theories about the best macronutrient mix for people with diabetes have been "thrown out." Table 1 illustrates a history of the preferred "diabetic diet" in which to treat patients.

## New Approaches in the Nutritional Management of Diabetes

Authors: **Anita B. Lasswell, PhD, RD, CDE**, President, Creative Nutrition Consulting, Vero Beach, Fla; and **William L. Lasswell, Jr., PhD, MD**, Endocrinologist, Doctor's Clinic, Vero Beach, Fla.

Certified diabetes educators and registered dietitians are the best health professionals to consult to counsel patients regarding changes in diet and tailor meal plans. The use of preprinted diet sheets distributed by a number of pharmaceutical companies is strongly discouraged by the ADA primarily because they do not address an individual's specific needs, preferences, and readiness.<sup>2</sup> If "survival" dietary information is needed, the USDA/DHHS Food Guide Pyramid is the best introductory piece for learning about healthy eating patterns.<sup>3</sup> This literature is available free of charge and is

downloadable from the USDA web site on the internet. The URL is: [http://pueblo.gsa.gov/cic\\_text/food/food-pyramid/main.htm](http://pueblo.gsa.gov/cic_text/food/food-pyramid/main.htm). The Food Guide Pyramid now is available in Spanish and various versions to accommodate ethnic preferences, and weight management strategies are also available to be downloaded from the web site.

## Nutrient Specific Updates in Nutritional Management of DM

### Carbohydrate

This macronutrient has been both heralded as a savior (complex carbohydrate, fiber) and a demon (simple carbohydrates) in the nutritional management of diabetes. For many years, we have assumed that the type of carbohydrate ingested would either rapidly raise blood glucose or delay the rise. Newer research has shown that it is the *total*

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amount of carbohydrate ingested during a meal that partly determines blood glucose excursions and not the type per se.<sup>4</sup> There is no reason why individuals with either type 1 or type 2 diabetes cannot ingest sucrose as part of their daily meal plans as long as the carbohydrate is counted into the total recommended daily intake. A caveat: When making substitutions to allow sucrose-containing foods, the presence of other nutrients frequently ingested with sucrose, such as fat, must be considered. A case in point: rich desserts such as pastries, cakes, or pies.

Fructose has the potential to cause increases in serum cholesterol and LDL cholesterol when ingested in large amounts ( $\geq 20\%$  of caloric intake), so it has no overall advantage as a sweetening agent in the diabetic diet.<sup>5</sup> Sugar alcohols such as sorbitol, mannitol, and xylitol produce a lower glycemic response than sucrose and other carbohydrates; however, they can cause significant laxative effects when ingested in large quantities.<sup>6</sup>

Carbohydrate counting is becoming a more popular method of dietary planning than the traditional exchange lists, especially for patients on intensive insulin therapy.<sup>7</sup> It has been found that the number of grams of carbohydrate ingested in a meal or snack largely determines increases in blood glucose. For example, a common algorithm used in carbohydrate counting states that for every 15 g of carbohydrate taken (regardless of source or type), 1 unit of fast-acting regular or lispro insulin is needed to "cover" that amount of carbohydrate. Table 2 illustrates some examples of 15 g carbohydrate equivalents.

The US Dietary Guidelines recommendation for carbohydrate intake is 50-60% of calories.<sup>8</sup> This figure should be used with caution for patients with diabetes as some individ-

uals may experience a rise in triglyceride levels on a high carbohydrate diet.<sup>9</sup> Therefore, nutritional recommendations should be tailored for each individual with diabetes. This is best accomplished with the assistance of a certified diabetes educator, registered dietitian, or other qualified nutrition professional.

## Protein

Levels of protein intake have been controversial in regard to nutritional management in DM, especially in terms of the prevention and treatment of diabetic nephropathy.<sup>10,11</sup> It is important to realize that the Recommended Dietary Allowances (RDA) for protein should be followed regardless of renal function status. The RDA for protein is 0.8g/kg body weight. US Dietary Guidelines recommend no more than 12-20% of calories from protein sources.

Americans eat far more protein than is necessary and high-protein diets do put stress on the kidney, most notably in terms of glomerular filtration rate (GFR) and may contribute to renal hypertension, which may initiate or exacerbate microalbuminuria.<sup>12</sup> Some authorities believe that modestly reducing the protein intake to 6g/kg of body weight may slow progression of frank diabetic nephropathy, but this intervention should be approached cautiously and with the assistance of a registered dietitian familiar with renal disease in diabetes and the consultation of a nephrologist.<sup>13</sup>

It was previously thought that primarily the "high biologic value" or animal-based protein was essential regarding repair, building, and maintaining body tissue, but more recent studies have shown the use of plant proteins and some of their health advantages previously unknown.<sup>14</sup> Newer research on soy-based proteins have shown additional benefits in terms of reducing cardiovascular risk and possibly cancer, but the best advice is to recommend foods containing soy protein rather than supplements.<sup>15</sup>

## Fat

It is now known that cardiovascular disease is the No. 1 killer of people with diabetes.<sup>16</sup> It is estimated that 80% of people with diabetes will die of atherosclerotic cardiovascular disease. Physicians need to be very aggressive in treating lipid disorders in patients with DM, and diet is certainly a cornerstone of this treatment. Total fat intake is not as important as the sources of fat ingested (the opposite of carbohydrate) except in patients who require weight reduction or those at risk of pancreatitis (individuals with triglyceride levels above 1000 mg/dL). The US Dietary Guidelines recommend that no more than 30% of total calories be ingested as fat. Again, though, some individuals with diabetes may do better with up to a 40% monounsaturated fat diet—it largely depends on the patient's lipid profile and health status.

Saturated fat intake is still considered to be the primary predictor of LDL cholesterol levels in the body and should not exceed 7% of caloric intake. Polyunsaturated fats lower LDL but also lower HDL and may increase cancer risk because of susceptibility to oxidation and increase in the unstable free radicals that form. Monounsaturated fats seem to be the safest fat sources to ingest. The "Mediterranean" diet that is so popular now is fairly high in monounsaturated fat and may reduce

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### Questions & Comments

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**Table 1. Historical Perspective of Composition of Meal Plans Used to Treat DM**

Year	Distribution of calories (%)		
	Carbohydrate	Protein	Fat
Before 1921	Starvation Diets		
1921	2	10	70
1950	40	20	40
1971	45	20	35
1986	< 60	12-20	<30
1994	*	10-20	*#

\*Based on nutritional assessment and treatment goals

#Less than 10% of calories from saturated fats

**Source:** American Diabetes Association. *Clinical Practice Recommendations. Position statement: Nutrition recommendations and principles for people with diabetes mellitus. Diabetes Care. 2000;23:(S1).*

hypertriglyceridemia that may afflict some people with diabetes who ingest high carbohydrate diets.<sup>17</sup> The “Mediterranean” diet, as it is referred to, is a diet commonly eaten in Greece and Italy where pasta, beans, and breads are the staples of the diet with meat used more as a condiment rather than an entrée. Olive oil is used generously in cooking and on spreads and sauces for breads and pastas, rather than dairy fats such as cream and butter.

An important note here: It is unwise to only treat patients with statin drugs without addressing diet as well, because proper dietary measures will augment the efficacy of pharmacotherapy.

### Calorie Levels

Patients with DM need individualized meal plans based on their lifestyles and preferences. Again, there is no place for rigid preprinted calorie restricted diet sheets in the nutritional management of diabetes. The main goal of energy nutrient intake is to achieve and maintain a healthy body weight. This is often unattainable in people with DM, and patients who are overweight or obese should be encouraged that even modest weight reduction (10-20 lbs) will improve their diabetes control, as well as blood pressure and lipid levels.

Hypocaloric diets and weight loss usually improve short-term glycemic control and have the potential to improve long-term control.<sup>18</sup> Traditional dietary strategies and low calorie diets have not been effective in achieving long-term weight loss.<sup>18,19</sup> The focus should shift from weight loss per se to achieving and maintaining near-normal blood glucose levels.<sup>20</sup> The arsenal of medications available for this goal has expanded greatly and should assist in this effort.

Just as important, discussions of physical activity should accompany any discussions of weight management as exercised muscle is much more insulin sensitive than unexercised muscle.<sup>21</sup> Simple physical activities that are aerobic and not stressful on the joints such as walking, dancing, gardening, or swimming are all good choices. Again, discussions should center around patient preferences and readiness. If patients with diabetes have made all the lifestyle changes they are able to

make and metabolic control has not improved, aggressive pharmacologic therapy should be instituted.

### Vitamins

Generally, there is no reason to recommend additional vitamin supplements for patients with diabetes, with the exception of women of childbearing age who wish to conceive. Multivitamins that contain 400 mcg of folic acid are recommended for this population regardless of health status.<sup>22</sup> Antioxidant vitamins may be beneficial, but there is little confirmatory evidence to support this intervention at this time.<sup>23</sup> A caveat: there is always a risk of overdosing on individual vitamin supplement intake when taken in doses as little as 4 times the recommended dietary intake such as in the case of vitamin D. Caution should be used with vitamin E, as large doses may compromise platelet aggregation.<sup>24</sup>

### Minerals

Minerals such as chromium and magnesium have received a lot of press in regard to their benefit in diabetes. The only known circumstance in which chromium replacement has any beneficial effect on glycemic control is in patients who are chromium deficient as a result of long-term infusion of parenteral nutrition solutions lacking in chromium. Most people with DM are not chromium deficient; therefore, no chromium supplementation is necessary.<sup>25</sup> Magnesium deficiency plays a role in insulin resistance, carbohydrate intolerance, and hypertension. Magnesium should only be supplemented if hypomagnesemia can be demonstrated.<sup>26</sup>

Potassium should only be supplemented in patients taking potassium-losing diuretics. Hyperkalemia sufficient to warrant potassium restriction may occur in patients with renal insufficiency, hyporeninemic hypoaldosteronism, or in patients taking ACE inhibitors.<sup>27</sup> Therefore, in those patient populations, potassium levels should be checked on a regular basis.

There is no reason to restrict sodium intake unless the patient has salt-sensitive hypertension or has frank diabetic nephropathy. There is never a reason to supplement sodium in the form of salt pills, even in athletes and exercisers who may lose excessive sodium through sweat. Normal intake of sodium-containing foods should be sufficient to offset losses.

Calcium supplements are now routinely recommended for women, regardless of health status, to prevent the onset of osteoporosis. Women with diabetes are at greater risk for developing osteoporosis—especially those people in poor glycemic control

**Table 2. Examples of 15 Gram Carbohydrate Equivalents**

- 4 oz 100% fruit juice or soft drink or 1 small apple, orange, peach, half banana; ½ cup canned fruit or applesauce
- 2 tsp jam, jelly, honey, sugar, syrup
- ½ cup cooked pasta, rice, cereal, mashed potato
- 1 slice bread, half bagel, 1 pita pocket, 1 small dinner roll
- 6 crackers, 2 c popped popcorn

due to calcium losses through excessive urination. The new recommended intake of calcium exceeds what most people in the United States ingest through diet; so routine supplementation of 500-1000 mg of calcium carbonate or other equivalent calcium salt is usually recommended by clinicians. However, it is important to note that physicians should encourage the use of high calcium foods first, assess the diet, and then prescribe any necessary supplements in order to achieve optimal calcium intake.

### **The Use of Nonnutritive Artificial Sweeteners and Fat Replacers in Diabetes Mellitus**

Artificial sweeteners have been used in the US marketplace for more than 30 years. Notably, saccharine has been around for more than 100 years. It was recently removed from being listed as a potential carcinogen by the FDA, and there is no reason why anyone can't use saccharin-sweetened foods and beverages. Aspartame is a more controversial sweetener as it is a dipeptide that contains phenylalanine. The American Diabetes Association position on the use of nonnutritive artificial sweeteners is that saccharine, aspartame, acesulfame K, and sucralose are approved for use in the United States by the Food and Drug Administration (FDA).<sup>28</sup> All food additives, including nonnutritive sweeteners have an acceptable daily intake (ADI) determined by the FDA. ADI is defined as the amount of a food additive that can be safely consumed on a daily basis over a person's lifetime without experiencing adverse events and includes a 100-fold safety factor. Actual intake by individuals with diabetes for all nonnutritive sweeteners is well below the ADI. Practical recommendations to patients include varying the types of artificial sweeteners used and using moderation and common sense.

Fat replacers are either 1) carbohydrate-based, such as modified food starch, dextrans, and maltodextrins, fibers, gums, and gels; 2) protein-based such as egg white or whey protein; or 3) fat-based such as emulsifiers or olestra, which is a nondigestible fat, approved by the FDA as a food additive in 1996. There is reasonable certainty of no harm regarding the use of fat replacers, but the health and nutrition benefits have been minimally explored.

The American Diabetes Association position on the use of fat replacers in DM is that foods with fat replacers have the potential to help people with diabetes reduce total and saturated fat intake.<sup>29</sup> The intended consequence for this is to reduce the increased prevalence of dyslipidemia in type 2 diabetes. These foods however, like any other foods, are subject to abuse, and for them to have any potential benefit people must learn to use them appropriately. Individuals with diabetes should receive self-management training on how to identify ingredients that are fat replacers on food labels, how to use the food label to determine serving sizes, and how to incorporate these foods into the meal plan. Additional research is needed to assess the effect of the use of fat replacers on the macronutrient content of the diet, metabolic parameters related to diabetes, and potential health and nutrition benefits for patients. Therefore, they need to be used in moderation and with caution.

### **Alcohol**

The use of alcoholic beverages can generally be safely incorporated into the diabetic meal plan if taken in modera-

tion and with food. Alcohol ingested alone may cause significant hypoglycemia as it inhibits gluconeogenesis in the liver when glucose is low in the bloodstream. Small amounts of alcohol (one drink = 12 oz beer, 1.5 oz distilled liquor, or 5 oz wine) eg, 1 or 2 drinks per day, when ingested with meals or snacks is usually not a problem for most people with diabetes. Alcohol is metabolized similarly to fat, and because it contains 7 kcal/g, 1 serving of an alcoholic beverage usually counts as 2 fat exchanges in the meal plan if caloric intake is monitored.<sup>30</sup> Patients should be counseled regarding the use of alcohol. When alcohol is mixed with carbohydrate-containing mixers such as tonic water, soda, or sweet syrups, the carbohydrate ingested with the alcohol needs to be figured in as well. Patients on medications in which alcohol is contraindicated should be counseled to abstain. Recommending abstinence applies to pregnant patients, individuals with other medical problems such as pancreatitis, dyslipidemia (especially hypertriglyceridemia or neuropathy), and those patients who are susceptible to or have a history of alcohol abuse as well.

### **Update on Methods to Institute Medical Nutrition Therapy in DM**

The "exchange list" system is an old tried and true method of teaching patients to follow a healthy diet. It is probably the most common diet-teaching tool used in diabetes care. It uses categories of foods that contain similar amounts of macronutrients that can be "exchanged" with one another to provide variety and balance in the diet. This method tends to work well with people who like structure and are somewhat compulsive. Patients who learn this method need to be literate but there are low literacy versions available.

A newer approach to dietary management in diabetes is carbohydrate counting in which only the grams of carbohydrate of the food ingested at a meal or snack are calculated.<sup>30</sup> Insulin needs are adjusted according to the amount of carbohydrate eaten. This approach is ideal for people with type 1 diabetes who are on intensive insulin regimens and who are not restricting caloric intake. It allows maximum flexibility without compromising diabetes control. Teaching this method requires patients to be flexible, able to calculate figures, and learn the carbohydrate content of foods commonly eaten.

Some people with diabetes do well with basic dietary guidelines that are designed for the general American public. The most commonly used teaching tool for this approach is the food guide pyramid as was discussed previously in the introduction section of this paper.

Medical nutrition therapy goals for patients with both types 1 and 2 diabetes include stabilization of blood glucose levels to achieve near normal levels long-term, as measured by glycosylated hemoglobin, and optimal nutritional status to reduce severity or delay onset of complications of diabetes. Patients with type 1 diabetes using insulin may have a more flexible meal plan option regarding meal timing and composition than in the past because of the use of intensive insulin regimens more commonly used now. Patients with type 2 diabetes using long-acting insulin and/or oral hypoglycemic agents, notably sulfonureas, need to be aware that meal times may not be as flexible as the medications require

that meals or snacks be taken when peak drug action occurs. In the past, patients with type 2 diabetes who were overweight or obese were given weight reduction regimens and the focus was solely on weight loss. Now, as stated previously in this paper, the focus is more on the normalization and stabilization of blood glucose levels.<sup>20</sup> Obesity leads to insulin resistance and the thought was that if body fat is reduced, insulin sensitivity improves. Even modest weight reduction improves this physiological parameter and more importantly, new pharmacotherapeutic agents vastly improve insulin sensitivity to address this problem in type 2 diabetes.

The main point of all of this is for the PCP to recognize the different needs and abilities of patients regarding dietary change and consult with or refer to registered dietitians or certified diabetes educators in a team approach to maximize success with adherence.

### **The Use of Herbal Supplements in DM**

The use and study of natural products, especially herbs, has had an effect on many areas of medicine through the years. The treatment of diabetes is no exception. Initially, for many centuries, plant medicines were the mainstay of medical therapy in various societies. The advent of biomedicine in the past 150 years resulted in changes, especially in the United States. The development of modern-day pharmaceuticals and use of objective clinical studies to evaluate and validate medical therapies have relegated herbal products to the "back burner."

Crude herbs were used, for a time, as a source of pure medications, but existing patent laws now prevent the profitable marketing of crude herbs and their products by pharmaceutical manufacturers.

In the second half of the 20th century, the "back to nature movement" and subsequent congressional legislation resulted in a largely unregulated market in which there was increasing demand. The herbal market is booming once again but in a form somewhat different from the earlier market. In this new market, a bewildering and constantly increasing variety of products, usually combination products, is being introduced. Claims about the efficacy of such products is often made with little or no supporting scientific evidence, and promotion of these products sometimes consists of little more than testimonial.

Research and development dollars are still being spent on exploiting herbs as a source of pharmaceutical agents. Herbs are being explored today as a source of synthetic derivatives that could be marketed as pharmaceutical agents. The merit of this approach is borne out by the fact that it has resulted in the past in the marketing of an effective diabetes medication, metformin.

There is a large list of traditional plant treatments that have been claimed to be effective for diabetes. However, only a small number of these have demonstrated antihyperglycemic effects in animal or human studies.<sup>31,32</sup> In general, studies aimed at establishing the efficacy of plant medicines in treatment of diabetes have had significant flaws in terms of population size or other aspects of study design.<sup>33,34</sup>

A number of purified constituents are known to have antihyperglycemic activity. In fact, metformin was developed as a

result of studies on constituents of the plant, *Galego officinalis*. In addition, some intriguing reports have surfaced recently on the development of new synthetic derivatives of plant constituents that can affect glycemic control.<sup>35</sup>

Examination of the list of herbs reported to treat diabetes in reputable sources reveals that there is even disagreement as to which herbs are claimed to have beneficial effects. The three most commonly used herbal products, which are most likely to be effective hypoglycemic agents, are Fenugreek (*Trigonella foenum-graecum*), Ginseng (*Panax* sp.) and Gymnema (*Gymnema sylvestre*). Recommendations as to the plant parts used, doses, and how they should be prepared are given in the references cited.<sup>31-35</sup>

Unfortunately, counseling patients about the use of herbal products is based more on what is not known than what is known. In today's unregulated market, there is great uncertainty about the quality of herbal products. It cannot be said with absolute certainty that a given product contains a specific listed plant product in sufficient quantity or that the plant listed is even in the product. Batch to batch product variability is also a potential problem. A product that varies in potency may help achieve desired glycemic control at one time, provide inadequate control at another, and cause hypoglycemia at still another.

There is additional uncertainty regarding the presence of contaminants and adulterants. Certain herbal products produced in China were recently removed from the market by the FDA after a number of cases of hypoglycemia were reported.<sup>34</sup>

These products were found to be adulterated with glyburide or glucophage. The best advice that can be given is for the buyer to beware of these facts. Patients who show interest in using herbal products should not necessarily be discouraged as this may interfere with their unique belief systems, but it should be documented carefully in the medical record and counseled accordingly if known contraindications of using the product exist. If they experience any symptoms that may represent an adverse effect, such an experience should be reported to their physician and the FDA should be notified.<sup>36</sup>

Current legislation severely restricts the ability of the FDA to act as watchdog on the herbal industry, and they need all the assistance they can get.

### **Nutritional Management in Complications of DM**

Complications in diabetes can be either acute or chronic long term. Acute complications include hyperglycemia, which can lead to diabetic ketoacidosis (DKA) in individuals with type 1 DM; or hyperosmotic nonketotic coma (HHNK) in individuals with type 2 DM, which frequently occurs during periods of illness when the patient does not take insulin or ingest food; and hypoglycemia. Sick day management is one of the most powerful preventive strategies of preventing hospitalization for DKA. Chronic long-term complications of diabetes involve many organ systems and different nutritional management strategies are recommended to assist in the treatment of complications.

### **Sick Day Management**

Many hospitalizations can be prevented, and reduced number of hospital days can be realized by teaching patients

proper sick day management.<sup>37</sup> Individuals who are experiencing nausea and vomiting should be instructed to take medication as usual, and ingest carbohydrates and fluids as tolerated throughout the day (such as regular gelatin, sugar containing cola, clear soups, sugar-sweetened tea, etc). People who may be having oral surgery should again take medication as usual and ingest a liquid or pureed diet containing carbohydrate until usual diet can be consumed. It is especially important to push fluids for hemodilution of glucose to prevent HHNK and DKA.

### Update on the Management of Hypoglycemia

A common problem regarding the treatment of hypoglycemia is to overtreat. Patients who are exhibiting sympathetic nervous system symptoms (shaking, sweating, lightheadedness, etc) often have an overwhelming urge to eat until symptoms subside. This action leads to rebound hyperglycemia. Patients should be instructed to ingest 15 g equivalents of simple carbohydrate such as glucose tablets, 4 oz juice, regular sodas, 2 tsp sugar or honey, etc and then wait 10 minutes for symptoms to subside. If symptoms remain, repeat with another 15 g of carbohydrate. This action should be followed with a snack that contains protein and fat (such as peanut butter crackers or cheese for example) to sustain the blood glucose level.

New products are available on the commercial market that are designed to prevent hypoglycemia by using a type of carbohydrate that is slowly released into the bloodstream. The emphasis here is **prevention**. These products are not designed to treat hypoglycemia. They are an excellent choice as a bedtime snack for those individuals who are susceptible to nocturnal hypoglycemia or for people who may have problems with delayed hypoglycemia after a period of exercise.<sup>38</sup>

### Diabetic Retinopathy

Often, the presence of proliferative diabetic retinopathy is a window to what is happening to other microvascular systems in the body, notably the kidneys. The DCCT clearly showed that tight metabolic control in people with type 1 DM lessened the incidence of complications regarding microvascularopathies.<sup>39</sup> More recently, the UKDP trial showed the same results in people with type 2 DM.<sup>40</sup> It should be noted here that other dietary treatment strategies such as lutein supplementation is somewhat controversial and needs further study. However, several studies have suggested that lutein supplementation significantly increases macular density and, therefore, may be protective in regard to macular degeneration.<sup>41,42</sup> One study suggested that insulin resistance may be improved with antioxidant supplementation, notably carotenoids including lutein.<sup>43</sup>

### Diabetic Nephropathy

The use of protein restriction in end-stage renal disease (ESRD) is still somewhat controversial. Short-term studies have shown that moderate protein restriction improves GFR, but longer term investigations have not borne out that conclusion.<sup>44</sup> In fact, one study found that protein restriction may actually exacerbate kidney function decline.<sup>45,46</sup> A recent paper

noted that diets restricted in protein are difficult to adhere to and do not offer much protection to the patient.<sup>47</sup> It was suggested that this dietary intervention may distract the physician from offering more effective treatment methods that are currently available.<sup>48</sup>

### Diabetic Neuropathy

The diabetic neuropathies that require special dietary intervention are those that affect the sympathetic nervous system of the GI tract. Gastroparesis is a common manifestation of neuropathy in which the stomach does not empty properly. People with gastroparesis should not eat high-fiber foods as they can cause bezoars and may lead to obstruction. They should also be careful about foods that can cause esophageal reflux such as peppermint, caffeine-containing foods or beverages, etc. Diabetic diarrhea is caused by neuropathy to the nerves controlling the lower GI tract. Patients with this type of complication often do well with psyllium fiber supplements such as Metamucil, which is a gel-forming agent and helps bind the stool without causing constipation.

### Peripheral Vascular Disease

Individuals with peripheral vascular disease need to be aggressively treated for hyperlipidemia just as patients with atherosclerotic heart disease are. Lipid-lowering management is key here. A diet low in saturated fat and cholesterol, high in fiber, and optimum intake of fruits and vegetables (> 5 servings per day, preferably 8 servings per day) is an essential part of lipid-lowering regimens.<sup>49</sup> It has also been suggested that patients with DM who already exhibit atherosclerotic arterial disease be supplemented with folate to reduce homocysteine levels, which are often elevated in these individuals.<sup>50</sup>

### Summary and Conclusions

Diet is still considered a cornerstone of treatment in the management of both type 1 and type 2 DM. There have been shifts in philosophy regarding the macronutrient mix, and former taboos of restricting simple carbohydrates have been lifted. A healthy diet prescription for a person with diabetes is most often no different from the dietary recommendations made for the general public. The No. 1 public enemy regarding type 2 diabetes is obesity and its underlying insulin resistance syndromes, so obesity needs to be aggressively but conservatively treated in these patients. People with type 1 diabetes now have a much wider selection of treatment options regarding insulin and diet regimens and the buzzwords here are *individualized tailoring*. If at all possible, clinicians should consult with and refer patients to certified diabetes educators or registered dietitians familiar with medical nutrition therapy for DM on a regular basis for patient education and counseling whether in group or one-on-one settings for a team approach.

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## Physician CME Questions

16. The diabetic diet is ideally:
  - a. 1500 kcals/d, low fat, and low cholesterol.
  - b. high carbohydrate, low fat, and moderate protein.
  - c. high in monounsaturated fat and carbohydrate restricted.
  - d. individually tailored to meet patient needs and preferences.
17. Simple carbohydrates are:
  - a. not indicated for use in people with diabetes due to rapid absorption into the bloodstream.
  - b. able to be used in moderation and in mixed meals for patients with DM.
  - c. considered free foods in the diabetic diet.
  - d. metabolized differently than complex carbohydrates.
18. The use of sugar substitutes and fat replacers in DM is:
  - a. recommended by the American Diabetes Association.
  - b. not necessary for a healthy diet in patients with DM.
  - c. approved by the American Diabetes Association as approved by the FDA.
  - d. to be viewed with caution as some of these compounds may be toxic.
19. The use of herbal supplements by patients with DM may be summarized by which statement?
  - a. Herbal supplements are standardized as pharmaceuticals and may contain adulterants.
  - b. They are of natural origin, they are safe and may be used freely.
  - c. Herbal supplements should be used only under the advice of a physician and any adverse events that occur should be reported to the FDA.
  - d. Patients who wish to use herbal supplements should consult

with a certified herbalist who is familiar with herbal preparations used for diabetes.

20. Sick day management consists of:
  - a. monitoring blood glucose more than 4 times per day.
  - b. planning a special diet that concentrates on replacement of fluids and electrolytes.
  - c. ingesting simple carbohydrates and fluids as tolerated and taking medications as usual.
  - d. contacting the physician when blood glucose levels exceed 300 mg/dL.
21. Patients who have the complication of gastroparesis are counseled to:
  - a. avoid high-fiber foods due to bezoar formation.
  - b. increase fluid intake to enhance stomach emptying.
  - c. avoid fatty foods due to delay of stomach emptying.
  - d. increase simple carbohydrate intake as this requires minimal digestion.

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