

A Harvard Medical School Special Health Report

# Healthy Eating for Type 2 Diabetes



## **In this report:**

First-line treatment:  
Eating for weight loss

The essentials of  
a healthy diet

Coming to grips with  
carbohydrates

Sample meal plans

How exercise helps  
fight diabetes

## **SPECIAL BONUS SECTION**

40 diabetes-friendly  
recipes



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# HEALTHY EATING FOR TYPE 2 DIABETES

## SPECIAL HEALTH REPORT

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Dear Reader,

“What can I eat?” This is one of the most common questions that people with type 2 diabetes ask. It may surprise you to know that there isn’t a special “diabetes diet.” Instead, dietitians and other health professionals recommend the same healthy diet for people with diabetes as they do for most people, with extra emphasis on controlling weight and keeping blood sugar, blood pressure, and cholesterol as close to normal as possible.

There are several healthy dietary approaches that can help. One that you may have heard of is a Mediterranean-type diet. Others that we’ll discuss in this report are the DASH diet and the Look AHEAD strategy. While these approaches vary, they share certain important features. The basics: Eat a well-balanced diet that includes plenty of fruit, vegetables, whole grains, and lean protein. Go easy on red meat, sugar-sweetened beverages, and highly refined carbohydrates. Pay attention to calories. And though it’s not part of the diet per se, exercise most days of the week.

Following a healthy eating plan can also help you lose weight—one of the most important things you can do to control diabetes. Being overweight is the leading risk factor for type 2 diabetes. But there is a silver lining to that fact: losing weight can vastly improve your health. By itself, weight loss can help you rein in your blood sugar, blood pressure, and cholesterol—the three targets of diabetes control. And if you do that by eating a healthy diet with the most nutritious choices, you can come even closer to all three goals. It’s worth the effort. Managing these three measures can help you prevent long-term complications of diabetes such as blindness, foot amputation, heart attack, and stroke; avoid short-term consequences such as low blood sugar (hypoglycemia); and live longer and healthier.

This report describes ways to eat well while achieving a healthy weight and being good to all of your body’s systems. You’ll learn about the components of a healthy diet, how to work with a dietitian, how to develop a meal plan, and how to fit physical activity into your schedule. You will learn how to recognize portion distortion (the many ways that portions of food can appear smaller than they really are), how to make wise choices while dining out, and how to stay on track with your weight-loss plan. The report also includes 40 diabetes-friendly recipes so you can put this advice into practice—starting today.

Sincerely,

David M. Nathan, M.D.  
*Medical Editor*

Linda M. Delahanty, M.S., R.D.N., L.D.N.  
*Medical Editor*

# Understanding diabetes

**D**iabetes is a common disorder marked by high levels of sugar (glucose) in the bloodstream. Given that glucose is essential for energy, that may not sound like such a bad thing. But blood sugar levels above the normal range are toxic to your cells and affect many parts of the body in serious ways. Left untreated—or poorly managed—diabetes can lead to kidney failure, blindness, amputation of a limb, and other major long-term complications. Having diabetes also increases your risk for cardiovascular disease, including heart attack and stroke.

Diabetes usually can't be cured. But it can definitely be controlled. Diet and exercise are crucial components of a good care plan. A poor diet—including a lot of sugar-sweetened beverages and fruit juices, for example—can send your blood sugar level soaring. A healthy diet won't do that. And exercise makes your cells hungry for energy, so they soak up glucose from the bloodstream. What's more, a healthy diet plus exercise can help you trim off some weight—the single most important lifestyle change you can make to help manage diabetes. Losing just 5% of your body weight can make a difference in controlling blood sugar. And if you are in the early stages of the disease, the trio of healthy diet, exercise, and weight loss may be as powerful as medication.

But before we go further, we need to clarify an important point. There are two main types of diabetes. Type 1 diabetes tends to start early in life. It occurs when the body's immune system attacks cells in the pancreas that are essential for controlling blood sugar. Type 2 diabetes

tends to come on later in life, often as a result of obesity or physical inactivity. Most people with diabetes (about 95%) have type 2 diabetes. *For simplicity's sake, the term "diabetes" in this report means type 2 diabetes unless otherwise specified.*

## How your body handles glucose

To understand type 2 diabetes—and the role played by food—it's helpful to understand the basics of how your body breaks down (metabolizes) food.

The cells in your body rely on one type of sugar—glucose—for energy. But you never need to eat glucose, or any sugar for that matter, because your body can turn many kinds of food into glucose. Think of glucose as the universal currency of the body's carbohydrate economy, and the organs of the digestive system as a 24/7 currency exchange, turning simple and complex carbohydrates into glucose. If needed,

your body can even make glucose from protein and fat.

When you eat any food that contains carbohydrates—for instance, a bowl of white rice, a slice of whole-grain bread, or an orange—your body breaks down the digestible carbohydrates into glucose and other sugar molecules. Glucose rapidly passes from the digestive system into the bloodstream, which delivers it to cells from the brain to the toes.

But your cells can't use glucose without some help. That help comes from insulin, a hormone made by the pancreas, a gland that sits behind your stomach and liver. The pancreas releases insulin into the blood-



Many people who have type 2 diabetes are not aware that they have it. Above are some warning signs of this common disorder.



stream when blood sugar begins to rise after you've eaten. Like traffic cops dispatched at rush hour to ease congestion, insulin molecules direct sugar into the body's cells (see Figure 1, below right). Glucose that isn't immediately needed for energy is sent to the liver, where it's stored in the form of a compound called glycogen. However, the capacity of your liver to store energy as glycogen is very limited; therefore, excess calories are stored as fat.

Insulin also increases the uptake of amino acids (the building blocks of proteins) and fatty acids (the building blocks of fats) into protein and fat stores, respectively. Insulin thus serves as one of the principal gatekeepers of metabolism, promoting energy storage and cell growth.

The specialized cells in the pancreas that produce insulin are called beta cells. They are located in tiny cell clusters called islets of Langerhans. But the islets of Langerhans also include another specialized set of cells known as alpha cells, which produce the hormone glucagon. When your blood sugar drops below a certain level, your pancreas stops making insulin and starts churning out glucagon. Glucagon prompts your liver to release stored glucose into the bloodstream.

Insulin and glucagon have generally opposite actions. Levels of the two fluctuate in a coordinated fashion to keep your blood sugar in a rather narrow range. This is important because certain organs, such as the brain and kidneys, depend on a consistent, steady supply of glucose, but too much glucose can be harmful.

In healthy people, the finely tuned interplay between insulin and glucagon keeps blood sugar levels relatively steady. The blood sugar level before breakfast usually hovers between 70 and 100 milligrams per deciliter (mg/dL). The level after a meal rarely exceeds 140 mg/dL. Among people with diabetes, blood sugar can hit 140 mg/dL or more before eating anything for the day—or 200 mg/dL or higher after a meal.

## Who gets type 2 diabetes?

Type 2 diabetes results from a combination of problems. First, the body's cells become less responsive to insulin—a problem known as insulin resistance. This requires the pancreas to secrete more insulin to help

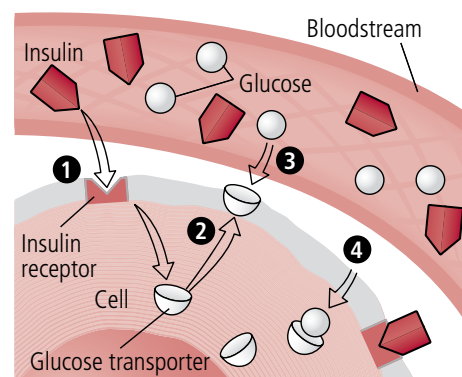
push glucose into cells. For a while, this is enough to keep blood sugar in the normal range. Over time, however, the insulin-producing cells fail to keep up with the increased demand. Blood sugar levels rise, resulting in type 2 diabetes. (In type 1 diabetes, cells in the pancreas stop generating any insulin.)

As is true for many common diseases, the genes you inherit from your parents affect your chances of developing type 2 diabetes. Researchers have identified about 100 genes that may contribute to the development of diabetes. However, each of them individually contributes only a small amount of risk.

Advancing age also increases your likelihood of developing diabetes, which usually strikes people ages 45 and older (see Figure 2, page 4). About one in four Americans older than 65 has diabetes.

You can't change your age or your genes. However, there is still a great deal that you can do to ward off or treat type 2 diabetes. There is a saying in the medical community: "Genes load the gun, but lifestyle pulls the trigger." That means that in many cases, you can modify the influence of your genes by making important lifestyle changes. As noted earlier, the single most

**Figure 1: Normal glucose absorption**



Insulin plays an important role in cells' ability to absorb glucose from the bloodstream. It works by binding to receptors on the cell membrane, much as a key fits into a lock, and activating glucose transporters, which then ferry the glucose into the cell:

- 1 Insulin binds to a receptor.
- 2 A glucose transporter rises to the cell surface.
- 3 The glucose transporter binds to a glucose molecule from the bloodstream.
- 4 The glucose enters the cell.

effective thing you can do to counteract diabetes is to control your weight. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) estimates that 80% of people with type 2 diabetes are overweight or obese. The term “diabesity” is often used to note the close connection between these two conditions.

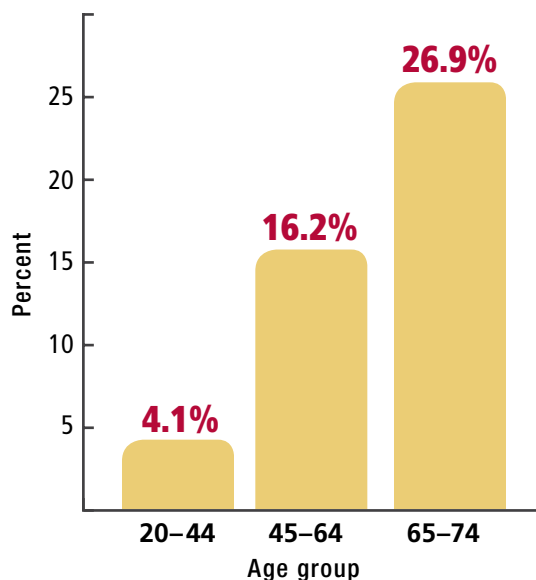
Type 2 diabetes was once called adult-onset diabetes. But more and more it is cropping up in younger people—including children as young as 10 years old. This worrisome trend likely stems from the growing girth of America’s youth. Since 1980, obesity rates have tripled in children and teens ages 2 to 19, and about 17% of this age group is now obese. In fact, the swelling ranks of people of all ages who are overweight or obese likely accounts for the more than fourfold increase in diabetes since the early 1980s.

To some extent, you know intuitively if you are overweight or not. But you can tell more precisely which weight category you are in—normal, overweight, or obese—by using a measurement called body mass index (BMI) that takes both weight and height into consideration. Your BMI is your weight in kilograms divided by your height in meters squared.

(Using pounds and inches, it’s your weight in pounds divided by your height in inches squared times 703.) An easier way to determine BMI is by using a chart like the one in [Table 1 \(page 5\)](#) or an online calculator such as the one at [www.health.harvard.edu/BMI](http://www.health.harvard.edu/BMI). A BMI of 18.5 to 24.9 represents a healthy weight. A BMI of 25 or more puts you in the overweight category, while a BMI of 30 or more puts you in the obese category.

Another factor to pay attention to is blood sugar. The risk for developing diabetes follows a continuum. The higher your blood sugar level, the greater the odds that you will develop diabetes. If your blood glucose is 100 mg/dL to 125 mg/dL after not eating for at least eight hours—for example, after an overnight fast—you have what’s known as prediabetes, which means that you are at high risk. A fasting blood sugar level of 126 mg/dL or higher signals full-blown diabetes. An estimated 86 million Americans ages 20 and older have prediabetes and so are much more prone to developing diabetes than people with lower blood sugar levels. People with prediabetes, like those with diabetes, tend to be overweight and have high blood pressure and high cholesterol, along with a higher risk for cardiovascular disease.

**Figure 2: Diabetes prevalence rises with age**



About 4% of adults under age 45 have diabetes, compared with nearly 26% of those ages 65 and older.

*Source: National Diabetes Fact Sheet, 2014, Centers for Disease Control and Prevention.*

## Why weight matters

Body fat is more than just a storage site for extra nutrients. Fat tissue, also known as adipose tissue, makes hormones and other chemicals such as leptin, resistin, and adiponectin. These substances affect appetite and insulin action and may cause inflammation.

Leptin is normally released after eating. It dampens appetite. Resistin and adiponectin affect cells’ response to insulin. Too much resistin may cause the body’s cells to become resistant to insulin’s “open up for sugar” command. Too little adiponectin may do the same.

The body’s system for regulating appetite is complex, and scientists are still deciphering the roles of individual components. Even so, it’s becoming clear that too much body fat disrupts the normal balance and functioning of these hormonal signals. That, in turn, contributes to insulin resistance and sets the stage for diabetes. Substances secreted by fat cells

**Table 1:** Normal, overweight, or obese? Determining your body mass index (BMI)

<p>Body mass index (BMI) uses your weight and height to gauge whether you are normal weight, overweight, or obese. These categories were established after researchers examined the BMIs of millions of people and correlated them with rates of illness and death; those with normal BMIs had the lowest rates.</p> <p>To determine your BMI, find your height in the left-hand column, then scroll across to your body weight. Finally, move to the bottom of that column to find your BMI.</p> <p>Obesity is subdivided into three classes—class I, BMI of 30–34; class II, 35–39; and class III, 40 or greater. Class III obesity is roughly equivalent to being at least 80 pounds overweight if you are a woman or at least 100 pounds overweight if you are a man.</p> <p>People may be candidates for weight-loss surgery if they have class III obesity, or if they have class II obesity plus diabetes or another serious, weight-related medical condition.</p>	HEIGHT	BODY WEIGHT IN POUNDS				
	4'10"	89–119	120–143	144–167	168–191	192+
	4'11"	92–124	125–148	149–173	174–198	199+
	5'0"	95–128	129–153	154–179	180–204	205+
	5'1"	198–132	133–158	159–185	186–211	212+
	5'2"	101–136	137–164	165–191	192–213	219+
	5'3"	105–141	142–169	170–197	198–225	226+
	5'4"	108–145	146–174	175–204	205–232	233+
	5'5"	111–150	151–180	181–210	211–240	241+
	5'6"	115–155	156–186	187–216	217–247	248+
	5'7"	118–159	160–191	192–223	224–255	256+
	5'8"	122–164	165–197	198–230	231–262	263+
	5'9"	126–169	170–203	204–236	237–270	271+
	5'10"	129–174	175–209	210–236	244–278	279+
	5'11"	133–179	180–215	216–250	251–286	287+
	6'0"	137–184	185–221	222–258	259–294	295+
	6'1"	140–189	190–227	228–265	266–302	303+
	6'2"	145–194	195–223	234–272	273–311	312+
	6'3"	149–200	201–240	241–279	280–319	320+
	6'4"	153–205	206–246	247–287	288–328	329+
	<b>BMI</b>	<b>19–24 NORMAL</b>	<b>25–29 OVERWEIGHT</b>	<b>30–34 CLASS I OBESITY</b>	<b>35–39 CLASS II OBESITY</b>	<b>40+ CLASS III OBESITY</b>

likely contribute to heart disease and other diabetes-related health problems as well.

Fat accumulates in two main places. Fat deposited under the skin is known as subcutaneous fat. Fat deposited inside the belly and around the abdominal organs is known as visceral fat. The risk of developing health problems from added body fat is especially high when fat is deposited around the abdomen, since the visceral fat is more metabolically active than fat deposited elsewhere and plays a role in insulin resistance. A body profile featuring fat around the abdomen and

waist is often referred to as an “apple” shape. Deposition of fat around the hips is called a “pear” shape.

Carrying extra pounds around the waist puts you at risk for a condition known as metabolic syndrome (see “What is metabolic syndrome?” on page 6). This syndrome has been linked to the development of diabetes and heart disease. One reason is that visceral fat makes hormones called cytokines. One cytokine, TNF-alpha, may play a role in causing insulin resistance. Visceral fat may also affect levels of another group of hormones called glucocorticoids that con-



## What is metabolic syndrome?

More than 70 million Americans have metabolic syndrome. This term describes a constellation of risk factors for heart disease, stroke, and type 2 diabetes. You have metabolic syndrome if you have three or more of the following:

- ✓ a large waist size (greater than 40 inches in men or 35 inches in women)
- ✓ blood pressure of 130/85 millimeters of mercury (mm Hg) or higher
- ✓ HDL (good) cholesterol less than 40 mg/dL in men or less than 50 mg/dL in women
- ✓ a triglyceride level of 150 mg/dL or higher
- ✓ a fasting blood glucose level of 110 mg/dL or higher.

Some experts believe that insulin resistance could be the underlying problem in metabolic syndrome.

tribute to obesity and insulin resistance. In addition, fat deposited in muscle may increase muscle cells' resistance to insulin. Although further research is needed, it is becoming clearer that fat—and especially fat that surrounds your abdominal organs—impairs insulin action and contributes to type 2 diabetes.

## Avoiding diabetes-related health problems

Untreated or poorly treated diabetes can cause serious problems, such as damage to the eyes, kidneys, nerves, heart, and brain (see Figure 3, at right). Nearly all diabetes-related health problems (known medically as complications) develop from having high blood sugar over many years, with high blood pressure and other factors contributing to the damage. Diabetes is the seventh leading cause of death in the United States.

To stay as healthy as possible with type 2 diabetes, and to prevent complications from it, work to control your blood sugar, blood pressure, and cholesterol—a strategy sometimes known as minding the ABC's (see "The ABC's of diabetes control," page 7).

### Blood sugar testing

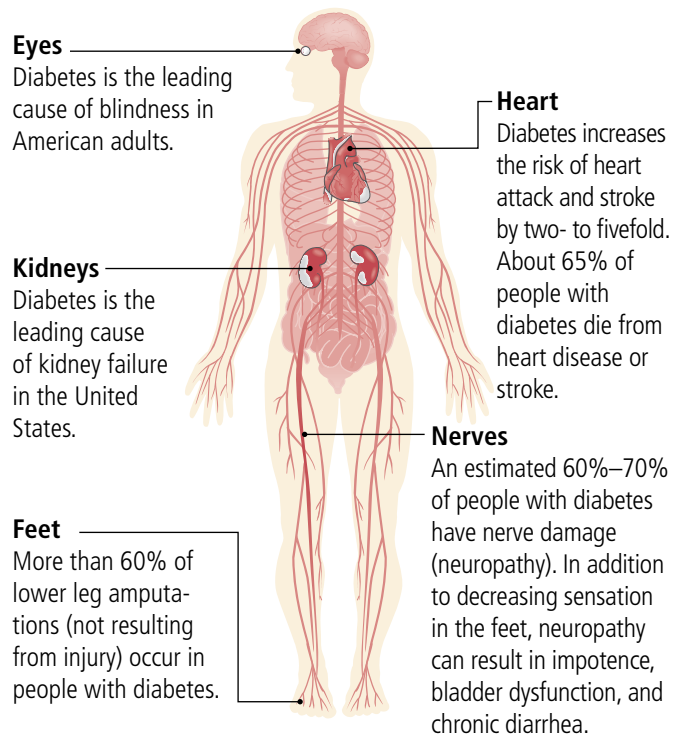
There are two main blood sugar tests for diabetes. One measures the amount of glucose in the bloodstream at

the moment the test is done. The other measures the average blood sugar level over the past three months.

**Immediate blood sugar results.** Many people with type 2 diabetes are advised to check their blood sugar at home, especially when they are adjusting their medications or trying to decide which dose of insulin to use. This usually involves pricking a finger to obtain a small drop of blood, applying the blood to a special strip, and then using a meter to analyze the blood. Some people use a small sensor attached to the skin to monitor blood sugar continuously.

**Long-term blood sugar results.** A blood test for hemoglobin A1c (HbA1c) reflects your average blood sugar level over the past three months. This test is done in a doctor's office or lab. Hemoglobin is the oxygen-carrying protein in red blood cells. HbA1c (also known as glycated hemoglobin or glycohemoglo-

**Figure 3: Complications of poorly controlled diabetes**



If not adequately treated, diabetes can cause serious health problems. Nearly all of these complications develop from having high blood sugar over many years. Individuals who achieve good blood sugar control through diet, exercise, or medication can greatly reduce their risk of developing these long-term complications.

## The ABC's of diabetes control

The risks of developing heart disease, kidney disease, loss of vision, erectile dysfunction, and other ailments are significantly higher in people with diabetes than in those without the disease, so it's important to pay close attention to factors that can put you at greater risk for these problems.

These factors are often referred to as the **"ABC's"**:

**A**—hemoglobin A1c (average blood sugar for three months)

**B**—blood pressure

**C**—cholesterol.

The blood pressure and cholesterol treatment goals for people with diabetes are generally more stringent than for people without diabetes. The good news is that lifestyle changes to improve blood sugar—beginning with weight loss—usually have beneficial effects on the other values as well.

### ABC goals

HbA1c	Less than 7%
Blood pressure	Less than 140/90 mm Hg (less than 130/80 mm Hg for younger or healthier individuals)
LDL (bad) cholesterol	No specific target, though lower is better
Triglycerides	Less than 150 mg/dL
HDL (good) cholesterol	More than 40 mg/dL in men or 50 mg/dL in women

bin) is a compound formed when glucose attaches to hemoglobin. The HbA1c test measures the percentage of hemoglobin molecules that have glucose attached to them. A normal HbA1c level is 5.6% or lower. An HbA1c level of 5.7% to 6.4% represents prediabetes. You have diabetes if your HbA1c level is 6.5% or higher.

You and your doctor should use the HbA1c test to determine if you have prediabetes or diabetes and to monitor your blood sugar control over time. According to current guidelines from the American Diabetes Association (ADA), the goal of treatment for most individuals with diabetes is an HbA1c level of 7% or lower. If you can keep your blood sugar in check with a healthy diet, exercise, and other lifestyle changes, great. If not, you'll need to take one or more medications to lower blood sugar. The ADA guidelines recommend having your HbA1c measured every two to three months until you achieve the goal of less than 7%. After that, monitoring can occur every six months.

An HbA1c goal of under 7% isn't for everyone. A higher target may be in order for individuals with a relatively short life expectancy or those with other serious health problems.

### Blood pressure

People with high blood pressure are more than twice as likely to have a heart attack or stroke as those with

normal blood pressure. In addition, high blood pressure increases the risk of developing eye and kidney complications. Therefore, keeping blood pressure under control is important for everyone, but especially for people with diabetes, who are at higher risk of suffering these problems.

A blood pressure reading has two numbers, like 120/80. The first number represents the systolic blood pressure, which is the pressure in the circulatory system while the heart is contracting and pushing blood into arteries. The second number represents the diastolic blood pressure, which is the pressure while the heart relaxes between beats and refills with blood. A healthy blood pressure is under 120/80. High blood pressure (known medically as hypertension) is a blood pressure of 140/90 or higher.

Your health care provider should test your blood pressure regularly. It might also be a good idea for you to check it at home. People with diabetes are advised to keep their blood pressure as close to the ideal as possible (see Table 2, page 8). Those with both diabetes and high blood pressure are usually encouraged to keep their pressures to less than 140/90. Several recent studies have examined the benefits and risks of aiming for even lower blood pressure, such as less than 130/80. Interestingly, this strategy has not shown a clear benefit. For now, discuss your blood pressure goal with your health care provider. Your individual

target should take into account a variety of factors, such as your age, any other heart disease risk factors you have, and whether you have kidney problems or other health issues.

Much of the advice provided in this report—such as eating more fruits and vegetables, cutting back on salt, increasing physical activity, and losing weight—should help lower your blood pressure. If diet and exercise don’t bring your blood pressure into a healthy range, medications are often necessary to lower it.

### Cholesterol

Your body needs cholesterol to build cell membranes, make hormones such as testosterone and estrogen, and create the bile acids needed to digest and absorb fats. Cholesterol is also an important precursor to vitamin D. But too much of a good thing can be harmful. A lot of cholesterol in the bloodstream can set the stage for heart attack, stroke, and other cardiovascular problems.

Fats like cholesterol don’t mix with liquids like blood. To move cholesterol through the bloodstream, the digestive system packages it with other fats and proteins. These cholesterol-carrying particles are called lipoproteins. There are two main types: low-

density lipoproteins (LDL) and high-density lipoproteins (HDL).

LDL is sometimes called “bad” cholesterol because it delivers cholesterol to artery walls. The accumulation of cholesterol in artery walls creates artery-clogging plaque. Blockage of the arteries supplying the heart can cause chest pain known as angina, usually when you exercise. When a plaque breaks open, a clot may form and completely block an artery. Such a blockage can cause a heart attack—or a stroke, if the blood vessel is in the brain. The higher the LDL level, the greater the risk for heart attack, stroke, and other cardiovascular problems.

HDL counteracts the harmful effects of LDL. It does this by scavenging cholesterol from artery walls and carrying it to the liver for disposal. The higher an individual’s natural HDL level, the lower his or her risk of heart attack, stroke, and other cardiovascular problems.

Triglycerides are the main type of fat released into the bloodstream after a meal or snack. They are also the main type of fat stored in the body. A high triglyceride level increases the risk for heart disease, although not as much as high LDL does.

A blood test for cholesterol should be done after a fast of eight hours or more. It gives information on total cholesterol as well as LDL, HDL, and triglyceride levels. These measurements can serve as another indicator of whether the changes you are making in your diet and activity levels, and any medications you are taking, are reducing your risk for heart disease, and whether you need to make any further adjustments.

Treatment guidelines for people with diabetes once recommended aiming for an LDL under 100 mg/dL, and ideally under 70 mg/dL. Although dietary approaches are an important first step to lowering LDL, a cholesterol-lowering statin or other medication is usually needed to get it down that far. New guidelines have done away with specific targets and instead recommend that people with diabetes take a “high-intensity” statin medication. Many doctors, though, continue to use the earlier targets as guides to statin therapy. ♥

**Table 2: A guide to blood pressure levels**

The National Heart, Lung, and Blood Institute (NHLBI) has identified four categories of blood pressure. Prehypertension signals an increased risk of developing hypertension and the associated risks of heart disease and stroke. Individuals with diabetes are advised to keep their blood pressure below 140/90, or 130/80 if possible, because of their increased risk of developing diabetes-related health problems, which are often made worse by high blood pressure.

CATEGORY	SYSTOLIC BLOOD PRESSURE (MM HG)		DIASTOLIC BLOOD PRESSURE (MM HG)
Ideal	less than 120	and	less than 80
Prehypertension	120–139	or	80–89
Stage 1 hypertension	140–159	or	90–99
Stage 2 hypertension	160 or greater	or	100 or greater

# The first-line treatment: Eating for weight loss



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Losing even a little weight—just 5% to 10% of your starting weight—can help you manage diabetes.

The American Diabetes Association (ADA) urges all people newly diagnosed with diabetes to take two steps immediately to control their blood sugar:

- First, lose weight by eating more healthfully and exercising more.
- Second, take the medication metformin (see “Metformin: A diabetes mainstay,” page 10).

Losing weight and exercising more can decrease your HbA1c level by one or two percentage points. Adding metformin can reduce it by another one-and-a-half percentage points. That may not sound like much, but a two-point reduction in HbA1c is equivalent to lowering your blood sugar levels by more than 60 mg/dL and can put your blood sugar in the normal range, dramatically reducing your chances of developing a diabetes-related health problem.

How much weight do you need to take off to see improvements in diabetes? If you are overweight, losing even a little—just 5% to 10% of your starting weight—can help you manage the disease. For example, a woman who is 5 feet, 4 inches tall and weighs 165 pounds would need to lose just 8 to 16 pounds to see noticeable reductions in her blood sugar, blood pressure, and cholesterol levels. Even if your weight is

in the healthy zone, losing 3 to 5 pounds can make a difference in controlling your blood sugar.

Evidence for the wide-ranging benefits of weight loss comes from the Look AHEAD (Action for Health in Diabetes) trial. This federally funded study included more than 5,000 overweight or obese individuals with diabetes at 16 centers across the United States. Half the participants were randomly assigned to follow an intensive lifestyle program that required them to eat less and move more, with a goal of losing at least 7% of their body weight within the first year. They were taught to shop, cook, and eat in a healthier fashion, with portion-controlled diets (including liquid meal replacements and frozen entrees). They were also encouraged to walk or do other moderate-intensity exercise, aiming for a goal of 175 minutes of physical activity a week. The other participants, who served as the control group, received standard diabetes education and support.

On the face of it, the trial was not a success. The main goal of the study was to determine if the Look AHEAD strategies would prevent heart attack, stroke, death from cardiovascular disease, or hospitalization for angina. As described in *The New England Journal of Medicine*, after one year, people in the intensive lifestyle intervention group had lost an average of 8.6% of their body weight, compared with 0.7% in the control group. But much to the surprise of the Look AHEAD investigators and other diabetes experts, this didn't translate into heart protection. After nearly 10 years of follow-up, the rates of heart attack, stroke, deaths from cardiovascular disease, and hospitalization for angina were not significantly different between the two groups.

That doesn't mean the Look AHEAD strategy is a failure, however. As Linda Delahanty, one of the medical editors of this report, wrote in the *Journal of the Academy of Nutrition and Dietetics*, the combination of diet, exercise, and weight loss led to improvements



## Metformin: A diabetes mainstay

Most people with diabetes take metformin (Glucophage). This drug blocks the liver's release of glucose and makes tissues throughout the body more sensitive to insulin's "open up for sugar" signal. Available in both generic and brand-name versions, the pill is usually taken twice a day, with breakfast and dinner, although a longer-acting formula (Glucophage XR) may be taken once a day. It works well in overweight and average-weight people, and lowers blood sugar levels as effectively as the other common, generic class of diabetes drugs (known as sulfonylureas) without promoting weight gain or causing hypoglycemia (low blood sugar). More information on medications for diabetes is available in a companion report from Harvard Medical School, *Diabetes: A Plan for Healthy Living*.

in blood sugar, blood pressure, and protective HDL cholesterol that could have cardiovascular payoffs over a longer time frame.

Equally important, it produced significant improvements in other measures of health. Participants following the Look AHEAD strategy were less likely to develop diabetes- and weight-related problems such as kidney disease, urinary incontinence, sexual dysfunction, and sleep apnea than those in the control group. They also improved their quality of life. The greatest gains were physical changes—for example, compared with the control group, people in the group that engaged in lifestyle changes were more physically fit, felt healthier, and had less body pain. They also reported feeling less depressed, with the greatest benefit seen among people who were the most depressed at the start of the study.

Managing your weight is important at every stage of the disease. It is especially important for people who are on blood sugar-lowering medications, because some of these drugs (such as insulin and the class of drugs known as sulfonylureas) make it easier to gain weight. That's why it's doubly important for such people to control what they eat.

## Weight-loss strategies

Contrary to popular belief, there's no specific type of weight-loss diet—such as low-fat or low-carb—that's

best for everyone, or even for all people with diabetes. What's most important is that the diet delivers fewer calories than you burn each day. That imbalance is what translates into weight loss.

The growing consensus on weight-loss diets is that specific components of the diet, like the amounts of carbohydrate or protein, matter less than how well you can sustain a particular way of eating and be satisfied with it. A study led by Harvard researchers, published in *The New England Journal of Medicine*, reaffirmed this notion. The multisite study compared four different low-calorie diets—high fat, high protein; high fat, average protein; low fat, high protein; and low fat, average protein—in 811 overweight adults. Although all the participants lost an average of about 13 pounds in the first six months (about 7% of their initial weight), they started to regain at the one-year mark. After two years, average weight loss was the same in all groups.

One lesson from this and related studies is that for sustained weight loss, it's important to choose a diet that appeals to you so you can stick with it. (For long-term health, however, it's also important to choose a diet that gives you *healthy* foods; see “[The elements of a healthy diet](#),” page 17.)

One option that works for some people is to use meal replacements. The use of portion-controlled meals and meal replacements, which can help curb overall calorie intake, may have been one reason for the weight loss in Look AHEAD's lifestyle intervention. The available options in that study included shakes, bars, and meals that contained from 150 to 220 calories. People who used meal replacements 12 times a week instead of preparing their own meals lost about 11% of their weight in the first year, whereas those who used just two per week lost about 6% of their weight. Keep in mind, though, that people who used meal replacements tended to consume a healthier diet overall; they were more likely to have met their goals for dietary fat, fruits and vegetables, and dairy foods, and to have cut back on sweets, than those who didn't use meal replacements.

It's also worth noting that study participants weren't assigned a specific number of meal replacements per week, but could choose how many to consume, so all that scientists can really conclude is that



those who voluntarily chose meal replacements lost weight—not that meal replacements will necessarily work for everyone. While many people like meal-replacement shakes and find them to be a convenient way to sustain a reduced calorie intake over time, others don't feel satisfied drinking them and often end up simply adding them to what they'd normally eat. Also, some people have a hard time readjusting to eating real food after they stop using meal replacements.

## Calorie-cutting methods

So, how can you cut calories—the primary means of losing weight? Different methods work for different people. One approach—probably the most accurate—is to list the things you usually eat in a day, calculate how many calories each delivers, add up the number of calories you generally take in, and then identify ways to cut back. Websites that list the calories per serving of many foods can help you do this (see “[Websites and apps for losing weight](#),” page 12). Two easy ways to cut calories are to switch from regular to diet soda, and to eliminate or reduce high-calorie meals and snacks. Try one or more of these strategies:

- Eat high-fat, high-calorie foods less often.
- Eat smaller portions of these foods (see “[Quick tips for portion control](#),” below).
- Substitute lower-fat, lower-calorie alternatives.

The nutrition labels on packaged foods and beverages list calories per serving. Make a point of reading the labels of the foods and drinks you use, noting the number of calories and the serving sizes. Many

published recipes provide similar information. And a growing number of restaurants now list serving size and calorie information on their menus.

If you'd rather not count calories, try substituting low-calorie foods for high-calorie foods, like salad instead of mashed potatoes with butter, or fruit instead of ice cream for dessert.

Whatever method you choose, the most successful approach involves sticking with a regular eating schedule—with meals and snacks planned for certain times each day—and recording or keeping track of what and how much you eat. Planning meals and snacks that are no more than four hours apart can help keep you from becoming too hungry and overeating as a result. Noting what you eat on paper or in an app makes you more aware of when and how you get off track with your goals—and also helps you identify what does work. The same strategy applies after you have lost weight and want to keep it off. Sticking with a regular eating routine increases your chances of maintaining your new weight.

It's not a good idea for women to take in fewer than 1,200 calories a day or men to take in fewer than 1,400 except under the supervision of a health professional (see “[Estimating your calorie needs](#),” page 31). Eating too few calories can endanger your health by depriving you of needed nutrients. If you are pregnant, consult with your health care team to make sure you're getting enough calories for yourself and your growing baby. A registered dietitian can be invaluable in helping you create a personalized weight-loss plan (see “[Meet with a registered dietitian](#),” page 29).

### Quick tips for portion control

Your dietitian may say that you can have an ounce of nuts or cheese, but do you know how much that is—or do you keep eating until you're full? Here, so to speak, are some simple rules of thumb.



**1 thumb tip** =  
1 teaspoon of  
peanut butter,  
butter, or sugar



**1 finger** =  
1 ounce of cheese



**1 fist** =  
1 cup cereal,  
pasta,  
vegetables



**1 handful** =  
1 ounce of nuts



**1 palm** =  
3 ounces of meat,  
fish, or poultry



**2 handfuls** =  
2 ounces of  
pretzels

## Eating away from home

Eating out is a way of life for many people. Many away-from-home meals are purely a matter of convenience: a sandwich from the supermarket deli counter, a drive-through burger, or take-out Chinese food.

Although meal planning and weight loss can be more difficult when you eat out, you can step into a restaurant prepared. Try the following to make your dining experience as healthy as it is enjoyable:

**Ask how the food is prepared.** Talking with the restaurant staff before you order about the various menu selections and how they're prepared will help you make appropriate choices.

**Look for less.** Consume less saturated fat and fewer calories. It's not hard to find the best selections. Skinless chicken, fish, or lean meat that's been

broiled, poached, baked, or grilled are all more health-conscious options than fried foods or dishes prepared with heavy sauces.

**Practice portion control.** Use your estimating techniques to size up the food on your plate (see “Quick tips for portion control,” page 11). If it looks like there's more food on your plate than your meal plan calls for, section off the serving size you want and ask to take the rest home.

**Order an extra side of veggies.** Non-starchy vegetables, such as green beans, broccoli, asparagus, or squash, will help you fill up with low-calorie choices.

**Do your research.** Detailed nutrition information on various menu items is available for most fast-food chains. Check out [www.calorieking.com](http://www.calorieking.com) for a listing of thousands of foods, including many restaurant

## Websites and apps for losing weight

Hundreds of websites and computer, tablet, and smartphone apps have been developed to help people follow healthier diets and lose weight. Some are based on popular fee-based programs such as Weight Watchers and Jenny Craig. Others are free. Most offer tools that let you track your eating and exercise habits, count calories, and chart your weight loss. Some are targeted to women, others to men. Some offer plans that follow specific diets, such as low-carb, Mediterranean, or vegetarian. Many feature online chats or discussion groups. Some even provide email advice from experts, including psychologists and dietitians. Here are some of the better-known weight-loss websites:

- |  |  |
|--|--|
| • <b>Calorie Count</b><br><a href="http://www.caloriecount.com">www.caloriecount.com</a> | • <b>MyFitnessPal</b><br><a href="http://www.myfitnesspal.com">www.myfitnesspal.com</a>        |
| • <b>Calorie King</b><br><a href="http://www.calorieking.com">www.calorieking.com</a>    | • <b>Nutrisystem</b><br><a href="http://www.nutrisystem.com">www.nutrisystem.com</a>           |
| • <b>eDiets</b><br><a href="http://www.ediets.com">www.ediets.com</a>                    | • <b>SparkPeople</b><br><a href="http://www.sparkpeople.com">www.sparkpeople.com</a>           |
| • <b>FitDay</b><br><a href="http://www.fitday.com">www.fitday.com</a>                    | • <b>Weight Watchers</b><br><a href="http://www.weightwatchers.com">www.weightwatchers.com</a> |

Thanks to their portability, smartphones and tablets make it even easier to track eating and exercise habits. Numerous options abound. So how do you choose the best one? According to an article in *Translational Behavioral Medicine*, weight-loss apps should focus on methods proven to help people lose weight, like those promoted by the CDC and other federal agencies. Ideally, an app should include 13 features that help you lose weight. These include

- |                                       |   |
|---------------------------------------|---|
| • keeping a food diary                | • planning meals                          |
| • assessing your weight               | • losing 1 to 2 pounds per week           |
| • tracking your weight                | • exercising regularly                    |
| • maintaining calorie balance         | • eating more fruits and vegetables       |
| • keeping a physical activity journal | • drinking water instead of soda or juice |
| • controlling your portions           | • getting social support.                 |
| • using Nutrition Facts labels        |   |

The authors of the article reviewed 204 apps related to weight loss that were available in September 2009. Only 15% of the apps met five or more of the 13 criteria. Six of the top 10 were still available when this report went to press and are listed below. (The number of the 13 criteria featured in each app is noted in parentheses.)

- |  |  |
|--|--|
| • <b>Diet &amp; Fitness Tracker / Calorie Counter &amp; Diet Tracker by SparkPeople (12):</b> free, for iPhone, Android, and Blackberry                    | • <b>Edibles—Diet Journal (10):</b> \$4.99, for iPad   |
| • <b>Food Diary and Calorie Tracker / Calorie Counter by MyNetDiary (11):</b> \$9.99, depending on phone and features; for iPhone, Android, and Blackberry | • <b>MyPlate Calorie Tracker / Calorie Tracker by Livestrong.com (9):</b> free, for iPhone and Android |
| • <b>Daily Burn Tracker (10):</b> free, for Android  | • <b>Low Carb Diet Assistant by Jommi Online (9):</b> \$2.99, for iPhone.                              |

items. You can also visit company-specific websites (such as [www.mcdonalds.com](http://www.mcdonalds.com) or [www.pizzahut.com](http://www.pizzahut.com)) for nutrition breakdowns, or call and request a pamphlet. Many locations display this type of nutrition information.

## Keeping the weight off

If you embark on a weight-loss program, sticking to your meal plan, limiting calories to your target amount, and exercising regularly should pay off. You'll lose weight at a steady pace for about six months. After that, though, weight loss slows for many people, for reasons that aren't entirely clear. One theory is that the body's weight-regulation system, which is geared toward maintaining stability, senses that the body is starving, and so compensates to protect against further weight loss by slowing metabolism and kicking up levels of hunger hormones. Another theory is that people simply tire of diets after a while and start eating more.

Whatever the cause, few things are more discouraging to someone trying to lose weight than the oft-cited statistic that 95% of people who lose weight regain it all within a few years. One of the main reasons that weight-loss programs falter and fail is the difficulty in sticking with a weight-maintenance plan.

## Lessons from the National Weight Control Registry

One research effort has been examining success stories—people who have lost weight and kept it off for many years—for clues that might work for everyone else. This project, called the National Weight Control Registry (NWCR), is tracking some 6,000 “successful losers” for their secrets to lasting weight loss. Here are six strategies gleaned from NWCR participants who kept off at least 30 pounds for at least one year:

**Get plenty of physical activity.** Successful losers exercise about an hour a day, burning an average of 2,600 calories per week. Walking is the most popular exercise, done by about three-quarters of participants. About one in five exercises with weights. A separate study of 201 overweight or obese women underscores this observation: women who kept off 10% or more of their initial body weight over a two-

year period did enough exercise to burn about 2,000 calories per week.

**Eat a lower-fat, higher-fiber diet.** Eating less fat and more fiber helped many participants lose weight and keep it off. Eating less fat helps you to reduce overall calorie intake more efficiently because fat contains 9 calories per gram consumed, whereas carbohydrate and protein each contain 4 calories per gram. Eating more fiber helps you to feel fuller with fewer calories over all.

**Don't skip breakfast.** More than three-quarters of participants eat breakfast (usually cereal and fruit) every day; just 4% said they never eat breakfast. Eating breakfast helps prevent you from becoming too hungry and overeating later in the day.

**Keep tabs on how much you eat.** Many successful losers track what they eat every day in a food log or diary. Doing this makes you aware of just how many calories you're consuming—and where you can trim calories. Many online programs make this practice easy to do (see “Websites and apps for losing weight,” page 12).

**Step on the scale.** Weighing yourself often is another strategy for keeping weight off. NWCR participants who weighed themselves less often tended to regain more weight than those who weighed themselves daily or several times a week. Researchers speculate that this habit lets people detect a small weight gain and take action before the problem escalates.

**Cut back on screen time.** Middle-aged Americans spend more than 30 hours watching television each week. Successful losers logged far fewer hours in front of the tube. About two-thirds reported watching 10 or fewer hours per week on entry in the study, and only 12% watched 21 or more hours per week. Those who watched the most TV at baseline and those who increased their TV time over the study were more likely to regain weight than those who watched less, even after researchers controlled for diet and exercise differences.

## Other approaches

Research points to other strategies that may help you lose pounds and keep them off:

**Eat s-l-o-w-l-y.** A leisurely meal can help you eat less food. Chew each bite a little bit longer, and

put down your fork or spoon in between bites. Sipping water between mouthfuls of food also helps. This strategy works because it takes about 20 minutes for your stomach to “tell” your brain that it is full. If you eat quickly, you’ll probably end up consuming more than you need to feel full. By eating slowly, you give your brain the time it needs to get the signal that you’ve had enough. In a study published in the *Journal of the American Dietetic Association*, researchers asked 30 women to eat a large plate of pasta quickly, until they were comfortably full. They took in an average of 646 calories in about nine minutes. On another day, the women were served the same dish but were asked to eat it slowly and to put down their forks after each bite. That time, they took a leisurely 29 minutes and consumed an average of 579 calories. Despite eating fewer calories during the slow eating session, the women reported being less hungry and more satisfied than they felt after the hurried meal.

**Get enough ZZZs.** There’s a strong connection between sleep and weight. The less you sleep, the more likely you are to be overweight. The link appears to be especially strong among children, according to a review of the topic in the journal *Obesity*. Not getting enough sleep tends to disrupt hormones that control hunger and appetite. It also appears to boost cravings for high-fat, high-calorie foods. If you don’t get enough shut-eye, the resulting daytime fatigue can make you less motivated to exercise. Strive for at least seven to eight hours a night, or enough so you wake up refreshed, not tired and groggy.

**Medications and surgery.** If repeated attempts at losing weight with diet and exercise don’t work, other options exist, but these should be viewed as last resorts.

A number of injectable medications for diabetes—including exenatide (Byetta, Bydureon), liraglutide (Victoza), and pramlintide (Symlin)—have been linked to modest weight loss (4 to 7 pounds, on average, during the first six to 12 months, after which weight either stabilizes or begins to creep back up to the person’s original weight). The first two of these medications, which are modeled after naturally occurring proteins secreted by the intestines, slow the emptying of the stomach. People feel full longer, and therefore may eat less. (In fact, the FDA recently gave

its approval for high-dose liraglutide to be sold for weight loss under the trade name Saxenda.) Pramlintide sends a signal to your brain that you’re full sooner after eating and also slows stomach movement. But it’s best to regard all these medications as second- or third-line diabetes drugs for several reasons. They are more expensive than alternatives; they require up to three injections a day; and they commonly cause side effects, such as nausea, vomiting, and diarrhea.

Other medications approved by the FDA specifically for weight loss suppress appetite, in part by slowing stomach emptying, by decreasing the absorption of fat from the intestine, and by stimulating metabolism. They may help some overweight people with diabetes lose weight, but don’t expect miracles. The effect is usually modest to begin with, resulting in 5 to 10 pounds of weight loss during the first six to 12 months, and the drugs work only as long as you take them. Moreover, these medications are usually advised only for people with diabetes whose BMI is 27 or greater. Even then, lifestyle changes such as those discussed in this report are necessary for losing weight.

Surgery provides another option for people with diabetes who are severely obese (a BMI over 35, and usually much higher). This approach is generally reserved for people who have not been able to lose weight and keep it off despite repeated attempts to do so with diet and exercise. Gastric bypass and other procedures that shrink the size of the stomach and sometimes shorten the small intestine can lead to weight loss of 50 to 100 pounds or more. Diabetes is almost always improved, often allowing the person who underwent surgery to stop taking diabetes medications. However, surgery carries risks that must be weighed against the benefits. And you still need to pay attention to your diet, and especially vitamin and calcium intake, since some types of surgery can cause poor absorption of these nutrients.

It is possible to achieve and maintain a healthy weight—but it takes commitment and vigilance. Individuals who successfully lose weight and keep it off usually make a lifetime commitment to following an eating pattern that’s not only low in calories but also satisfying and sustainable. Stepping up routine physical activity and exercising regularly are also important. ♥



# Exercise: The essential partner

Together with a healthy diet, exercise and routine physical activity can help you maintain a healthy weight. However, there are other, equally compelling reasons to get up and move. Both formal exercise and everyday physical activity—that is, the kind you get by simply climbing stairs or walking from your car to a store—can play an important role in controlling blood sugar and improving overall health, including heart health.

A single session of exercise—say, walking or strength training for 30 minutes—makes the body more sensitive to the effects of insulin, temporarily reversing the insulin resistance at the core of type 2 diabetes. The effect wears off after a day or so. Several long-term studies have shown that people with diabetes who exercise moderately for 30 to 60 minutes three to four times a week can lower their average blood sugar levels by 10% to 20%, reducing the chances of long-term complications. What's more, those who were the most insulin-resistant derived the most benefit from the activity.



Regular exercise makes the body more sensitive to the effects of insulin, temporarily reversing insulin resistance.

## Examples of moderate-intensity activity

- Walking (3 to 4 mph)
- Bicycle riding (5 to 10 mph)
- Gardening and yard work
- Golf (wheeling or carrying your clubs)
- Housework (sweeping the floor, washing windows)
- Swimming (recreational)
- Ballroom dancing
- Shoveling light snow

*Source: Centers for Disease Control and Prevention.*

Regular exercise also improves blood pressure and cholesterol levels, and lowers the risk of having a heart attack or stroke or developing other forms of cardiovascular disease. By strengthening bones, exercise helps prevent osteoporosis. It helps ward off some cancers, prevents or eases arthritis pain, tunes up immune function, helps keep depression at bay, and extends people's life span. That's an impressive benefit for a free, safe activity that everyone can do.

The U.S. Department of Health and Human Services urges adults to exercise often. How much time you should spend exercising depends on how hard you exercise. Current guidelines call for 150 minutes of moderate aerobic activity a week, or 75 minutes of vigorous activity, or a mix of the two. While the guidelines don't spell out how many days a week you should exercise, experts recommend spreading activity throughout the week and being active at least five days a week.

Aerobic activity makes your heart beat faster and your lungs work harder. It encompasses a continuum of movement. At one end are the periods of sustained activity that make up a structured exercise program, such



as walking, running, swimming, or biking. With that level of effort, you'll reap the maximum rewards.

At the other end of the spectrum are the activity "bits"—daily activities such as gardening, washing your car, or walking to the corner for a newspaper—that you can work into your day as part of an active lifestyle. These are also important. Any physical activity requires your muscles to use energy, which helps with glucose control. Even if you sometimes have trouble fitting a full exercise session into your schedule, you can greatly improve your post-meal blood sugar level with just 10 or 15 minutes of walking or other physical activity soon after eating, which is when your blood sugar levels are highest.

Strength training is another component of a well-rounded exercise program. Although the relationship between this type of exercise and diabetes has not been studied as thoroughly as the effects of aero-

bic activity, some studies have revealed encouraging results with strength training. For example, strength training builds muscle, which soaks up glucose from the bloodstream for energy.

However, a few safety precautions are in order. If you are on any type of medication for diabetes, check with your doctor before beginning or changing your exercise routine. This is especially important if you are overweight or have a history of heart disease, peripheral vascular disease, or diabetic nerve damage. Your doctor may recommend a stress test to make sure it's safe for you to exercise and to determine the intensity that's best for you. You may also need to wear special footwear to protect your feet. Nerve damage and circulation problems make people with diabetes vulnerable to foot blisters, ulcers, and infections, which can lead to serious infections requiring amputation of a toe, foot, or leg. ♥

# The elements of a healthy diet

**W**eight loss should be your first goal when it comes to managing diabetes. Whatever strategy you choose for this—whether it's low-carb, high-protein, or something else—it's important to make healthy choices. This will help you control your diabetes, your blood pressure, and your cholesterol while also giving your body what it needs for a long and healthy life.

One way to do this is to follow the strategy set out in the Healthy Eating Plate (see Figure 4, below), developed by nutrition experts at the Harvard T.H. Chan School of Public Health. The advice is simple and straightforward. Divide your plate in half. Fill one side with vegetables (preferably non-starchy ones) and fruits. Fill the other side with whole grains and healthy

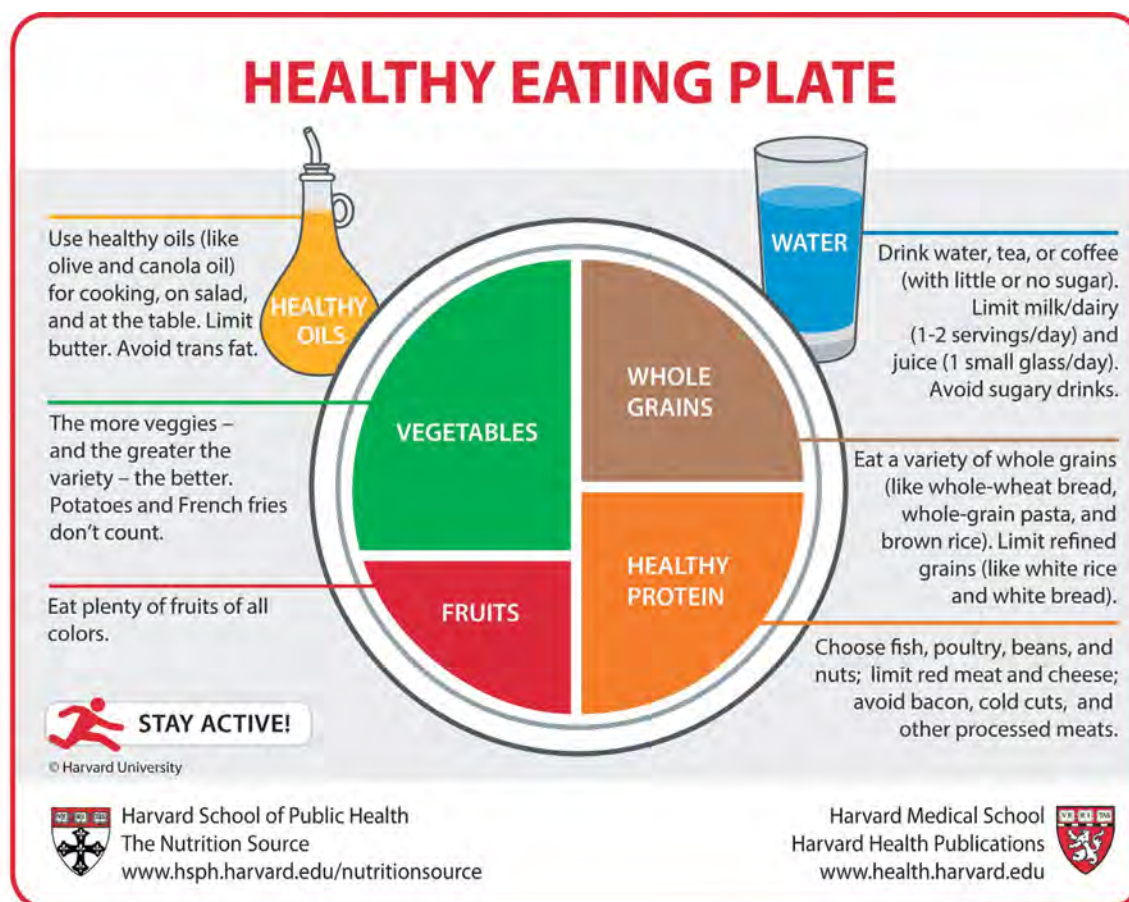
protein. Minimize refined grains such as white rice and white bread, from which fiber has been removed. Choose healthier protein sources, such as fish, poultry, and beans, instead of processed meats like bacon and cold cuts. And use healthy oils.

The rest of this chapter details food choices of special importance to people with diabetes. These closely follow recommendations on diet from the American Diabetes Association.

## Eating patterns matter

Nutrition experts and researchers once focused on the individual nutrients that make up the foods we eat—

**Figure 4: Harvard's Healthy Eating Plate**



carbohydrates, saturated fat, protein, vitamins, and the like. That work has taught us a lot. But we eat *food*, not individual nutrients. That's why nutrition research is increasingly exploring connections between eating patterns and health.

A healthy eating pattern should help you lose weight and control your blood sugar, blood pressure, and cholesterol. It should also be good for your heart, your brain, and every other part of your body.

The term “eating pattern” covers a lot of ground. It can refer to an overall approach to eating, such as being a vegetarian or vegan. It can refer to a general mix-and-match approach to eating with something like a Mediterranean-type diet. Or it can mean a somewhat more specific plan, like the Dietary Approaches to Stop Hypertension (DASH) diet or the Look AHEAD strategy. Each of these healthy patterns is described below.

**Vegetarian.** Vegetarians eat mostly food from plants. Some include milk and other dairy foods (lacto vegetarian), while others include eggs (ovo vegetarian) or both dairy and eggs (lacto-ovo vegetarian). Some even allow for a little bit of animal protein within an overall plant-based diet. Though this doesn't strictly count as vegetarian, people sometimes call themselves vegetarian if they eat mainly vegetarian but with a little chicken (pollo vegetarian), fish (pesco vegetarian), or the occasional serving of red meat, chicken, or fish (flexitarian). Clinical trials have shown that vegetarian diets may be better than traditional low-fat diets for helping people with type 2 diabetes control blood sugar and cholesterol.

**Vegan.** Vegans eat only food from plants. They do not consume any animal products or byproducts. That means no meat, poultry, fish, eggs, or dairy foods, such as yogurt or cheese. In a 2015 review of vegan diets and diabetes, University of Illinois at Chicago researchers found that, like vegetarian diets, traditional vegan diets improve blood sugar and cholesterol levels in people with type 2 diabetes better than standard low-fat diets.

**Mediterranean-type.** In the 1950s and 1960s, nutrition research pioneer Ancel Keys and his colleagues studied eating patterns in 16 different populations in seven countries. They observed that people

living in Crete, other parts of Greece, and southern Italy tended to live longer than others in the study and had lower rates of heart disease and some cancers. Keys was convinced that the regional diets, together dubbed the Mediterranean diet, were an important reason for the good health in those populations. He and his wife, Margaret, promoted the Mediterranean diet in a series of best-selling books.

Over the past four decades, studies have shown that a Mediterranean-type diet can help prevent and treat type 2 diabetes, heart disease, and other chronic conditions. For example, several studies, including a landmark trial in Spain called PREDIMED, have shown the following:

- A Mediterranean-type diet supplemented with additional amounts of nuts or extra-virgin olive oil reduces weight and improves blood sugar at least as well as the often-recommended low-fat diet.
- People newly diagnosed with type 2 diabetes who follow a lower-carb Mediterranean-type diet have greater reductions in their HbA1c levels, a higher rate of normal blood sugar readings, and a delayed need for diabetes medication compared with those following a standard low-fat diet.
- A Mediterranean-style eating pattern prevents heart attacks, strokes, and death from heart disease.

There's no such thing as *the* Mediterranean diet, since more than a dozen countries—each with distinct foods and dietary habits—border the Mediterranean Sea. Here are the general features of a Mediterranean-type dietary pattern:

- plant foods as the main source of calories: vegetables, fruits, whole grains, nuts, and legumes (like beans, peas, and lentils), with a preference for foods that are fresh and minimally processed to preserve nutrients
- olive oil as the main source of fat
- low to moderate amounts of cheese and yogurt with meals
- moderate amounts of fish and poultry as the preferred sources of animal protein; minimal amounts of red meat
- fresh fruit with meals instead of desserts
- for those who drink alcohol, wine consumed in low to moderate amounts (no more than two glasses a

day for men, no more than one a day for women), usually with meals.

**DASH.** The Dietary Approaches to Stop Hypertension (DASH) trial, done in the 1990s, showed a substantial reduction in blood pressure from a diet rich in fruits, vegetables, and low-fat dairy foods, and with reduced sodium, saturated fat, and total fat. In several small trials among people with type 2 diabetes, a DASH approach has been shown to help control blood sugar, blood pressure, and other cardiovascular risk factors. You can find information about the DASH diet at [www.health.harvard.edu/dash](http://www.health.harvard.edu/dash).

**Look AHEAD.** This important trial didn't examine a specific eating pattern. Instead, nutritionists helped participants create meals and snacks that each day delivered enough calories for good health and weight loss (1,200 to 1,800 calories a day). Fat provided less than 30% of calories, while protein provided more than 15%. Participants were also encouraged to replace one or two meals or snacks a day with alternatives such as portion-controlled shakes, bars, or meals that contained 150 to 220 calories. Those who used meal replacements had better diet quality and lost more weight than those who didn't. (For more details on this trial, see “[The first-line treatment: Eating for weight loss](#),” page 9.)

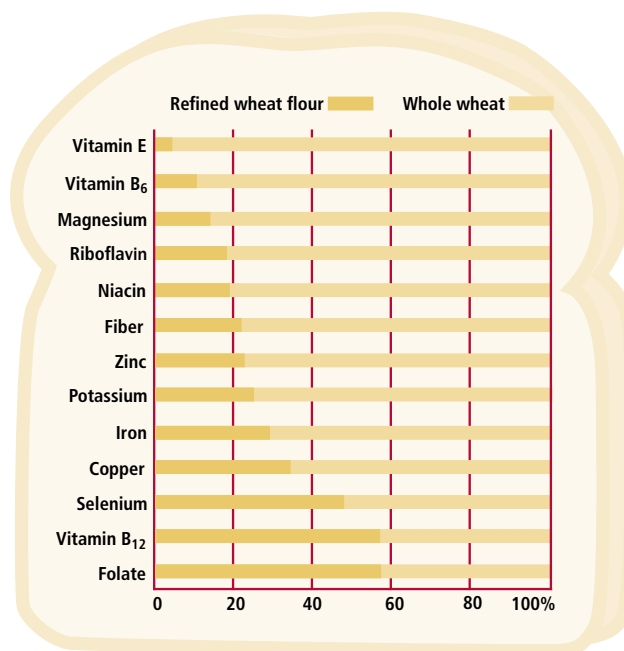
Any healthy eating pattern should spread meals evenly over the course of the day: breakfast after you wake up; lunch in the middle of the day; dinner or supper toward the end of the day, but not too close to bedtime; a snack or two if needed in between meals. Missing a meal often means eating extra food later, which can lead to a big spike in blood sugar and put extra pressure on the pancreas to make insulin.

In the context of an overall awareness of eating patterns, it's also useful to understand the various components of foods.

## Carbohydrates: Sugar, fiber, and more

Carbohydrates are the major component of bread, pasta, cereals, fruit, milk, vegetables, and beans. They affect blood sugar far more than fat and protein do, so it's wise to make the healthiest choices possible when it comes to carbohydrates.

Figure 5: The grain drain



Important nutrients disappear when whole wheat or other grains are refined. As this baker's dozen shows, the losses can be dramatic. For example, refined wheat flour has only 5% of the vitamin E of whole-wheat flour and roughly 10% of the vitamin B6.

Start by keeping two points in mind. First, both the *total amount* of carbohydrates and the *type* of carbohydrates you consume every day are important. Second, when choosing carbohydrate-rich foods, it's better to eat those that are rich in other nutrients and vitamins, so you get more “bang for the buck” when it comes to calories.

Whenever possible, stay away from highly refined carbohydrates such as white bread and other foods made with highly refined wheat flour, such as most bagels, crackers, cookies, pastries, and the like. Although the word “refined” makes it sound as though the ingredients are high grade, in fact the opposite is true. Refining grains removes valuable nutrients, fiber, and vitamins (see Figure 5, above). Drinking sugar-sweetened beverages or natural fruit juices or eating too many refined carbohydrates can cause a significant spike in blood sugar and insulin, increase triglyceride levels, and lower helpful HDL cholesterol—especially in people who are overweight. Other foods in this category include white rice, candy, and sweets.



It's better to eat carbohydrates that have been minimally processed and that are rich in fiber. These are digested more slowly, causing a more moderate increase in blood sugar. Less-processed carbohydrate foods are loaded with nutrients that are good for overall health. So opt for sources such as whole grains, fruits, and vegetables. Choose whole-wheat flour instead of white flour and brown rice over white rice.

Note that, despite the current interest in gluten-free diets, these are not useful for managing diabetes (though they are lifesaving for people with celiac disease).

### Fiber

Fiber is a form of indigestible carbohydrate found mainly in plant foods. It's what your grandmother called "roughage." Fiber comes in two forms: insoluble fiber, the kind found in whole grains, and soluble fiber, a gummy substance that is a component of dried peas, beans, oats, and fruits.

Fiber slows the digestion of food. That has two payoffs. One is that you feel full longer, and so may not eat as often, or as much. Another is that it delays the release of glucose into the bloodstream, making for a slower and more gradual rise in blood sugar. Soluble fiber in particular appears to reduce blood sugar and improve insulin sensitivity. Perhaps more significant, given that the risk of heart disease is so high for people with diabetes, a number of studies in the general population have linked eating fiber with a lower risk of heart disease. In the Physicians' Health Study, for instance, men who consumed higher amounts of fiber (roughly 29 grams per day) were 41% less likely to have had a heart attack than those who consumed less (about 12 grams a day). A similar reduction was seen in a large study of female nurses.

Eating more fiber is a good strategy even after having a heart attack. In two large studies, male and female heart attack survivors who ate more fiber after their heart



Red kidney beans are among the best sources of soluble fiber, which helps reduce blood sugar and improve insulin sensitivity.

**Table 3:** Good sources of fiber

FOOD	GRAMS OF FIBER*
Red kidney beans, cooked, 1 cup	16.5
Split peas, cooked, 1 cup	16.3
Raspberries, raw, 1 cup	8.0
Whole-wheat spaghetti, cooked, 1 cup	6.3
Pear, medium, with skin	5.5
Oat-bran muffin, medium	5.2
Broccoli, cooked, 1 cup	5.1
Apple, medium, with skin	4.4
Oatmeal (quick, regular, or instant), cooked, 1 cup	4.0
Green beans, cooked, 1 cup	4.0
Brown rice, cooked, 1 cup	3.5
Popcorn, air-popped, 2 cups	2.4
Whole-wheat bread, one slice	1.9

*\*Fiber content can vary among brands and varieties.  
Source: USDA National Nutrient Database for Standard Reference, 2015.*

attacks were less likely to have died over a 22- to 32-year follow-up period.

To reap the benefits of fiber, try to consume 20 to 35 grams a day. Most Americans fall far short of this mark, averaging just 15 grams every day. You can boost your fiber intake by choosing whole-grain cereals and breads. Look for products that list whole wheat, oats, barley, or another whole grain first on the list of ingredients. Eat baked potatoes with the skin, or choose sweet potatoes instead. Try baking with whole-wheat flour instead of white flour. Swap regular pasta with whole-grain pasta. Foods that have at least 5 grams per serving are excellent fiber choices (see Table 3, above, for good sources).

Thinkstock



Some practical advice: if you currently eat only modest amounts of fiber, add in extra fiber slowly over several weeks, and drink plenty of fluids with your meals. This gives your digestive tract time to adjust and lessens gas and other types of gastrointestinal distress that may occur with the shift to a higher-fiber diet. Drinking more water is also important in order to avoid constipation: insoluble fiber absorbs fluid as it is digested, so you need to drink enough to compensate and keep things moving.

## Sugar and sugar substitutes

Sugar was once taboo for people with diabetes. But clinical studies have shown that sugar and sugar-containing foods don't increase blood sugar any more than white bread, white rice, and other types of refined carbohydrates, as long as the total amount of carbohydrates is the same. In other words, sugar is no worse than other refined carbohydrates. Both are nutrient-poor sources of calories, but a small amount is acceptable.

Most Americans eat far more sugar than they should—an average of 21 teaspoons a day for men and 15 a day for women. That's well above the upper

### The many names of sugar

Foods can contain many sweeteners besides refined white sugar, which the FDA recognizes as table sugar, or sucrose. But these other sweeteners are just different forms of sugar, so don't be fooled. The Nutrition Source, an online newsletter from the Harvard T.H. Chan School of Public Health, lists these other names for sugar that you may see on food labels:

- agave nectar
- brown sugar
- cane crystals
- cane sugar
- corn sweetener
- corn syrup
- crystalline fructose
- dextrose
- evaporated cane juice
- fructose
- fruit juice concentrates
- glucose
- high-fructose corn syrup
- honey
- invert sugar
- malt syrup
- maltose
- maple syrup
- molasses
- raw sugar
- syrup

### Label lingo for sugar

**Sugar-free** means less than 0.5 grams of sugar per serving.

**Reduced sugar or less sugar** means a reduction of sugar by 25% compared with regular products.

**No added sugar** means no sugars have been added during processing.

limit of 10 teaspoons a day recommended by nutritional guidelines—and these amounts of added sugar translate into plenty of extra calories: 335 for men and 240 for women.

One way to cut back on sugar is to choose from the many sugar-free and no-calorie sweetened foods on the market. In moderation, foods containing non-sugar sweeteners can satisfy a craving for sweets while limiting the number of calories consumed. The key, once again, is to keep an eye on total calories, because sugar-free does not mean calorie-free.

**Natural and added sugars.** Sugar is sometimes referred to as a simple or fast-acting carbohydrate, because it tends to cause a more rapid rise in blood glucose than complex carbohydrates like whole grains or vegetables. Milk contains a natural sugar called lactose; fruit contains a natural sugar called fructose. Table sugar (technically known as sucrose) is a combination of two natural sugars—glucose and fructose. The term “added sugar” means any sugar not naturally present in the food that is added in processing, and includes sugars found in sodas and other beverages, canned fruits, baked goods like cookies, and numerous other foods. On food labels, added sugar may be listed as sucrose or may go under a variety of other names (see “The many names of sugar,” at left).

High-fructose corn syrup (HFCS) now represents over 40% of caloric sweeteners added to foods and beverages. It is the main caloric sweetener in soft drinks in the United States. This sweetener has gotten a bad rap. HFCS has been scorned as “unnatural” and blamed for the rising tide of obesity in the United States. In reality, HFCS isn't all that different from regular table sugar. Both are extracted from plants: HFCS from corn, and table sugar from sugar cane or sugar beets. Both con-

**Table 4:** Non-nutritive sweeteners

COMMON NAME	BRAND NAMES	NUMBER OF TIMES SWEETER THAN SUGAR	COMMON USES	ACCEPTABLE DAILY INTAKE (ADI)* (mg/kg body weight per day)	ADI SAFETY EQUIVALENT
<b>Artificial non-nutritive sweeteners</b>					
acesulfame-K	Sunett, Sweet One	200+	Baked goods, frozen desserts, candies, beverages, cough drops, breath mints	15	23 packets; 30 to 32 12-ounce cans lemon-lime diet soda
advantame	none yet	20,000+	General-purpose sweetener and flavor enhancer in foods (except in meat and poultry)	32.8	4,920 packets
aspartame	Equal, NutraSweet (the “blue packet”)	200+	Tabletop sweetener, carbonated soft drinks, soft drink mixes, chewing gum, confections, gelatins, dessert mixes, puddings and fillings, frozen desserts, yogurt, and some medications (including vitamins and cough drops)	50	75 packets; 15 cans diet soda
neotame	Newtame	7,000–13,000	Baked goods, soft drinks, chewing gum, frosting, frozen desserts, jams, jellies, gelatins, pudding, processed fruit and fruit juices, toppings, syrups	0.3	23 packets
saccharin	Sweet’N Low (the “pink packet”)	200–700	Tabletop sweetener, baked goods, soft drinks, jams, chewing gum	15	45 packets
sucralose	Splenda (the “yellow packet”)	600	Tabletop sweetener, beverages, chewing gum, frozen desserts, fruit juices, gelatins	5	23 packets
<b>Natural non-nutritive sweeteners</b>					
Siraitia grosvenorii (luo han guo) fruit extracts	Nectresse, PureLo	100–250	Tabletop sweetener, sweetener in foods	not determined	not determined
rebaudioside A (extract of the stevia plant)	Truvia, PureVia (the “green packet”)	200–400	Soft drinks, fruit juices	4	9 packets

*\*Acceptable daily intake is the maximum amount of sweetener per kilogram of body weight that a person can safely consume every day over a lifetime without risk. However, these figures come from animal studies rather than human trials, so they are only estimates. Source: U.S. Food and Drug Administration.*

tain roughly equal amounts of fructose and glucose: sucrose has 50% fructose and 50% glucose, while HFCS has 55% fructose and 45% glucose. Your body uses HFCS in much the same manner as it does sucrose.

HFCS and sugar have similar effects on blood sugar levels and prompt similar insulin responses in healthy people. There’s been some suspicion that fructose may contribute to overeating by lowering natu-

ral levels of hormones that signal a feeling of fullness. Still, the evidence isn’t definitive. It’s true that rates of obesity and diabetes rose in tandem with the increased HFCS use in the United States since the 1970s. But “diabesity” has become a global problem—even in Europe and Australia, where HFCS is rarely used.

**Sugar alcohols.** Many “sugar-free” foods contain sugar alcohols such as sorbitol, xylitol, erythritol, and

mannitol. Also called polyols, these sweeteners are often found in sugar-free chewing gum, candy, cookies, and ice cream. Although sugar alcohols contain some calories and carbohydrates, they are absorbed into the blood less rapidly than sugars and usually don't raise blood sugar dramatically. If you count carbohydrates (see “Carbohydrate counting,” page 32), the ADA recommends counting half the calories from sugar alcohols as carbohydrate, since only half of the sugar alcohol is digested and absorbed into the bloodstream.

Sugar alcohol sweeteners do have drawbacks. If eaten in large quantities, they can have a laxative effect. Products with these ingredients may also be more expensive than similar foods.

**Non-nutritive sweeteners.** The FDA has approved six artificial sweeteners for use in the United States (see Table 4, page 22). It has also acknowledged that two plant extracts are “generally recognized as safe” and can be used as sweeteners. All of these are called “non-nutritive sweeteners” because they don't deliver any calories.

Non-nutritive sweeteners are considered safe for people with diabetes. Whether they help people lose weight is less clear. Some studies suggest that these sweeteners may actually *promote* weight gain, possibly by increasing appetite, whereas other studies don't support that finding. Substituting artificial sweeteners for sugar (for example, drinking diet instead of regular soda) is one way to cut excess calories from your diet. Just don't overdo it, although it's unlikely you will

consume more than the acceptable daily intake. For aspartame, that translates to 15 or more 12-ounce diet sodas per day for a 150-pound person.

## Fats

For years, fat was a dirty word in the dietary world. After World War II, large studies established links between saturated fat and heart disease. Most dietary experts advised people to reduce their fat intake, not only because of the heart connection, but also because fat has more calories per gram than protein or carbohydrate and was assumed to contribute more to weight gain. Many people did so, but they often replaced the lost calories with large amounts of carbohydrates—especially refined carbohydrates. They also stopped eating healthy fats, like olive and canola oils. Instead of helping us slim down, the decline in fat consumption was accompanied by *higher* rates of overweight and obesity.

What went awry? As it turns out, the “all fat is bad” message was wrong. Foods that contain fat help fill you up, so you stop eating earlier. More important, not all fats are alike. Saturated fat, found mainly in meat and dairy foods, contributes to clogged arteries and cardiovascular disease. But monounsaturated and polyunsaturated fats, found in plants and healthful oils, actually protect your health by improving your cholesterol profile (see Table 5, below). Fat has little direct effect on blood sugar levels. It is a major energy

Table 5: The skinny on fats			
TYPE OF FAT	MAIN SOURCES	STATE AT ROOM TEMPERATURE	EFFECT ON CHOLESTEROL
Monounsaturated fat	Olives and olive oil, canola oil, peanut oil; cashews, almonds, peanuts, and most other nuts; peanut butter; avocados	Liquid	Lowers LDL; raises HDL
Polyunsaturated fat	Corn, soybean, safflower, and cottonseed oils; fatty fish	Liquid	Lowers LDL; raises HDL
Saturated fat	Whole milk, butter, cheese, and ice cream; red meat; chocolate; coconuts, coconut milk, and coconut oil	Solid	Raises both LDL and HDL
Trans fat	Most margarines; vegetable shortening; foods containing partially hydrogenated vegetable oil; deep-fried chips; many fast foods; most commercial baked goods	Solid or semi-solid	Raises LDL; lowers HDL
Adapted from Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating, by Walter C. Willett, M.D., with P.J. Skerrett (Simon & Schuster, 2005).			



Diets that contain a lot of fresh fruits and vegetables, such as the DASH diet, tend to be best for people with diabetes.

source for your body, and it helps you absorb certain vitamins and nutrients.

Another type of fat needed for a variety of vital physiological functions is the family of omega-3 unsaturated fats. Your body can't make these on its own; it must get them from food. Omega-3s may help prevent heart disease and stroke. There is emerging evidence that omega-3s may also help beta cells in the pancreas improve their production of insulin. Good sources of omega-3s include fatty fish such as salmon, tuna, sardines, and mackerel. Flaxseeds, walnuts, wheat germ, canola oil, unhydrogenated soybean oil, and flaxseed oil are also rich in omega-3s (see Table 5, page 23).

Trans fats are the worst fats for your health. These fats are made when hydrogen is added to healthy unsaturated fats to solidify them and make them less likely to spoil. Trans fats raise harmful LDL cholesterol, lower beneficial HDL cholesterol, increase inflammation, and make blood more likely to clot. To avoid them, look for products that have a zero on the "trans fat" line in the Nutrition Facts box. The FDA has ruled that "partially hydrogenated" oils, the main source of trans fats in the American food supply, are no longer "generally recognized as safe" and that food companies must stop using them by 2018. Until then, it's a good idea to stay away from foods that list "partially hydrogenated" oils in their ingredient lists.

The current Dietary Guidelines for Americans recommend that adults get 20% to 35% of their daily calories from fat and limit saturated fat to under 10%

of daily calories. The American Diabetes Association, while generally supporting the Dietary Guidelines, has backed away from giving this type of specific guideline, saying there isn't much evidence behind those numbers. Whenever possible, choose healthy polyunsaturated and monounsaturated fats over unhealthy trans fats and saturated fats.

## Diet and blood cholesterol level

There is some evidence that food has a greater effect on the level of harmful LDL cholesterol in people with diabetes than in other people. For that reason, it is especially important to make food choices that won't increase your LDL.

Start by limiting the amount of trans and saturated fats you eat, since your body uses these fats as building blocks to make cholesterol. Higher-fat cuts of red meat are high in saturated fat, as are some dairy foods, such as cheese, butter, and ice cream (see Table 5, page 23). Steer clear of trans fats by reading food labels and avoiding deep-fried foods when eating out. The cooking fats that contain trans fat are certain commercial frying oils, partially hydrogenated vegetable oils, vegetable shortening, margarine, griddle shortening, and vegetable ghee, a fat commonly used to cook Indian food. Types of oils that are preferable for frying include canola, soybean, sunflower, and olive oils.

Cutting back on foods that contain high amounts of cholesterol—such as liver, egg yolks, squid, shrimp, and some meat and dairy products—may also help keep your cholesterol level in check, although for most people, cholesterol-rich foods have only a minor effect on their blood cholesterol levels.

Switching from refined grains and foods made from them (like white rice and white bread) to whole grains and foods made from them can also improve cholesterol levels.

## Protein

Your body needs protein to build and repair muscle, skin, and other cells. Too little protein in the diet can slow growth, decrease muscle mass, lower immunity, and weaken the heart and respiratory system. According to the Dietary Guidelines for Americans, a wide

**Table 6: Choosing protein-rich foods wisely**

This table shows the relationship between different protein sources and the amount of fat they contain. It's wise to get most of your protein from items in the "very lean" and "lean" categories.

CATEGORY	FOOD SERVING	PROTEIN GRAMS	FAT GRAMS	CALORIES
Very lean	1 ounce skinless turkey or chicken 1 ounce cod, flounder, haddock, halibut, or canned tuna in water ½ cup low-fat or nonfat cottage cheese	7	0–1	35
Lean	1 ounce lean beef (round, flank, chuck, or rump roast) 1 ounce pork tenderloin or center-cut chop 1 ounce herring, salmon, sardines, mackerel, or fresh tuna 1 ounce low-fat cheese	7	3	55
Medium to high fat	1 ounce beef (most types, including ground beef, steak, prime rib, or corned beef) 1 ounce lamb 1 ounce pork chop, cutlet, or spareribs 1 ounce veal cutlet	7	5–8	75–100

*Adapted from the American Diabetes Association's Exchange Lists for Meal Planning and A Guide to Healthy Eating, Brigham and Women's Hospital Department of Nutrition.*

range of daily protein intake—from 10% of daily calories to 35%—covers daily needs and is healthy. Protein has relatively little effect on blood sugar.

Protein is found primarily in meat, fish, poultry, dairy foods, nuts, and dried beans and other legumes. Some vegetables and starches contain a modest amount of this nutrient. Fortunately, there is no shortage of available protein in the American diet. The trick is avoiding protein in the form of cured and processed meats, and protein high in saturated fat, which accompanies many sources of animal protein, like meat and dairy foods (see Table 6, above).

High-protein diets that deliver more than 20% of calories from protein, such as the Atkins and South Beach diets, may lead to short-term weight loss. But they may also be harder on the kidneys—a potential concern for people with diabetes. If you want to try a higher-protein diet to lose weight or control your blood sugar, talk with your doctor or nutritionist about it.

## Other dietary components

The big three nutrients—carbohydrate, fat, and protein—cover the lion's share of your metabolic needs. But the story doesn't end there. Plenty of other factors

enter into good nutrition. For example, people who have diabetes should be aware of the latest recommendations about alcohol, calcium, salt, and vitamins.

### Alcohol

Alcohol can be a double-edged sword. There's consistent evidence that light to moderate alcohol intake (that means no more than two drinks a day for men, no more than one a day for women) can improve the body's response to insulin and glucose metabolism in people with diabetes. It's also well documented that light drinking has been linked with lower rates of heart attack, stroke, and other cardiovascular conditions.

But drinking too much can cause a range of problems. It makes the body's tissues less sensitive to insulin. It can boost blood pressure and triglyceride levels—both detrimental to heart health. Heavy drinking can damage the liver, erode mental health, and destroy relationships.

If you take insulin or certain oral medications to lower blood sugar, you raise your risk of developing dangerously low blood sugar, known as hypoglycemia, when you drink alcohol.

If you do drink alcohol, bear these points in mind:

- One drink of alcohol equals 1.5 ounces of hard



**Table 7: Calories in selected alcoholic beverages**

DRINK	CALORIES
White wine (4 ounces)	121
Red wine (4 ounces)	125
Light beer (12 ounces)	103
Regular beer (12 ounces)	153
Extra dry martini (2.2 ounces)	139
Margarita (4 ounces)	168
Wine cooler (12 ounces)	200–240

*Source: Rethinking Drinking, National Institute on Alcohol Abuse and Alcoholism.*

liquor, a 12-ounce beer, or 5 ounces of dry wine.

- Remember to account for the calories in your alcoholic drinks in your daily meal plan (see Table 7, above). If you have a mixed drink, don't forget to add the calories of both the mixer and the alcohol. Avoid mixed drinks that include regular soda or fruit juices. And beware of eating more beer nuts, pretzels, chips, and other snacks while drinking.
- Don't drink alcohol on an empty stomach or after vigorous exercise. That can lead to low blood sugar if you're on insulin or sulfonylureas.
- If you are taking medications for diabetes, ask your doctor or pharmacist whether these drugs raise the risk of developing dangerously low blood sugar and how to avoid problems with alcohol.

## Calcium

When you have diabetes, one of the last things you may think about is the effect your diet has on your bones. But it's worth taking steps to help fend off osteoporosis, the loss of bone mass that often occurs as people get older. Bone is dynamic tissue: old bone is constantly being replaced with new bone. In the first 20 years of life, bone is built more quickly than it is removed. But the balance shifts as people grow older. When women approach menopause, bone is lost more rapidly than it is replaced. In the five to seven years after menopause, women can lose up to one-fifth of their bone mass. Bone loss usually begins later for

men—most often when they are in their late 50s—and it worsens more slowly. But by ages 65 to 70, most men and women lose bone at the same rate.

A key treatment for type 2 diabetes is weight loss. In the Look AHEAD trial, intensive lifestyle efforts that helped participants lose weight improved many aspects of their diabetes. However, weight loss was also linked to significant bone loss at the hip among men, although not among women. The benefits of weight loss far outweigh the risks, but the Look AHEAD results suggest that you should keep an eye on your bone health when you are trying to lose weight or afterward. Weight-bearing exercises such as walking are good ways to keep bones strong and prevent osteoporosis.

Calcium helps build bones and keep them strong. The recommended daily dietary intake of calcium is 1,000 mg for adults ages 19 to 50; 1,200 mg for women over 50; and 1,200 mg for all adults over 70. One good source of calcium is milk and other dairy foods. But these products also can be high in saturated fat as well as retinol (vitamin A), which at high levels can weaken

**Table 8: Calcium-rich foods**

FOOD	CALCIUM (MG)
Tofu, firm, prepared with calcium sulfate (½ cup)	861
Collards, frozen (1 cup)	357
Orange juice, calcium-fortified (8 ounces)	348
Sardines, Atlantic, canned in oil (3 ounces)	325
Milk, 1% or skim (8 ounces)	314
Mozzarella cheese, nonfat (2 ounces)	269
Yogurt, low-fat, flavored (6 ounces)	260
Salmon, sockeye, canned, including bones (3 ounces)	197
Greek yogurt, plain (6 ounces)	180
Rhubarb, fresh (1 cup)	105
Soy nuts, roasted (2 ounces)	80
Broccoli, cooked (1 cup)	62
Black beans, cooked (1 cup)	46

*Source: USDA National Nutrient Database for Standard Reference, 2015.*

bones. Limit milk and dairy foods to no more than one to two servings per day. More won't necessarily do your bones any good—and less is fine, as long as you get enough calcium from other sources. Calcium-rich nondairy foods include leafy green vegetables and broccoli (see Table 8, page 26).

**Vitamin D.** This vitamin, sometimes called the sunshine vitamin, helps the body absorb calcium. One way to get vitamin D is to make it the old-fashioned way, by exposing your skin to sunlight for a few minutes each day. (Keep in mind that too much sun can cause skin cancer.) You can also get vitamin D from supplements. The recommended daily intake is 600 international units (IU) for people ages 19 to 70 and 800 IU for those over 70, although some experts recommend higher levels. (*Making Sense of Vitamins and Minerals: Choosing the Nutrients and Foods You Need to Stay Healthy*,

a Special Health Report from Harvard Medical School, features comprehensive information about these nutrients; see back cover for ordering information.)

## Salt

Most people with diabetes also have high blood pressure. According to the American Heart Association, high blood pressure is twice as common among people with diabetes as it is among the general public. Like diabetes, high blood pressure increases your chances of developing heart disease, stroke, kidney disease, and loss of vision. Having both diabetes and high blood pressure raises these risks even more.

The human body needs sodium, which we get mainly from salt. But consuming too much sodium boosts blood pressure and leads to high blood pressure in some people. The average American takes in about

## Rethink your food and drink: Choices that may lower diabetes risk

Many of the same healthy eating choices that can help you control your diabetes can help your family members and friends prevent diabetes. The relationship between eating specific types of foods and diabetes risk remains a topic of some debate, since the research is limited and the results somewhat controversial. The following summaries come from studies in which people reported what they ate or drank, and are there-

### LOWER RISK



**Fiber.** Men and women who eat lots of whole grains have a roughly 40% lower risk of diabetes than those who eat scarce amounts. Fiber from cereals, breads, and grains seems to be the most beneficial.



**Coffee.** One cup of coffee a day lowers diabetes risk by 13%, and two cups a day cuts the risk by 42%, when compared with no coffee drinking.



**Moderate alcohol.** Compared with men who abstain from alcohol, men who have two to four drinks *per week* have a 25% lower risk than teetotalers. Five to six drinks per week drops the risk by 33%, and one drink a day cuts risk by 43%. (See "Alcohol," page 25, for information about moderate use and precautions.)



**Nuts.** Women who eat nuts or peanut butter at least five times a week have a 20% to 30% lower risk of diabetes than those who rarely eat nuts.

fore considered less rigorous than those in which people are assigned to follow different diets. But over all, the findings are consistent with what experts consider healthy eating habits for most adults. What's more, all of the dietary choices (with the exception of alcohol) that have been linked to a lower risk of diabetes have also been associated with weight loss, whereas those linked to a higher risk also promote weight gain.

### HIGHER RISK



**Sugary drinks.** Women who drink two or more sugar-sweetened soft drinks per day have a 24% higher risk of developing diabetes compared with women who sip less than one per month. Two or more daily fruit drinks (which contain little, if any, real fruit juice) lead to a 31% higher risk.



**Meat.** Women who eat the most red meat (about a serving per day) have about a 20% higher risk of diabetes than those who eat the least (about one serving a week). And men who eat processed meats like hot dogs, bacon, and lunch meats five times a week are nearly twice as likely to develop diabetes as men who eat such foods just twice a month.



**Trans fats.** Trans fats have been linked to a higher risk of diabetes as well as heart disease. One study documented a 30% increased risk of diabetes among women who ate the most trans fats compared with those who ate the least.

3,400 mg of sodium daily, more than three-quarters of it from processed foods. However, the American Diabetes Association recommends that people with diabetes consume no more than 2,300 mg per day. The Dietary Guidelines for Americans tell people with diabetes to aim even lower—for just 1,500 mg per day—but this level is very difficult to achieve. The bottom line is that you should try to cut down on sodium as much as you can.

Here are some steps that can help you do that:

- Eat more fresh, home-cooked foods. Take a pass on fast foods, which are often high in salt.
- Cut back on—or choose low-sodium versions of—frozen dinners, packaged mixes, canned soups or broths, and processed meats and cheeses.
- Use herbs and spices instead of salt to flavor foods while cooking.
- Don't use flavorings with “salt” in the name, such as onion salt or garlic salt. Soy sauce, salad dressings, barbecue sauce, and steak sauce usually are also high in sodium. Opt for low-sodium or salt-free seasonings, sauces, and dressings.
- Instead of salted snacks such as crackers, chips, and pretzels, eat “low-sodium” or “no salt added” versions.

For more tips on reducing sodium in your diet, see *Tasting Success with Cutting Salt* from the Harvard T.H. Chan School of Public Health and the Culinary Institute of America, at [www.health.harvard.edu/tasting-success](http://www.health.harvard.edu/tasting-success).

## Other minerals and vitamins

It's possible to get most of the vitamins and minerals you need from the foods you eat, especially if you eat healthy foods. The following vegetables are rich in vitamins, minerals, and healthy compounds called phytochemicals:

- |                     |                        |
|---------------------|------------------------|
| • asparagus         | • mushrooms            |
| • broccoli          | • onions               |
| • cabbage           | • pea pods             |
| • carrots           | • peppers              |
| • cauliflower       | • radishes             |
| • celery            | • spinach              |
| • cucumbers         | • tomatoes             |
| • green beans       | • yellow summer squash |
| • greens, all types | • zucchini.            |

But even if you are a healthy eater, it's likely that your diet sometimes falls short on vitamins and minerals. That's why many nutrition experts recommend taking a multivitamin-and-multimineral supplement every day. Keep in mind, though, that multivitamins aren't wonder drugs: they can't overcome the failings of a poor diet.

Don't take separate supplements of individual antioxidants, such as beta carotene or vitamin E or C; there is no evidence of any benefit in taking these supplements and some hints of possible harm. Some studies have found a higher risk of death in people who took antioxidant supplements. Likewise, there's no clear evidence that chromium supplements—often touted as helpful for diabetes—improve health. ♥

# Meal-planning basics

**D**oes your idea of an eating plan mean that you plan to eat at some point when you get hungry? Are the “what” and “how much” left to be discovered when you open the refrigerator door or sit down at the table? This haphazard approach can’t be endorsed as a design for healthy eating for anyone—much less for people with diabetes or those who are at risk for this disorder. Yet it’s an accurate description of the way many Americans approach meals. The more we learn about the influence of diet on long-term health and well-being, the more important it becomes to make wise, conscientious food choices. When you have diabetes, this is even more crucial.

What is meal planning? As the name implies, it involves thinking ahead of time about what, how much, and even when and where you are going to eat. It may involve working out a food budget as well—although in this case you’ll be counting calories as well as dollars and cents.

## Meet with a registered dietitian

Meal planning usually begins with a visit to a dietitian (see “Finding a dietitian,” at right). The Academy of Nutrition and Dietetics recommends having three to four meetings with a dietitian within three to six months of being diagnosed with diabetes. These meetings are generally covered by Medicare and some private insurance.

The first meeting with your dietitian will be largely devoted to compiling a nutritional assessment—your “diet history.” This analysis of your eating and lifestyle habits usually takes about an hour. It may be helpful if you bring to your first visit a diary listing everything you have eaten over a three-day period (ideally, two weekdays and one weekend day), with approximate serving sizes (see “Keep a food diary,” page 30). During this kickoff session, you and the dietitian will discuss what you eat, when you eat,

and who does the shopping and food preparation in your household. She or he will probably ask a variety of questions about your lifestyle and daily routine, including these:

- Do you take a lunch with you to work, or do you buy lunch out?
- Does your eating pattern change on weekends? If so, how?
- How often do you dine in restaurants or get takeout?
- Do you exercise regularly? If so, what kind of exercise do you perform, and when do you do it? How long do your sessions usually last, and how intense is the exercise? How does activity typically affect your blood sugar?
- What is your current weight and your pattern of weight changes over the years?

## Finding a dietitian

The best person to help you develop a healthy eating plan is a registered dietitian (R.D.) or registered dietitian-nutritionist (R.D.N.) with expertise in diabetes. Ideally, he or she will be a certified diabetes educator (C.D.E.) as well. There are several ways to find a qualified professional. One is to ask your doctor for referrals. You can also check the website of the Academy of Nutrition and Dietetics (formerly the American Dietetic Association), which lets you view a list of dietitians in your area by entering your ZIP code (see “Resources,” page 51). Or you can try calling the nutrition department of any large teaching hospital.

If you have diabetes, health insurance usually covers at least one or two visits to a dietitian. Medicare covers 80% of the cost of such visits as long as you are referred by a doctor and see a registered dietitian or other nutrition professional (and you first meet your annual Part B deductible). In general, Medicare covers three hours of consultation in the first year and two hours of consultation in subsequent years. Coverage provided by other types of health insurance varies, so it’s best to check with your provider.

- What diets or weight-loss strategies have you tried in the past, and how did they work for you?
- Do you take any medications for your diabetes? If so, what are the doses? Are you taking any other medications?
- Do you check your blood sugar? If so, how often, and what are the results?
- What other health conditions do you have?

The dietitian will use all this information to help you target a realistic healthy body weight and to devise an eating plan that is right for you and that will improve your blood sugar levels. Bring along any records of blood sugar tests, as this can provide the dietitian with some idea of your average blood sugar levels (see “Blood sugar testing,” page 6) and help him or her interpret the effect of your eating and activity on your blood sugar patterns. Also bring a list of any medications you are taking.

## Keep a food diary

One tool that can help you and your dietitian analyze your current eating patterns and put together an effective eating plan for the future is a food diary. By tracking what you currently eat, you may see trends in your eating habits that you failed to notice in the past. This information can also help the dietitian get a firsthand glimpse into your personal eating style.

To get the most complete picture of your food consumption, keep a food diary for one to two weeks. Use a paper notebook you can carry around, a computer, or one of the many food tracking apps for smartphones and tablets. Note what you’ve eaten, and how much, as soon as you eat it. If you wait until the end of the day, you’ll likely forget some of the things you ate earlier. Bring the food diary with you to any appointments with your dietitian. A thorough food diary should record such facts as these:



A registered dietitian with expertise in diabetes can help you develop a healthy eating plan that will help you lose weight, while reducing your blood sugar levels.

**What you eat and drink.** This means every mouthful of food—even tastes, snacks, and sips. Indicate how it was prepared (baked or fried, for instance). Also count oils, butter, sugar, and condiments.

**How much you eat.** When you first start recording your food intake, measure your portion sizes with standard measuring utensils. This serves two purposes: it provides more precise information about your food consumption, and it helps you get used to standard serving sizes. You’ll probably be surprised by what a 3-ounce serving of chicken or half a cup of mashed potatoes looks like on your plate. As you grow more familiar with these portions, you can begin

to eyeball servings more accurately. Or use the guidelines provided in “Quick tips for portion control” on page 11.

**When you eat.** The timing of meals and snacks is valuable information for blood sugar control. For example, it is important to assess the timing of your dinner in relation to the timing of your bedtime blood sugar readings. The goal for a blood sugar reading taken two hours after eating might be less than 180 mg/dL because the reading reflects the impact of the meal, whereas the goal for a blood sugar reading four hours after eating might be 80 to 130 mg/dL.

**Physical activity.** It’s important to track the timing and intensity of your exercise sessions so you can get a picture of how physical activity interacts with your food and medication schedules and how it affects your blood sugar levels. Note routine activity as well, such as climbing three flights of stairs at work or walking for 20 minutes while shopping.

## Calculate your calorie needs

Once all this information is collected, you and your dietitian will begin the planning stage of the assessment. Your dietitian will discuss the general principles of meal



planning for diabetes control and prepare an individualized eating plan that suits your lifestyle, health goals, medical needs, and personal likes and dislikes.

The first step in putting this plan together is determining whether you are currently at a healthy weight. Although various guidelines exist, many health professionals rely on the **BMI** (see Table 1, page 5).

If your current weight is within the healthy range, your dietitian will begin by figuring out how many calories you need each day to maintain that weight. Dietitians usually have calculators that can account for your age and activity level in order to come up with a personal recommendation (see also “**Estimating your calorie needs**,” at right). If you need to lose weight, you’ll aim for fewer calories per day (see “**Calorie-cutting methods**,” page 11).

Now you can apply the nutrition guidelines spelled out in “**The elements of a healthy diet**,” beginning on page 17. A summary for people with diabetes appears in Table 9 on page 32. Luckily, you don’t need a head for math or a calculator to start your meal plan. Your dietitian should translate these numbers into an easy-to-use, practical meal-planning system.

## Coming to grips with carbs: Exchanges and carb counting

When it comes to meal planning, no one strategy suits every person’s tastes or lifestyle. You and your dietitian will decide which planning system works best for you, based on your usual eating habits, weight goals, and learning style. The meal-planning strategy that is best suited for you may be as simple as stepwise, individual goals tailored to shape your eating habits over time. Or the dietitian could create sample menus for you to follow based on your usual eating habits (see “**Sample meal plan for a week**,” page 48). Other possibilities include a food group–based approach like the exchange system; a carbohydrate-counting approach; or a plan based on the glycemic index. These systems are described below.

### The exchange system

The modern era of meal planning was ushered in with the advent of the *Exchange Lists for Meal Planning* in

### Estimating your calorie needs

To arrive at a rough estimate of how many calories you need each day, try this simple method:

**To stay at the same weight:** Multiply your weight by 11.4.

*Example:* 180 pounds  $\times$  11.4 = 2,052 calories.

**To lose weight:** Calculate the number of daily calories you need to stay at the same weight, then subtract 500 daily calories to lose 1 pound per week, OR subtract 250 daily calories to lose ½ pound per week.

*Examples:* 2,052 – 500 = 1,552 calories per day to lose 1 pound per week.

2,052 – 250 = 1,802 calories per day to lose ½ pound per week.

Online calculators, such as the one available at [www.calculator.net/calorie-calculator.html](http://www.calculator.net/calorie-calculator.html), can also help.

1950. These now-familiar food lists were designed in a joint effort by the American Diabetes Association, the American Dietetic Association (now the Academy of Nutrition and Dietetics), and the U.S. Public Health Service to make meal planning more consistent among nutrition professionals and easier for people to use. The exchange lists have been revised numerous times over the years to keep pace with popular tastes. Many people with diabetes still find the exchange system a useful tool, especially those who benefit from detailed information about serving sizes and food content.

Here’s how the system works: Based on your daily calorie and blood sugar goals, your dietitian will tell you the number of servings from each of several food groups that you should allocate in your meals and snacks to meet your daily calorie needs. The food groups are

- carbohydrates, which include the starch, fruit, milk, vegetable, and “other” categories
- meat and meat substitutes, which are further classified as very lean, lean, medium fat, and high fat
- fats, categorized as monounsaturated, polyunsaturated, saturated, and trans fats.

When putting together a meal, you choose foods from the appropriate categories to account for the desired number of servings per day. Foods grouped within a category can be exchanged for another item

**Table 9: Nutrition guidelines for diabetes**

DIETARY COMPONENT	RECOMMENDATION*	FOR A 2,000-CALORIE/DAY DIET	FOR A 1,500-CALORIE/DAY DIET	FOR A 1,200-CALORIE/DAY DIET
Calories	To maintain weight: your weight × 11.4 To lose weight: calories to maintain weight minus 500 to lose 1 pound/week, or minus 250 to lose ½ pound/week	2,000 calories/day	1,500 calories/day	1,200 calories/day
Total fat*	No set target. The quality of fat (unsaturated fats are healthier than saturated or trans fat) is probably more important than the quantity of fat.			
Saturated fat	10% of calories or less	22 grams/day or less	16 grams/day or less	13 grams/day or less
Trans fat	Consume as little as possible; preferably none	0 grams/day	0 grams/day	0 grams/day
Cholesterol	Less than 300 mg/day			
Carbohydrates*	No set target. Work with a nutritionist to determine the best target for you. Choose healthy sources of carbohydrates (whole grains, vegetables, fruits, and beans) instead of highly refined carbohydrates (white bread, white rice, pastries, sugar-sweetened beverages, and the like).			
Fiber	14 grams/day per 1,000 calories	28 grams/day	21 grams/day	17 grams/day
Protein*	No set target. Choose healthy sources of protein (fish, poultry, beans, nuts, seeds) whenever possible instead of red meat.			
Sodium	No more than 2,300 mg/day for people with diabetes**			
*Discuss with your doctor or dietitian to find the target that is right for you.				
**Lower sodium intake goals for people with diabetes and high blood pressure should be considered on an individual basis.				

in the same category, which is why this is called the exchange system.

The American Diabetes Association has published *Choose Your Foods: Exchange Lists for Diabetes*, available from the ADA store (see “Resources,” page 51). A briefer version is available from the University of Arkansas’s Cooperative Extension Service. You can view a copy online ([www.health.harvard.edu/UA-exchange](http://www.health.harvard.edu/UA-exchange)). To get the most out of the exchange system, consult with your dietitian.

### Carbohydrate counting

Since the late 1990s, the trend in meal planning for people with type 1 diabetes has been toward the carbohydrate-counting system. It’s also used by those with type 2 diabetes who are not interested in losing weight or who have problems with erratic blood sugar levels. This meal-planning system centers on how carbohydrates affect blood sugar after meals and snacks.

This system can be less complicated and more accurate than other approaches because it focuses on only one major nutrient—carbohydrate. It also allows more flexibility to include combination foods such as soups and casseroles in your diet because you don’t have to worry about finding a particular food item in the exchange lists.

The first step in tracking your carbohydrates is to figure out with your dietitian how many grams of carbohydrates (or carbohydrate choices) that you eat at each meal and snack on a typical day and then try to be consistent with those amounts from day to day. This will result in more stable blood sugar patterns and an easier time matching your medication doses to your eating habits. Another approach is to figure out the number of calories you need to take in each day (see “Estimating your calorie needs,” page 31). From this number, you and your dietitian will determine what portion of this energy total should come

from carbohydrate-rich foods. For example, if your meal plan calls for 1,800 calories a day, with 50% of these calories drawn from carbohydrates, you'll need to take in 900 carbohydrate calories a day. One gram of carbohydrate delivers 4 calories, so in this scenario, you'd plan on getting 225 grams of carbohydrates a day.

Many people with diabetes find that tallying carbohydrates in 15-gram servings, or choices, is more convenient than trying to add up carbohydrate totals. To help in this task, dietitians and diabetes organizations have developed carbohydrate choice lists (see Table 10, below). The number of carbohydrate choices to aim for each day depends on your total calorie goal.

Another thing to keep in mind is how much of the carbohydrate in a food is fiber. Fiber is largely undigested, meaning it has little effect on blood sugar. If the food contains 5 or more grams of fiber per serving, subtract the fiber grams from the total carbohydrate tally.

Using the glycemic index

Different carbohydrate-containing foods affect blood sugar differently—an effect quantified by measures known as the glycemic index and glycemic load.

The glycemic index (GI) assigns a numeric score to a food based on the rise in blood sugar after eating a standard amount (50 grams) compared with the

rise after eating 50 grams of pure glucose. Foods are ranked on a scale of 0 to 100, with pure glucose given a value of 100.

The lower a food's glycemic index, the slower and lower blood sugar rises after eating that food. A glycemic index of 55 or below is considered low; 70 or above is considered high. In general, the more cooked or processed a food is, the higher its GI, and the more fiber or fat in a food, the lower the GI.

The glycemic index tells just part of the story, because it indicates only how fast a particular carbohydrate-rich food raises blood sugar. What it doesn't tell you is how high your blood sugar could go when you actually eat the food, which is partly determined by how much carbohydrate is in a serving of a particular food. To understand a food's complete effect on blood sugar, you need to know both how quickly it makes glucose enter the bloodstream and how much glucose it can deliver.

A separate measure called the glycemic load does both. It gives a more accurate picture of a food's real-life impact on blood sugar. The glycemic load is determined by multiplying the grams of carbohydrate in a serving by the glycemic index and dividing by 100. A glycemic load of 10 or below is considered low; 20 or above is considered high. Watermelon, for example, has a high glycemic index (80). But a serving of watermelon has so little carbohydrate (6 grams) that its glycemic load is only 5.

Table 10: Sample carbohydrate choice list			
To calculate how many carbohydrate choices a particular food represents, divide the food's total carbohydrate grams by 15. Many dietitians have created lists of typical foods and done the calculations for you. The sample below is based on a much longer list developed by dietitians at Harvard-affiliated Brigham and Women's Hospital in Boston.			
FOOD	SERVING SIZE	CARBOHYDRATE GRAMS	CARBOHYDRATE CHOICES (rounded to nearest half)
Peas, green	½ cup	12	1
Bread (whole-grain)	1 slice	13	1
Apple, orange, or pear	1 medium	15	1
Bagel, small (3-inch diameter)	1 bagel (2 ounces)	30	2
Pasta (macaroni, spaghetti), cooked	1 cup	37	2.5
Potato, baked or boiled	1 medium (7 ounces, with skin)	51	3.5
Bagel, large (4½-inch diameter)	1 bagel (4 ounces)	60	4

## 4 principles of low-glycemic eating

**1** Eat non-starchy vegetables, beans, and fruits such as apples, pears, peaches, and berries. Even tropical fruits like bananas, mangoes, and papayas tend to have a lower glycemic index than typical desserts.

**2** Eat grains in the least-processed state possible: “unbroken” grains such as whole barley, millet, wheat berries, brown rice, and whole-kernel bread; or traditionally processed grains such as stone-ground whole-grain bread, steel-cut oats, and natural granola or muesli breakfast cereal.

**3** Cut back or cut out white potatoes and refined grain products such as white breads, bagels, pastries, and regular pasta.

**4** Let concentrated sweets—including high-calorie foods with a low glycemic index, such as ice cream—be an occasional treat instead of a staple. Don’t drink more than one-half cup of fruit juice a day. Completely eliminate sugar-sweetened drinks.

*Adapted from Ending the Food Fight by David Ludwig with Suzanne Rostler (Houghton Mifflin, 2008).*

To look up the GI values for a wide range of foods, visit [www.glycemicindex.com](http://www.glycemicindex.com). For general guidelines on reducing blood sugar spikes, see “4 principles of low-glycemic eating,” above, and “Tips to help prevent blood sugar spikes after eating,” below.

### ► Tips to help prevent blood sugar spikes after eating

When you eat a snack or meal that contains carbohydrates, your blood sugar level will rise. The more carbohydrate you eat, the higher your blood sugar will rise. Here are a few tips to minimize these spikes.

**Have some nuts or cheese, up to 30 minutes before a meal.** Fat slows the digestion of food in the stomach, making for a slower release of glucose into the bloodstream.

**Start a meal with a salad dressed with oil and vinegar.** The fiber in the salad and the oil slow the digestion and absorption of food. Vinegar may help prime muscles to take up blood sugar. Vinegar slows the stomach’s ability to empty its contents into the intestines, and so delays absorption of glucose into the bloodstream. In one study, a tablespoon or two of vinegar, when eaten with a meal containing high-glycemic-index foods such as white bread or white rice, lowered the blood sugar surge by 25%.

Some nutrition experts believe that people with diabetes should pay attention to the glycemic index and glycemic load to avoid sudden spikes in blood sugar. A review by the Cochrane Collaboration (an international group of health authorities who evaluate evidence from randomized clinical trials) found that people who followed a low-GI diet lowered their HbA1c levels by 0.5 percentage point—and they were also less likely to experience hypoglycemia (see “Handling hypoglycemia,” page 35). To put that effect into perspective, the FDA considers a drop in HbA1c of as little as 0.4 percentage point to be meaningful when assessing drugs to treat diabetes.

The American Diabetes Association acknowledges the value of the glycemic index and glycemic load, saying that “substituting low-glycemic-load foods for higher-glycemic-load foods may modestly improve” blood sugar control. But it also says that the total amount of carbohydrate in a food, rather than the food’s glycemic index or load, is a stronger predictor of what will happen to blood sugar. Some dietitians feel that focusing on the glycemic index and glycemic load adds an unneeded layer of complexity to choosing what to eat. The bottom line? Following the principles of low-glycemic-index eating is likely to be beneficial, as it essentially encourages a high-fiber diet that is moderate in carbohydrates, but reaching

**Include lean protein with your meal.** Consuming a healthy source of protein such as beans, nuts, fish, or skinless chicken along with carbohydrates can help blunt the surge in blood sugar after a meal and increase the production of insulin.

**Have some foods containing soluble fiber.** For example, include oat cereal or oatmeal as part of breakfast, barley or legumes in soups or salads at lunch or dinner, or an apple or orange for dessert.

**Eat slowly.** Taking your time when eating slows the delivery of sugar to your bloodstream and gives your brain time to send “I’m full” signals to your stomach.

**Take a walk.** Going for a stroll after eating a meal or snack helps your muscles soak up blood sugar so it doesn’t linger in your bloodstream.

## Handling hypoglycemia

**H**ypoglycemia is a potentially dangerous condition in which blood sugar falls too low, usually below 70 mg/dL. Too much exercise, too little food or carbohydrates, a missed or delayed meal, or a combination of these factors can bring on hypoglycemia. Symptoms vary depending on the severity of the reaction, but commonly include nervousness, sweating, feeling cold and clammy, trembling or shakiness, rapid heartbeat, lightheadedness, hunger, and irritability. If early symptoms aren't recognized and treated quickly, blood sugar levels may continue to fall, resulting in drowsiness, weakness, blurred vision, slurred speech, confusion, clumsiness, and personality change or strange behavior such as belligerence or silliness. At its worst, hypoglycemia can cause seizures or coma.

Most people with type 2 diabetes don't have to worry about hypoglycemia. It may, however, occur in those who use insulin or take a diabetes medication known as a sulfonylurea. Changes in eating habits, such as dieting—especially if carbohydrates are reduced—or increased exercise can lead to hypoglycemia. Talk with your doctor before making any changes in your diet or increasing your exercise.

Familiarize yourself with the symptoms of hypoglycemia, so that if it occurs, you can take steps to treat it appropriately and prevent the problem from recurring.

If you think you're having an episode of low blood sugar, don't ignore your symptoms. If possible, test your blood sugar with a finger-stick test. If it is low, eat or drink something that will quickly boost your blood sugar. If you

can't conveniently check your blood sugar but feel like the level is low, do the same thing.

Here are some ways to quickly restore your blood sugar to a normal level:

- eat three glucose tablets or four dextrose tablets
- drink 4 to 6 ounces of fruit juice
- drink 5 to 6 ounces (about half a can) of regular soda, such as Coke or Pepsi
- eat five to seven Life Savers
- eat 2 tablespoons raisins
- eat six jelly beans.

Don't eat foods containing chocolate, peanut butter, nuts, or fats. Fat slows the body's absorption of carbohydrates, so foods with fat won't raise your blood sugar quickly enough.

and staying at a healthy weight is more important for your blood sugar and your overall health.

## Track your progress

Your dietitian will want to meet with you periodically to evaluate your progress and hear your feedback about the meal plan. He or she will probably ask you to bring your food diary and blood sugar records to follow-up appointments. Your dietitian or doctor may also ask that you have your hemoglobin A1c, chole-

sterol, and blood pressure checked to see if your dietary changes have had any effects on your overall health. Based on this information, you and your dietitian will determine whether to adjust your meal plan.

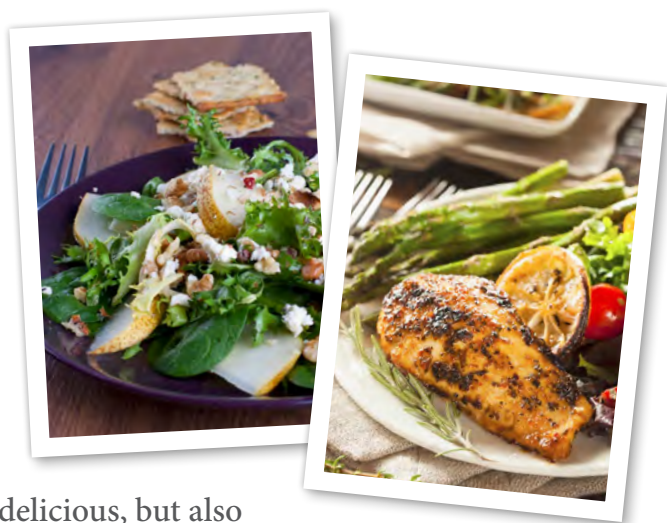
Even after you've settled in to a satisfactory program, it's still a good idea to check in with the dietitian every so often for a tune-up. This is especially true if your weight or health status has changed or if you're having trouble keeping your blood sugar in control. You may also need to re-evaluate your eating plan if you change medications. ♥



## SPECIAL SECTION

# Healthy recipes

In this section, you'll find 40 recipes that not only are delicious, but also follow the healthy eating guidelines outlined in this report. Try a few of these recipes out at home, and you'll discover that something can taste good and still be good for you! The recipes are organized by general categories: lunch and dinner entrees, salads and side dishes, snacks and sauces, breakfast foods, and desserts. A sample meal plan, following the recipes, suggests how to use some of these recipes throughout the week while counting calories and accumulating nutrients.



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## ENTREES

### Chili Non Carne

MAKES 8 SERVINGS (1 cup per serving)

- ¾ cup chopped onion
- 2 cloves garlic, minced
- 3 tablespoons olive oil
- 2 cups finely chopped zucchini
- 1 cup finely chopped carrots
- 2 (28-ounce) cans whole tomatoes, undrained (no salt added)
- 1 (14½-ounce) can diced tomatoes, undrained (no salt added)
- 3 (15-ounce) cans kidney beans (one undrained, two drained and thoroughly rinsed)
- 2 tablespoons chili powder
- ¼ teaspoon dried basil
- ¼ teaspoon dried oregano
- ¼ teaspoon cumin

**Toppings:** Chopped onions, tomatoes, lettuce, or green peppers

In a large pot, sauté onion and garlic in olive oil until soft. Mix in zucchini and carrots until well blended. Cook for about 1 minute over low heat, stirring occasionally. Stir in tomatoes and kidney beans. Bring to a boil. Add spices. Reduce heat and simmer 30 to 40 minutes or until thick. Top as desired with chopped onions, tomatoes, lettuce, or green peppers.

*(Recipe courtesy of Brigham and Women's Hospital Department of Nutrition)*

Nutrition information per serving	
Calories	246
Total fat	6 g
Saturated fat	0.7 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	149 mg
Total carbohydrates	39 g
Fiber	12 g
Sugars	1 g
Protein	9 g
Carbohydrate choices	2.5

### Italian Bean and Vegetable Soup

MAKES 10 SERVINGS (1 cup per serving)

- 3 (3-ounce) low-fat, sweet Italian chicken sausages
- 2 tablespoons olive oil
- 2 cloves garlic, minced
- 1 cup chopped yellow onion
- ½ cup chopped celery
- 3 medium carrots, peeled and sliced into rounds
- 12 ounces mushrooms, chopped
- ¼ cup chopped Italian parsley
- 4 large plum tomatoes, peeled, chopped, or 1 (15-ounce) can diced tomatoes
- 8 cups low-fat, low-sodium chicken broth
- ½ cup uncooked barley
- 1 (15-ounce) can cannellini or white kidney beans, undrained
- 1 small head escarole, chopped
- Fresh basil and grated Parmesan (for garnish)

Nutrition information per serving	
Calories	189
Total fat	5.7 g
Saturated fat	1.3 g
Trans fat	0 g
Cholesterol	18 mg
Sodium	388 mg
Total carbohydrates	22.4 g
Fiber	6 g
Sugars	3.8 g
Protein	12.7 g
Carbohydrate choices	1

Slice sausages into rounds and sauté in olive oil until brown. Add garlic and cook for 10 seconds, being careful not to brown it. Add the onion, celery, carrots, mushrooms, and parsley and cook over high heat until softened. Stir in tomatoes, chicken broth, and barley. Cover and simmer for 30 minutes. Add beans and escarole and simmer an additional 5 minutes. Garnish with fresh basil leaves and Parmesan.

## Baked Chicken with Brown Basmati Rice

MAKES 4 SERVINGS (1 quarter-chicken and ½ cup rice per serving)

- 1 chicken (4 to 4½ pounds), quartered
- 1 (10-ounce) package frozen chopped broccoli
- 1 cup brown basmati rice
- 1½ cups low-sodium chicken broth
- 2 bay leaves
- 2 cups tomato sauce (look for a brand with low sugar and sodium content)

Preheat oven to 350° F. Remove skin and any visible fat from chicken. Thaw broccoli and squeeze out excess water. Rinse basmati rice.

In a saucepan, bring chicken broth and bay leaves to a boil. Lower the heat, add tomato sauce, stir, and heat through. Place rice and broccoli in a baking pan; stir to combine. Pour sauce over rice and broccoli mixture. Place chicken on top of rice mixture, meat side down. Cover tightly with aluminum foil or lid and place in oven. Bake 75 minutes.

Remove foil or lid (being careful to avoid steam) and check that chicken is done (the rice should be soft and the chicken meat white in color). If the food needs more cooking time, recover tightly with foil or lid and cook an additional 10 to 15 minutes.

Nutrition information per serving	
Calories	413
Total fat	4.5 g
Saturated fat	0.8 g
Trans fat	0 g
Cholesterol	99 mg
Sodium	159 mg
Total carbohydrates	47 g
Fiber	6 g
Sugars	7 g
Protein	48 g
Carbohydrate choices	3

## Individual Tortilla Cheese Pizza

MAKES 4 SERVINGS (1 tortilla pizza per serving)

- 4 whole-wheat or multigrain tortillas
- 1 cup tomato sauce (check to make sure there is no added sugar)
- 1 bunch arugula
- 1 cup fat-free ricotta cheese (choose brand with the lowest sodium content)
- 4 ounces shredded low-fat mozzarella cheese

Preheat oven to 375° F. Place tortillas on rack in preheated oven and lightly toast. Heat tomato sauce. Wash and dry arugula and set aside. Remove tortillas from oven and place on a cookie pan. Spread each tortilla with warm tomato sauce, dot with ricotta cheese, and sprinkle with mozzarella. Return to oven to melt cheeses. Remove from oven and top with arugula.

Nutrition information per serving	
Calories	226
Total fat	5.4 g
Saturated fat	2.6 g
Trans fat	0 g
Cholesterol	25 mg
Sodium	621 mg
Total carbohydrates	30.5 g
Fiber	3.3 g
Sugars	5.1 g
Protein	17.8 g
Carbohydrate choices	2

## Balsamic Marinated Pork Loin

MAKES 4 SERVINGS

- 1 (1-pound) boneless pork tenderloin
- ½ cup balsamic vinegar
- 2 shallots, chopped
- 2 teaspoons minced garlic (about 4 cloves)
- 2 teaspoons dry mustard

Remove any visible fat from pork loin. Combine balsamic vinegar, shallots, garlic, and mustard in a bowl. Place pork loin in the bowl, cover, and refrigerate for 1 to 2 hours, turning occasionally to marinate all sides of pork.

Preheat oven to 375° F. Remove pork from marinade and place in saucepan over medium heat. Brown on all sides. Place in a casserole pan and bake for about 15 to 20 minutes or until juices run clear and meat is white in center.

While pork is cooking, pour marinade into saucepan and simmer on medium-low heat until reduced by half. Serve marinade as sauce to accompany pork.

Nutrition information per serving	
Calories	285
Total fat	13.2 g
Saturated fat	4.6 g
Trans fat	0 g
Cholesterol	70 mg
Sodium	58 mg
Total carbohydrates	15.5 g
Fiber	0.2 g
Sugars	6.4 g
Protein	25.6 g
Carbohydrate choices	1

## Lemon Garlic Chicken

MAKES 2 SERVINGS

- 1 large or 2 small garlic cloves, chopped
- 1 tablespoon canola oil
- 2 (4-ounce) skinless, boneless chicken breasts
- ¼ cup white wine
- 2 tablespoons lemon juice
- 2 tablespoons grated Parmesan cheese
- 2 tablespoons chopped flat-leaf parsley
- Freshly ground pepper to taste

Preheat oven to 350° F. Sauté the garlic in the oil. When the garlic starts to brown, add the chicken breasts and brown on both sides, about 3 to 4 minutes per side. Place the browned chicken in a casserole dish. Add ½ cup water, wine, and lemon juice to the sauté pan and stir. Pour this liquid over the chicken. Sprinkle with Parmesan cheese. Cover and bake for 30 minutes. Sprinkle with parsley and pepper and serve.

Nutrition information per serving	
Calories	246
Total fat	10.1 g
Saturated fat	1.7 g
Trans fat	0 g
Cholesterol	73 mg
Sodium	155 mg
Total carbohydrates	3.4 g
Fiber	0.2 g
Sugars	0.7 g
Protein	29.4 g
Carbohydrate choices	0.5 for two servings

## Turkey Meatloaf

MAKES 4 SERVINGS

- 1 small red onion
- 1 small red pepper
- 1 cup grated carrot
- 1 teaspoon fresh thyme leaves or  
½ teaspoon dried thyme
- 1 teaspoon chopped fresh sage or  
½ teaspoon dried sage
- 1 tablespoon olive oil
- ½ cup plain unsalted bread crumbs
- 1 teaspoon ground black pepper
- 1 egg
- 1 pound ground turkey breast
- Olive oil cooking spray

Nutrition information per serving	
Calories	309
Total fat	15.8 g
Saturated fat	4.5 g
Trans fat	0 g
Cholesterol	142.9 mg
Sodium	280 mg
Total carbohydrates	16.5 g
Fiber	2.4 g
Sugars	3.9 g
Protein	24.6 g
Carbohydrate choices	1

Preheat oven to 350° F. Dice red onion and red pepper into small pieces; combine with carrot, thyme, and sage. Heat oil in large saucepan. Add vegetables and cook, stirring constantly, until onion is soft and transparent. Remove from heat and cool. Add bread crumbs, pepper, and egg to vegetables. Mix to combine. Add ground turkey and mix well. Spray a loaf pan with cooking spray and press mixture into the pan. Bake in preheated oven for approximately 1 hour or until juices run clear and turkey meat is no longer pink in color.

## Turkey Bolognese with Roasted Red Pepper

MAKES 6 SERVINGS (1 cup cooked pasta, ½ cup sauce per serving)

- 1 pound whole-wheat pasta
- 1 tablespoon olive oil
- 2 teaspoons minced garlic
- ½ cup diced red onion
- 2 teaspoons ground fennel seed
- 2 teaspoons dried sage or ½ tablespoon  
fresh chopped sage
- 1 teaspoon ground black pepper
- 1 pound ground turkey breast
- 1 (25-ounce) jar tomato sauce with vegeta-  
bles (such as mushrooms, peppers, etc.);  
choose a sauce without added sweeteners
- 1 cup diced roasted red peppers

Nutrition information per serving	
Calories	514
Total fat	13.1 g
Saturated fat	2.6 g
Trans fat	0 g
Cholesterol	64.3 mg
Sodium	664 mg
Total carbohydrates	69.3 g
Fiber	9.4 g
Sugars	8.5 g
Protein	26.2 g
Carbohydrate choices	4.5

Cook pasta according to package directions. Meanwhile, place olive oil in large saucepan. Heat gently on low heat. Add garlic, red onion, ground fennel seed, sage, and black pepper. Cook, stirring occasionally, until onion is translucent. Increase heat slightly and add ground turkey. Stir constantly until meat is broken up into small pieces and no pink color remains in the meat. Add tomato sauce and roasted red peppers and heat another 5 minutes until hot. Remove from heat and serve over the whole-wheat pasta.

## Tuna Steaks on Mediterranean Salad

MAKES 4 SERVINGS (1 tuna steak and 1 ⅓ cups salad mixture per serving)

- ⅓ cup finely chopped green bell pepper
- ⅓ cup finely chopped red bell pepper
- ½ cup finely chopped red onion
- 1 tablespoon minced fennel leaves
- 2 tablespoons plus 1 teaspoon red wine vinegar
- 1 tablespoon extra-virgin olive oil
- ½ teaspoon sugar
- ¼ teaspoon salt (omit if on a low-sodium diet)
- ⅓ pound fresh green beans
- 1 cup peeled and cubed baking potato (½-inch cubes)
- ¾ cup thinly sliced fennel bulb
- 2 large ripe tomatoes, each cut into 12 wedges
- 4 (4-ounce) tuna steaks (about ¾-inch thick)
- 12 kalamata olives

Nutrition information per serving	
Calories	348
Total fat	13.7 g
Saturated fat	2.7 g
Trans fat	0 g
Cholesterol	56 mg
Sodium	408 mg
Total carbohydrates	18.4 g
Fiber	4 g
Sugars	5 g
Protein	36.3 g
Carbohydrate choices	1

Combine the first eight ingredients in a bowl. Stir well and set aside. Wash green beans; trim ends and remove strings. Set aside. Arrange potato in a vegetable steamer over boiling water; cover and steam for 8 minutes. Add beans to the steamer; cover and steam for 8 more minutes. Combine potato, beans, fennel slices, and tomato wedges in a large bowl. Add the bell pepper mixture; stir well.

Place a large nonstick skillet over medium-high heat until hot. Add tuna; cook for 4 minutes on each side or until medium rare. To serve, arrange 1 ⅓ cups vegetable mixture, 1 tuna steak, and 3 olives on each of four plates.

## Poached Salmon BLT

MAKES 4 SERVINGS

- 2 bay leaves
- 2 cloves garlic, sliced
- 1 teaspoon dried thyme leaves or 4 sprigs fresh thyme
- 4 (3-ounce) boneless and skinless salmon fillets
- 1 tablespoon low-fat or fat-free mayonnaise\*
- 2 teaspoons Dijon mustard
- 1 tomato
- 1 ripe avocado
- 4 whole-wheat rolls or tortillas
- 8 slices turkey bacon, cooked
- 1 bunch arugula, washed and dried

Nutrition information per serving	
Calories	434
Total fat	20 g
Saturated fat	3.4 g
Trans fat	0 g
Cholesterol	60.6 mg
Sodium	584 mg
Total carbohydrates	40.7 g
Fiber	8.7 g
Sugars	7.3 g
Protein	26.1 g
Carbohydrate choices	2.5

Place bay leaves, garlic, and thyme in large saucepan. Add salmon and cover everything with water. Bring to a simmer and cook until salmon is opaque throughout. Remove salmon and cool. Combine mayonnaise and mustard, and set aside. Cut tomato into 4 slices. Peel avocado and slice into 8 wedges.

To assemble: Spread inside of each roll or top of tortilla with mustard-mayonnaise mixture. Add 1 salmon fillet, 2 slices of bacon, 2 slices of avocado, and 1 slice of tomato, and top with arugula. Cover with remainder of roll, or fold tortilla to form sandwich.

*\*Nutritional analysis based on low-fat mayonnaise.*

## Beef Stew with Mushrooms and Onions

MAKES 4 SERVINGS

- 2 tablespoons whole-wheat flour
- 2 teaspoons ground cumin
- 1 teaspoon ground black pepper
- 1 pound extra-lean (top or bottom round) stew beef, cubed
- 1 tablespoon olive or canola oil
- 8 ounces white mushrooms, washed and sliced
- 8 ounces red or white pearl onions, skinned
- 1 teaspoon dried rosemary or 2 teaspoons fresh chopped rosemary
- 1 teaspoon minced garlic
- ½ cup red wine
- 1 tablespoon red wine vinegar
- 1 cup low-sodium beef broth

Nutrition information per serving	
Calories	211
Total fat	8 g
Saturated fat	2.1 g
Trans fat	0 g
Cholesterol	50 mg
Sodium	81 mg
Total carbohydrates	11.7 g
Fiber	2 g
Sugars	1.6 g
Protein	27.7 g
Carbohydrate choices	1

Combine whole-wheat flour with ground cumin and black pepper. Remove any visible fat from beef cubes and toss in flour mixture until well coated. Place oil in a pan and cook beef over medium heat until brown on all sides. Remove from heat and add mushrooms, onions, rosemary, and garlic. Cook on low heat for 3 minutes. Add red wine and simmer until liquid is reduced by half. Add vinegar and beef broth. Cover and cook on very low heat for 2½ to 3 hours until meat is tender.

## Corn-Crusted Cod

MAKES 4 SERVINGS

*You can substitute halibut, tilapia, or haddock for the cod.*

- 1 cup polenta (roughly ground cornmeal)
- 1 teaspoon ground cumin
- 2 teaspoons chopped parsley or 1 teaspoon dried parsley
- 1 teaspoon ground white pepper
- ½ teaspoon paprika
- 1 cup nonfat buttermilk (or add 1 tablespoon vinegar to 1 cup nonfat milk to create a buttermilk substitute)
- 1 tablespoon hot sauce\*
- 4 (4-ounce) portions of cod
- Olive oil cooking spray

Preheat oven to 375° F. In a bowl, combine polenta with cumin, parsley, white pepper, and paprika, and set aside. In a large bowl, mix buttermilk with hot sauce. Dip each fish fillet into buttermilk mixture, allowing excess to drain off, then coat on all sides with polenta mixture.

Generously spray a sheet pan with cooking spray. Place coated fillets on the pan and bake approximately 10 to 15 minutes until coated fish is golden brown and firm to the touch; fish should flake apart easily and flesh should be white.

*\*Frank's Hot Sauce is a good choice, as it has a vinegary taste without being too hot.*

Nutrition information per serving	
Calories	325
Total fat	5.1 g
Saturated fat	1.6 g
Trans fat	0 g
Cholesterol	69 mg
Sodium	562 mg
Total carbohydrates	34.7 g
Fiber	3.1 g
Sugars	5 g
Protein	33.7 g
Carbohydrate choices	2.5



## SALADS &amp; SIDE DISHES

## Spaghetti Salad

MAKES 4 SERVINGS

- 4 ounces whole-wheat spaghetti  
 4 ounces shredded low-fat mozzarella cheese  
 3 plum tomatoes, quartered and sliced  
 4 scallions, sliced  
 1 cup artichoke hearts (frozen or canned in water), cut into small pieces  
 ¼ cup diced red onion  
 ¼ cup olive oil  
 ¼ cup balsamic vinegar  
 2 teaspoons chopped basil leaves or 1 teaspoon dried basil leaves

Break spaghetti into small pieces, cook in boiling water, drain, and rinse in cold water. Combine cooked spaghetti, cheese, tomatoes, scallions, artichokes, and onion in a large bowl.

Place olive oil in a separate bowl and slowly add vinegar while whipping to emulsify. Mix in basil and pour over spaghetti and vegetables. Toss to combine. Allow to sit in refrigerator for 1 hour before serving.

Nutrition information per serving	
Calories	342
Total fat	18.8 g
Saturated fat	4.6 g
Trans fat	0 g
Cholesterol	15.2 mg
Sodium	237 mg
Total carbohydrates	32.4 g
Fiber	7.7 g
Sugars	5.9 g
Protein	14.4 g
Carbohydrate choices	2

## Spinach Salad

MAKES 4 SERVINGS

- 5 ounces baby spinach, cleaned and dried  
 1 ripe pear, seeded and diced  
 3 tablespoons crumbled Gorgonzola cheese  
 ¼ cup dried cranberries  
 4 tablespoons Spiced Walnuts (see page 43)  
 ½ cup Creamy Cider Dressing (see above right)

Combine baby spinach with pear, Gorgonzola, cranberries, and Spiced Walnuts. Toss with Creamy Cider Dressing and serve.

Nutrition information per serving	
Calories	182
Total fat	10 g
Saturated fat	2 g
Trans fat	0 g
Cholesterol	5.8 mg
Sodium	151 mg
Total carbohydrates	22.1 g
Fiber	4.7 g
Sugars	11.4 g
Protein	4.8 g
Carbohydrate choices	1.5

## Creamy Cider Dressing

MAKES 5 SERVINGS  
(¼ cup per serving)

- 1 small (5½-ounce) can V-8 low-sodium vegetable juice  
 ½ cup fat-free sour cream  
 ¼ cup apple cider vinegar  
 1 teaspoon chopped garlic  
 1 teaspoon dried chives or 2 teaspoons chopped fresh chives

Combine all ingredients in food processor or blender until well blended. Cover and refrigerate 30 to 60 minutes. Serve over salad.

Nutrition information per serving	
Calories	35
Total fat	0.5 g
Saturated fat	0.2 g
Trans fat	0 g
Cholesterol	2.3 mg
Sodium	42 mg
Total carbohydrates	6.3 g
Fiber	0.3 g
Sugars	3.8 g
Protein	1.4 g
Carbohydrate choices	0.5

## Mixed Mesclun Greens and Apple Salad

MAKES 4 SERVINGS

(1 cup apple mixture and 1 cup greens per serving)

## For the salad:

- ¼ cup crumbled blue cheese  
 2 cups chopped Granny Smith apple  
 1 cup chopped Braeburn apple  
 1 cup chopped McIntosh apple  
 2 slices turkey bacon, cooked in a pan or on a panini grill and chopped  
 4 cups mesclun mix or other salad greens

## For the dressing:

- ¼ cup fresh lemon juice  
 3 tablespoons honey  
 1 teaspoon olive oil  
 Dash of salt  
 Dash of freshly ground pepper

Combine all the dressing ingredients in a small bowl and stir well with a whisk. Set aside.

Combine cheese, apples, and bacon in a bowl. Drizzle the dressing over the apple mixture and toss gently to coat. Divide the greens among four salad plates and top each with about 1 cup apple mixture.

Nutrition information per serving	
Calories	153
Total fat	4 g
Saturated fat	1.5 g
Trans fat	0 g
Cholesterol	7 mg
Sodium	190 mg
Total carbohydrates	29 g
Fiber	4 g
Sugars	5 g
Protein	3.5 g
Carbohydrate choices	2



## Moroccan Minty Carrot Salad

MAKES 4 SERVINGS (½ cup per serving)

- 1 pound carrots
- 1 garlic clove
- ⅛ teaspoon ground cinnamon
- ½ teaspoon cumin
- ½ teaspoon sweet paprika
- Pinch cayenne (optional)
- Juice of 1 lemon
- ⅛ teaspoon sugar
- ¼ teaspoon salt
- 1 tablespoon olive oil
- 2 tablespoons fresh mint leaves, sliced into long thin strips

Nutrition information per serving	
Calories	87
Total fat	4.0 g
Saturated fat	0.5 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	225 mg
Total carbohydrates	13 g
Fiber	3.7 g
Sugars	6 g
Protein	1 g
Carbohydrate choices	1

Wash and peel the carrots. Boil whole carrots in salted water with the garlic until barely tender. Drain. Discard the garlic and dice or slice the carrots. Combine the spices with the lemon juice, sugar, and salt and pour over the carrots. Chill. Sprinkle with oil and mint just before serving.

(Recipe courtesy of the Culinary Institute of America)

## Golden Beet and Yukon Gold Gratin

MAKES 4 SERVINGS

- Olive oil cooking spray
- 2 cloves garlic, minced
- ½ pound Yukon gold potatoes, cut into ¼-inch-thick slices (about 1 cup)
- ½ golden beet, cut into ¼-inch slices
- 1½ teaspoons black pepper
- 1¼ cups evaporated skim milk
- ½ cup grated Asiago cheese

Nutrition information per serving	
Calories	136
Total fat	0.3 g
Saturated fat	0.1 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	422 mg
Total carbohydrates	24 g
Fiber	1 g
Sugars	12.7 g
Protein	7.6 g
Carbohydrate choices	2

Preheat oven to 350° F. Spray a 6x8x2-inch baking pan generously with cooking spray and then sprinkle the minced garlic on the bottom of the pan. Alternate layers of potatoes and beets, seasoning each layer with pepper and pouring a few ounces of evaporated skim milk over each layer (enough to slightly cover the beets and potatoes). Bake, covered, for 40 minutes or until beets and potatoes are tender.

Layer the grated Asiago cheese on top and bake uncovered for an additional 10 minutes or until cheese is melted and golden brown. Divide casserole into 4 equal servings.

## Quinoa Vegetable Salad

MAKES 4 SERVINGS (1 cup per serving)

*Quinoa (pronounced keen-wa) seeds are naturally coated with a bitter-tasting saponin that protects this plant from birds and insects, so make sure to rinse the grain until water runs clear before cooking. This is an ancient grain that is high in protein, fiber, and many nutrients.*

- ½ cup quinoa
- 1 cup water
- 1 bay leaf
- 1 small zucchini, grated
- 1 medium carrot, grated
- 1 plum tomato, diced
- 2 tablespoons flat-leaf parsley, chopped

¾ cup Creamy Cider Dressing  
(see page 40)

Rinse quinoa and place in small saucepan with water and bay leaf. Simmer approximately 30 to 40 minutes until the grains of quinoa look like they have little “tails.” Remove from heat and cool. Add zucchini, carrot, tomato, parsley, and dressing. Toss, and chill for 30 minutes before serving.

Nutrition information per serving	
Calories	137
Total fat	1.9 g
Saturated fat	0.3 g
Trans fat	0 g
Cholesterol	1.7 mg
Sodium	55 mg
Total carbohydrates	25.7 g
Fiber	2.9 g
Sugars	5 g
Protein	5.2 g
Carbohydrate choices	1.5

## Sesame Green Beans

MAKES 4 SERVINGS

- 1 pound fresh green beans, ends trimmed, or 1 (16-ounce) package frozen green beans, no salt added
- 1 tablespoon sesame oil
- 1 tablespoon sesame seeds

Cook beans in boiling water until only slightly firm but not crisp; drain. Place sesame oil in a pan large enough to hold all the beans. Heat gently and toss cooked beans with the oil. Remove from heat.

In a small pan, toast sesame seeds on medium heat for approximately 2 to 3 minutes, stirring constantly to avoid burning. When you can smell the seeds, they are almost done. Place beans on serving platter and sprinkle with the toasted sesame seeds.

Nutrition information per serving	
Calories	70
Total fat	4.5 g
Saturated fat	0.5 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	4 mg
Total carbohydrates	7.1 g
Fiber	4.3 g
Sugars	2.7 g
Protein	1.9 g
Carbohydrate choices	0.5

## Mango Salsa with Black Beans

MAKES ABOUT 16 SERVINGS

- 1 ripe mango, peeled and chopped (about 1½ cups)
- ¾ cup canned black beans (no salt added)
- ½ cup roasted red peppers, diced
- 1 small shallot, chopped fine (about 2 tablespoons)
- 1 small jalapeño
- ¼ cup chopped cilantro
- 3 scallions, chopped
- ½ teaspoon ground cumin
- ¼ teaspoon cayenne pepper
- 3 tablespoons lime juice
- 1 tablespoon olive oil

Nutrition information per serving	
Calories	41
Total fat	1 g
Saturated fat	0.1 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	107 mg
Total carbohydrates	6.6 g
Fiber	1.1 g
Sugars	2.1 g
Protein	1.2 g
Carbohydrate choices	0.5

Place chopped mango in large bowl. Drain black beans and rinse under cold water. Add to mango along with roasted red peppers and shallot. Carefully remove seeds from jalapeño by cutting in half lengthwise and scraping out seeds (be careful not to touch your face while handling seeds, to avoid stinging or burning sensation). Mince jalapeño. Add jalapeño, cilantro, scallions, cumin, cayenne pepper, lime juice, and olive oil to mango and mix everything together. Cover and refrigerate for at least 1 hour before using. May be made a day ahead of time.

## Brown Rice Italiano

MAKES 9 SERVINGS (½ cup rice mixture plus ½ cup greens per serving)

- 4 cups cooked brown rice
- 2 tablespoons olive oil
- ½ tablespoon balsamic vinegar
- ½ can (15-ounce) artichoke hearts, canned in brine, rinsed and drained
- ½ large yellow pepper, seeded, chopped
- 2 garlic cloves, chopped
- ½ cup sun-dried tomatoes, chopped
- ¼ cup pine nuts
- Pepper to taste
- 1 (10-ounce) bag prewashed mixed salad greens
- 5 black olives, sliced
- 1 tablespoon Parmesan cheese

Nutrition information per serving	
Calories	160
Total fat	6.7 g
Saturated fat	0.7 g
Trans fat	0 g
Cholesterol	<1 mg
Sodium	212 mg
Total carbohydrates	23 g
Fiber	2.5 g
Sugars	2.1 g
Protein	4 g
Carbohydrate choices	1.5

Place rice in a large mixing bowl; add olive oil and balsamic vinegar and stir well to combine. Add the next six ingredients (artichoke hearts through pepper) and toss to distribute evenly. Spread the mixed greens on a large platter and top with the rice mixture. Sprinkle the olives and Parmesan cheese on top.

## Roasted Cauliflower

MAKES 8 SERVINGS (¾ cup per serving)

- 1 tablespoon coriander seeds
- 1 teaspoon cumin seeds
- ½ teaspoon peppercorns, whole
- ⅓ cup extra-virgin olive oil (plus extra for greasing baking dish)
- 3 pounds cauliflower, cored and broken into medium florets
- 1 medium red onion, halved and thinly sliced

Preheat oven to 425° F. Grind the coriander, cumin, and peppercorns in a coffee grinder or small food processor until fine. Mix the spices with the oil in a large bowl. Add the cauliflower and the onions and toss to coat. Grease a baking dish with some more of the oil. Transfer the vegetables to the baking dish and roast for 30 minutes or until they're tender, stirring every 10 minutes.

(Recipe courtesy of the Culinary Institute of America)

Nutrition information per serving	
Calories	134
Total fat	9.6 g
Saturated fat	1.3 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	57 mg
Total carbohydrates	10 g
Fiber	5 g
Sugars	5 g
Protein	3.6 g
Carbohydrate choices	1

## Fresh Vegetable Mélange

MAKES 4 SERVINGS (1 cup per serving)

- 1½ teaspoons canola oil
- 1½ cups sliced onion, separated into rings
- 1 cup red bell pepper strips
- 2 cloves garlic, minced
- 1¾ cups sliced yellow squash
- 1¾ cups sliced zucchini
- 1 cup chopped unpeeled plum tomatoes
- 1 tablespoon fresh basil, sliced into long thin strips
- ½ teaspoon lemon pepper
- ¼ teaspoon salt (omit if on a low-sodium diet)
- 1 tablespoon grated Parmesan cheese

Nutrition information per serving	
Calories	81
Total fat	2.7 g
Saturated fat	0.4 g
Trans fat	0 g
Cholesterol	1 mg
Sodium	211 mg
Total carbohydrates	12.1 g
Fiber	3 g
Sugars	6.5 g
Protein	2.8 g
Carbohydrate choices	1

Heat oil in a large nonstick skillet over medium-high heat. Add onion, bell pepper, and garlic; stir-fry for 2 minutes. Add squash and zucchini; stir-fry 3 more minutes or until the vegetables are crisp-tender. Add tomatoes, basil, lemon pepper, and salt; cook 1 minute or until thoroughly heated. Remove from heat; sprinkle with cheese.

## SNACKS & SAUCES

### Spiced Walnuts

MAKES 4 SERVINGS (¼ cup per serving)

- ½ teaspoon ground cumin
- ½ teaspoon paprika
- ½ teaspoon chili powder
- ½ teaspoon ground white pepper
- ½ teaspoon ground black pepper
- ½ teaspoon sugar
- Olive oil cooking spray
- 1 cup raw walnuts

Preheat oven to 350° F. Combine all spices with sugar in a small bowl and set aside. Place walnuts in a separate bowl and spray lightly with cooking spray. Toss and spray lightly again until walnuts are lightly coated. Sprinkle with spice mixture and toss again until well coated. Place on a sheet pan and toast in oven for approximately 7 minutes. Remove from oven and cool. Store in airtight container.

Nutrition information per serving	
Calories	169
Total fat	16.5 g
Saturated fat	1.5 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	5 mg
Total carbohydrates	4.6 g
Fiber	2 g
Sugars	1 g
Protein	4 g
Carbohydrate choices	0.5

### Tomato Salsa

MAKES 8 SERVINGS (¼ cup per serving)

- 2 large ripe tomatoes (about 1 pound)
- 1 small jalapeño
- 2 cloves garlic
- 2 teaspoons dried cilantro or 4 teaspoons fresh chopped cilantro
- 16 medium pitted black olives, drained and rinsed
- 2 tablespoons lime juice

Dice tomatoes and place in a bowl. Cut jalapeño in quarters, remove seeds, and dice. Chop garlic and place in the bowl with cilantro, jalapeño, and tomatoes. Chop olives into small pieces and add to the bowl. Add lime juice and toss. Cover and refrigerate for 30 to 60 minutes before serving. Can be served with Baked Tortilla Chips or Whole-Wheat Pita Chips (above right).

Nutrition information per serving	
Calories	33
Total fat	1.5 g
Saturated fat	0 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	92 mg
Total carbohydrates	4 g
Fiber	0.5 g
Sugars	1.6 g
Protein	0.5 g
Carbohydrate choices	0.5

### Baked Tortilla Chips or Whole-Wheat Pita Chips

MAKES 4 SERVINGS (8 wedges per serving)

- 4 small whole-wheat pitas or 4 (8-inch) corn tortillas

Olive oil cooking spray

Mrs. Dash or other salt-free seasoning

Preheat oven to 350° F. Cut each pita or tortilla into 8 wedges. Lightly spray pieces with cooking spray and sprinkle with salt-free seasoning. Place on a sheet pan and toast in oven approximately 5 minutes or until crispy.

Nutrition information per serving	
Calories	85
Total fat	0.8 g
Saturated fat	0.1 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	170 mg
Total carbohydrates	17.6 g
Fiber	2.4 g
Sugars	0 g
Protein	3.1 g
Carbohydrate choices	1

### Hummus

MAKES 7 SERVINGS (¼ cup per serving)

- 1 (15½-ounce) can chickpeas (no salt added)
- 2 teaspoons ground cumin
- 1 cup (packed) flat-leaf parsley
- 5 tablespoons lemon juice
- 2 cloves garlic
- 2 tablespoons tahini (ground sesame paste)

Drain and rinse chickpeas. Combine with rest of ingredients in blender or food processor and pulse until pureed. Serve with fresh vegetables or Baked Tortilla Chips or Whole-Wheat Pita Chips (see above).

Nutrition information per serving	
Calories	138
Total fat	4.1 g
Saturated fat	0.5 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	16 mg
Total carbohydrates	20.1 g
Fiber	3.5 g
Sugars	3.4 g
Protein	6.7 g
Carbohydrate choices	1.5

## Creamy Guacamole

MAKES 8 SERVINGS (1 tablespoon per serving)

½ medium avocado, peeled and cubed (about ½ cup)

¼ cup nonfat ricotta cheese

⅓ cup coarsely chopped onion

2 tablespoons fresh lime juice

2 tablespoons coarsely chopped fresh cilantro

2 tablespoons coarsely chopped jalapeño

½ teaspoon salt (omit if on a low-sodium diet)

Place all ingredients in a food processor and process until smooth. Spoon into a bowl, cover, and chill. Serve with Baked Tortilla Chips or Whole-Wheat Pita Chips (see page 43).

Nutrition information per serving	
Calories	24
Total fat	1.4 g
Saturated fat	0.2 g
Trans fat	0 g
Cholesterol	1 mg
Sodium	155 mg
Total carbohydrates	2 g
Fiber	1 g
Sugars	0.6 g
Protein	1 g
Carbohydrate choices	0

## Peanut Butter and Banana Roll-up

MAKES 1 SERVING

*This also makes an easy breakfast.*

2 teaspoons all-natural, sugar-free peanut butter

1 tablespoon apple butter

1 small whole-wheat, high-fiber tortilla

1 small ripe banana (or ½ large banana)

Spread peanut butter and apple butter down the center of the tortilla. Place banana on top, fold sides of tortilla inward, and roll up.

Nutrition information per serving	
Calories	276
Total fat	6.2 g
Saturated fat	0.9 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	215 mg
Total carbohydrates	57 g
Fiber	5.9 g
Sugars	21.4 g
Protein	6.6 g
Carbohydrate choices	4

## Raspberry Sauce

MAKES 3 SERVINGS (¼ cup per serving)

*This recipe can be used to create a nice light sauce, or adapted slightly for a thicker sauce that is great to roll inside crepes.*

### For light sauce:

1 (10-ounce) package frozen raspberries (no sugar added)

¼ cup orange juice

½ teaspoon artificial sweetener

### For thicker sauce or filling:

2 teaspoons cornstarch

**To make light sauce:** Place raspberries and orange juice in a small pan, add sweetener, and simmer until juices thicken slightly. Strain to remove seeds, and cool.

**To make thicker sauce or filling:** Use ingredients above and continue until raspberries are simmering. Combine cornstarch with 1 tablespoon water and add to the pan. Simmer for 3 to 4 more minutes, stirring constantly. Strain to remove seeds, and chill.

Nutrition information per serving	
Calories	51
Total fat	0.1 g
Saturated fat	0 g
Trans fat	0 g
Cholesterol	0 mg
Sodium	1 mg
Total carbohydrates	11.6 g
Fiber	1.3 g
Sugars	4.7 g
Protein	1 g
Carbohydrate choices	0.5

## Ham and Pepper Roll-ups

MAKES 1 SERVING (3 roll-ups)

1 tablespoon Neufchatel cheese (similar to cream cheese but with ⅓ less fat)

3 slices low-fat, low-sodium thinly sliced ham

⅓ cup thinly sliced red bell pepper

Spread cheese on ham slices. Top each with a few slices of red pepper and roll into cylinders.

Nutrition information per serving	
Calories	116
Total fat	4.9 g
Saturated fat	2.6 g
Trans fat	0 g
Cholesterol	40 mg
Sodium	758 mg
Total carbohydrates	4.9 g
Fiber	1 g
Sugars	2.4 g
Protein	3.4 g
Carbohydrate choices	0.5 for two servings

## BREAKFAST FOODS

### Yogurt Berry Crunch

MAKES 2 SERVINGS

(1 cup per serving)

- 1 cup fat-free plain yogurt
- ½ cup blueberries (fresh or frozen)
- ½ cup sliced strawberries (fresh or frozen)
- 2 tablespoons chopped walnuts
- 2 tablespoons old-fashioned rolled oats

Combine all ingredients in a bowl. Divide into two bowls and serve.

Nutrition information per serving	
Calories	182
Total fat	5.4 g
Saturated fat	0.5 g
Trans fat	0 g
Cholesterol	5 mg
Sodium	45 mg
Total carbohydrates	21.6 g
Fiber	2.8 g
Sugars	14.7 g
Protein	13 g
Carbohydrate choices	1.5

### Pumpkin Muffins

MAKES 12 SERVINGS (1 muffin per serving)

- 3 small ripe bananas (or 2 medium-large bananas)
- 1 (15-ounce) can pumpkin puree
- 2 egg whites
- 1 whole egg
- ½ cup unsweetened applesauce
- 1 cup nonfat dry milk
- 2 teaspoons pumpkin pie spice
- 1 cup whole-wheat flour
- 1¾ cups oat bran
- 1½ teaspoons baking soda
- ⅔ cup raisins (3 ounces)
- Cooking spray

Nutrition information per serving	
Calories	160
Total fat	1.8 g
Saturated fat	0.4 g
Trans fat	0 g
Cholesterol	18.4 mg
Sodium	209 mg
Total carbohydrates	35 g
Fiber	5.5 g
Sugars	12.1 g
Protein	7.7 g
Carbohydrate choices	2.5

Preheat oven to 350° F. Puree bananas and pumpkin in blender or food processor. Add egg whites, whole egg, and applesauce, and puree until smooth. Add dry milk and pulse until blended. Add pumpkin pie spice to mixture and blend. In a separate bowl, combine flour, oat bran, baking soda, and raisins. Mix to combine. Add banana-pumpkin mixture to flour mixture and mix well.

Spray a muffin pan with cooking spray and spoon mixture into cups, distributing batter evenly. Bake for 30 minutes or until toothpick inserted into muffin comes out clean.

### Vegetarian Strata

MAKES 4 SERVINGS

- 8 low-fat vegetarian breakfast links
- 2 slices whole-grain bread
- 1 (8-ounce) container Egg Beaters
- ½ cup skim milk
- 2 teaspoons hot sauce\*
- 2 tablespoons chopped chives or 1 tablespoon dried chives
- Olive oil cooking spray
- 1 cup grated low-fat Monterey Jack or cheddar cheese (choose brand with lowest sodium content)

Nutrition information per serving	
Calories	215
Total fat	7.6 g
Saturated fat	3.6 g
Trans fat	0 g
Cholesterol	19.7 mg
Sodium	754 mg
Total carbohydrates	12 g
Fiber	2.3 g
Sugars	5.1 g
Protein	24.3 g
Carbohydrate choices	1

Preheat oven to 350° F. Place breakfast links on a sheet pan and bake 10 minutes or until heated through. While links are cooking, place bread in oven to dry. In a bowl, combine Egg Beaters, milk, hot sauce, and chives. When links are cooked, slice into rounds. When bread is dry, remove from oven.

Spray a 9-inch pie pan with cooking spray. Break dry bread into small pieces and line bottom of the prepared pie pan. Sprinkle sliced links over bread, and then sprinkle grated cheese on top of mixture, distributing evenly. Pour egg mixture over entire mixture and place in oven. Bake 30 to 35 minutes until set. Cool slightly and serve.

*\*Frank's Hot Sauce is a good choice, as it has a vinegary taste without being too hot.*

### Raspberry and Cheese Blintzes

MAKES 4 SERVINGS (3 filled crepes per serving)

*A cheese filling plus Raspberry Sauce turns Buckwheat Crepes into Raspberry and Cheese Blintzes.*

Buckwheat Crepes (see page 46)  
Raspberry Sauce, thick version (see page 44)

- 12 rounded tablespoons fat-free ricotta cheese
- Ground cinnamon

For each crepe, place 1 tablespoon Raspberry Sauce and 1 tablespoon ricotta in center of crepe and fold in edges to overlap each other. Repeat with each of the 12 crepes. Sprinkle with cinnamon.

Nutrition information per serving	
Calories	182
Total fat	0.3 g
Saturated fat	0 g
Trans fat	0 g
Cholesterol	11.8 mg
Sodium	197 mg
Total carbohydrates	29 g
Fiber	2.5 g
Sugars	13 g
Protein	13.5 g
Carbohydrate choices	2



Buckwheat Crepes

MAKES 4 SERVINGS (3 6-inch crepes per serving)  
*Crepes are great stuffed with apple butter and sliced banana.*

- 3 eggs or the equivalent amount of Egg Beaters
- 2 tablespoons buckwheat flour\*
- 1 tablespoon nonfat milk
- Cooking spray
- 8 ounces sugar-free, fat-free fruit yogurt

Combine eggs, buckwheat flour, 1 tablespoon water, and milk in blender or food processor. Store in refrigerator for 3 hours or overnight. Batter should have the consistency of thin cream.

Spray a small skillet with cooking spray and place on high heat until the pan is hot. Pour approximately 1 tablespoon of batter into the pan. Tilt the pan around so that batter evenly coats the bottom. When small bubbles appear, use spatula to flip crepe over and cook for a few seconds on other side. Remove crepe from the pan and place on a plate. Fold in half, and then fold in half again to make a quarter-circle. Place 3 crepes on each plate. Spoon yogurt over and serve.

*\*Buckwheat flour is a good choice for people with diabetes, as it contains more fiber and protein than whole-wheat flour does.*

Nutrition information per serving	
Calories	76
Total fat	0.1 g
Saturated fat	0 g
Trans fat	0 g
Cholesterol	1.8 mg
Sodium	130 mg
Total carbohydrates	11.1 g
Fiber	0.8 g
Sugars	6.4 g
Protein	7.5 g
Carbohydrate choices	0.5

Buckwheat Pancakes

MAKES 6 SERVINGS (2 pancakes per serving)

- 1 whole egg
- 2 egg whites
- 1¼ cups nonfat buttermilk (or 1¼ cup nonfat milk combined with 1 tablespoon lemon juice)
- 1 teaspoon vanilla extract
- 1 tablespoon canola oil
- ⅔ cup buckwheat flour
- ⅓ cup oat bran
- 2 tablespoons ground flaxseed
- 1 teaspoon cinnamon
- ¾ teaspoon baking soda
- 1 teaspoon artificial sweetener (optional)
- Cooking spray

Nutrition information per serving	
Calories	130
Total fat	5.3 g
Saturated fat	0.9 g
Trans fat	0 g
Cholesterol	38.4 mg
Sodium	245 mg
Total carbohydrates	14.4 g
Fiber	3.6 g
Sugars	3.1 g
Protein	7.2 g
Carbohydrate choices	1

In a bowl, whip together egg, egg whites, buttermilk, vanilla, and canola oil. In a separate bowl, combine buckwheat flour, oat bran, ground flaxseed, cinnamon, baking soda, and (if you use it) artificial sweetener. Whisk buttermilk mixture into flour mixture, beating until well combined.

Spray a pan with cooking spray, then heat on medium-high burner until the pan is hot. Pour small amount of batter into the pan for each pancake. When bubbles appear on surface of batter, use spatula to flip onto other side and continue cooking till done. Remove to a plate. Serve with sugar-free syrup or sugar-free fruit yogurt.

## DESSERTS

## Cereal Cookies

MAKES ABOUT 26 SERVINGS (1 cookie per serving)

2 cups high-fiber, high-protein cereal (such as Kashi Good Friends, Kashi GoLean, or Weetabix flakes)  
 ¼ cup raisins (1½ ounces)  
 ½ cup chopped almonds, peanuts, or walnuts  
 ½ teaspoon ground cinnamon  
 2 tablespoons ground flaxseed  
 3 egg whites  
 ½ cup nonfat dry milk  
 1 teaspoon vanilla extract  
 Cooking spray

Nutrition information per serving	
Calories	43
Total fat	1.7 g
Saturated fat	0.1 g
Trans fat	0 g
Cholesterol	0.2 mg
Sodium	21 mg
Total carbohydrates	5.1 g
Fiber	1.4 g
Sugars	2.5 g
Protein	2.7 g
Carbohydrate choices	0.5

Preheat oven to 350° F. In a large bowl, combine cereal, raisins, nuts, cinnamon, and flaxseed. In another bowl, mix egg whites, dry milk, and vanilla until well blended. Pour egg white mixture into cereal mixture and toss until cereal is well-coated, forming cookie dough.

Spray a sheet pan with cooking spray. Place a teaspoon of cookie dough onto the pan, pressing lightly on the top to form cookie shape. Repeat, placing cookies a half-inch apart. (Alternatively, to form into bars, divide mixture into 6 parts, wet hands lightly, and shape on the pan.) Bake 10 to 12 minutes.

## Apple Cranberry Oat Crisp

MAKES 12 SERVINGS (½ cup per serving)

## For the oat topping:

¾ cup old-fashioned rolled oats  
 ⅓ cup whole-wheat pastry flour  
 ½ cup coarsely chopped pecans  
 ⅓ cup (packed) dark brown sugar  
 ¼ teaspoon ground cinnamon  
 ⅛ teaspoon allspice  
 ¼ teaspoon salt  
 3 tablespoons unsalted butter, melted

## For the filling:

Canola oil (for greasing the pan)  
 2½ pounds apples, cored  
 ⅓ cup dried cranberries  
 ¼ cup (packed) light brown sugar  
 2 pieces crystallized ginger, coarsely chopped (optional)  
 1 teaspoon lemon zest, grated  
 2 tablespoons fresh squeezed lemon juice

Nutrition information per serving	
Calories	217
Total fat	10.4 g
Saturated fat	2.4 g
Trans fat	0 g
Cholesterol	8 mg
Sodium	53 mg
Total carbohydrates	32 g
Fiber	3.4 g
Sugars	23 g
Protein	2 g
Carbohydrate choices	2

Set a rack in the lower third of the oven and preheat the oven to 375° F. In a bowl, combine the oats, flour, pecans, dark brown sugar, cinnamon, allspice, and salt. Stir the mixture as you drizzle on the butter. Continue stirring until the dry ingredients are coated with the butter.

Use the oil to grease an 8-inch-square baking pan. Cut the apples (no need to peel) into ½-inch chunks. Place them in a bowl and add the cranberries, light brown sugar, ginger (if using), lemon zest, and lemon juice. Toss gently to distribute the ingredients. Transfer the mixture to the prepared pan. Distribute the oat topping over the fruit.

Bake the crisp uncovered until the apples are tender when pierced with the tip of a knife and the topping is lightly browned, 45 to 60 minutes. If the topping threatens to burn before the fruit is tender, loosely cover the crisp with aluminum foil. Remove from the oven and let cool slightly before spooning onto plates or into bowls. ♥

# Sample meal plan for a week

## MONDAY

### Breakfast

Omelet of ½ cup egg substitute, ¼ cup chopped onion, ¼ cup chopped green bell pepper, and 2 teaspoons canola oil

1 slice whole-wheat bread, toasted, with 1 teaspoon creamy peanut butter

1 medium orange

### Lunch

3 ounces roasted chicken breast, no skin

Salad of 2 cups mixed greens, 2 teaspoons extra-virgin olive oil, and 1 tablespoon red wine vinegar

2 whole-grain rye crackers

½ cup skim milk

1 medium peach

### Snack

1 ounce unsalted almonds

### Dinner

Corn-Crusted Cod (see page 39)

½ cup brown rice

½ cup fresh broccoli and 1 medium carrot, stir-fried in 2 teaspoons extra-virgin olive oil

¾ cup fresh strawberries

#### Nutrition information

Calories	1,613
Total fat	59.2 g (32% of calories)
Saturated fat	8.9 g (5% of calories)
Trans fat	0 g
Cholesterol	101 mg
Sodium	1,784 mg
Total carbohydrates	186 g (45% of calories)
Fiber	33 g
Protein	94.4 g (22.8% of calories)

## TUESDAY

### Breakfast

¾ cup Kashi GoLean cereal with ½ cup skim milk

¾ cup vanilla nonfat yogurt with ¾ cup fresh blueberries

### Lunch

Poached Salmon BLT (see page 39)

1 cup cantaloupe

### Snack

¾ ounce dry roasted peanuts (about 20)

### Dinner

Lemon Garlic Chicken (see page 37)

Salad of 1 cup romaine lettuce, ⅓ cup cherry tomatoes, 2 teaspoons olive oil, and 1 tablespoon vinegar

1 baked sweet potato

1 cup fresh asparagus stir-fried in

2 teaspoons olive oil

1 kiwi fruit

#### Nutrition information

Calories	1,584
Total fat	63.3 g (34.5% of calories)
Saturated fat	11.2 g (6.1% of calories)
Trans fat	0 g
Cholesterol	203 mg
Total carbohydrates	167 g (40.4% of calories)
Sodium	1,745 mg
Fiber	32 g
Protein	103.7 g (25.1% of calories)

## WEDNESDAY

### Breakfast

⅔ cup old-fashioned oatmeal with ½ cup skim milk and 2 tablespoons chopped pecans

1 medium apple

### Lunch

1 Individual Tortilla Cheese Pizza (see page 37)

Salad of 1 cup mixed greens, ½ fresh cucumber, 2 teaspoons olive oil, and 1 tablespoon vinegar

1 medium pear

### Snack

¼ cup Spiced Walnuts (see page 43)

### Dinner

Baked Chicken with Brown Basmati Rice (see page 37)

Sesame Green Beans (see page 41)

¾ cup fresh pineapple

#### Nutrition information

Calories	1,586
Total fat	58.1 g (31.4% of calories)
Saturated fat	9.6 g (5.2% of calories)
Trans fat	0 g
Cholesterol	172 mg
Sodium	895 mg
Total carbohydrates	186 g (44.6% of calories)
Fiber	34 g
Protein	100 g (24% of calories)

## THURSDAY

### Breakfast

1 whole-wheat English muffin with  
2 tablespoons creamy peanut butter  
½ fresh banana

### Lunch

Chili Non Carne (see page 36)

Salad of 2 cups mixed greens, ¼ ounce  
almonds, 2 radishes, and Creamy Cider  
Dressing (see page 40)

½ cup honeydew melon

½ cup skim milk

1 whole-wheat dinner roll

### Snack

2 tablespoons Hummus (see page 43)  
with ½ cup carrot sticks

### Dinner

Turkey Meatloaf (see page 38)

Quinoa Vegetable Salad (see page 41)

¼ cup zucchini, ¼ cup summer squash,  
and ½ cup mushrooms stir-fried with  
2 teaspoons extra-virgin olive oil

2 cups mesclun salad with 1 tablespoon  
balsamic vinegar

#### Nutrition information

Calories	1,606
Total fat	60.8 g (32.9% of calories)
Saturated fat	11.8 g (6.4% of calories)
Trans fat	0 g
Cholesterol	147 mg
Sodium	1,313 mg
Total carbohydrates	201 g (48.3% of calories)
Fiber	44 g
Protein	78 g (18.8% of calories)

## FRIDAY

### Breakfast

1 whole-grain waffle with ¼ cup  
strawberries and 1 tablespoon sugar-free  
maple syrup

½ cup skim milk

1 cup fresh fruit

### Lunch

3 ounces roasted turkey breast,  
2 teaspoons Dijon mustard, romaine  
lettuce, and ½ fresh tomato on  
2 slices 100% whole-wheat bread

1 Cereal Cookie (see page 47)

### Snack

1 ounce dry roasted pistachios

### Dinner

4 ounces broiled haddock fillet with lemon

Brown Rice Italiano (see page 42)

Salad of 1 cup fresh Boston lettuce,  
½ fresh tomato, 1 tablespoon chopped  
onion, 1 tablespoon red wine vinegar, and  
1 tablespoon extra-virgin olive oil

¼ cup each red, yellow, and green bell  
peppers stir-fried in 1 tablespoon olive oil

1 medium apple

#### Nutrition information

Calories	1,501
Total fat	59.7 g (35.7% of calories)
Saturated fat	8.8 g (5.3% of calories)
Trans fat	0 g
Cholesterol	196 mg
Sodium	1,013 mg
Total carbohydrates	157 g (41.8% of calories)
Fiber	22.4 g
Protein	84 g (22.3% of calories)

## SATURDAY

### Breakfast

Buckwheat Pancakes (see page 46)  
topped with ½ cup fresh strawberry halves,  
½ cup fresh blueberries, ½ cup nonfat  
vanilla yogurt, and 1 tablespoon maple  
syrup

### Lunch

3 ounces white tuna and 1 leaf romaine  
lettuce on 1 whole-wheat pita

½ cup skim milk

½ cup green grapes

### Snack

Baked Tortilla Chips (see page 43)  
with Tomato Salsa (see page 43)

### Dinner

Balsamic Marinated Pork Loin  
(see page 37)

½ cup brown rice

¾ cup fresh broccoli and ¾ cup fresh  
cauliflower stir-fried in 1 tablespoon  
extra-virgin olive oil

1 cup mixed greens with 1 tablespoon  
extra-virgin olive oil and 1 tablespoon  
red wine vinegar

#### Nutrition information

Calories	1,599
Total fat	60.4 g (33% of calories)
Saturated fat	11.4 g (6.3% of calories)
Trans fat	0
Cholesterol	149 mg
Sodium	1,161 mg
Total carbohydrates	193 g (46.8% of calories)
Fiber	22 g
Protein	82.5 g (20% of calories)

## SUNDAY

### Breakfast

Vegetarian Strata (see page 45)

Pumpkin Muffin (see page 45)

½ cup citrus fruit (oranges and grapefruit sections)

### Lunch

1½ cups field greens salad, topped with  
½ cup chickpeas, ½ cup sweet corn,  
2 slices fresh avocado, with

2 teaspoons extra-virgin olive oil and  
1 tablespoon red wine vinegar

1 whole-grain flatbread cracker

### Snack

1 ounce unsalted peanuts

### Dinner

Turkey Bolognese with Roasted Red  
Pepper (see page 38) over whole-wheat  
penne pasta

Cucumber and tomato salad with  
2 teaspoons extra-virgin olive oil and  
1 tablespoon vinegar

#### Nutrition information

Calories	1,632
Total fat	63.5 g (33.8% of calories)
Saturated fat	12.6 g (6.7% of calories)
Monounsaturated fat	29.5 g
Polyunsaturated fat	10.6 g
Trans fat	0 g
Cholesterol	102 mg
Sodium	1,976 mg
Total carbohydrates	200 g (47.3% of calories)
Fiber	36 g
Protein	80 g (18.9% of calories)

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# Resources

## Organizations

### Academy of Nutrition and Dietetics

120 S. Riverside Plaza, Suite 2000  
Chicago, IL 60606  
800-877-1600 (toll-free)  
[www.eatright.org](http://www.eatright.org)

This organization provides comprehensive information on nutrition. The website features a dietitian-finder tool that enables you to locate a registered dietitian in your area.

### American Diabetes Association

1701 N. Beauregard St.  
Alexandria, VA 22311  
800-342-2383 (toll-free)  
[www.diabetes.org](http://www.diabetes.org)

This association serves as a prime resource for diabetes news and patient information, much of it available free on the association's website. In addition, the organization publishes and sells an extensive selection of books and pamphlets.

### CalorieKing

1001 W. 17th St., Suite M  
Costa Mesa, CA 92627  
[www.calorieking.com](http://www.calorieking.com)

This website offers a database of over 50,000 foods, including ethnic items and selections from popular restaurants. The pages include data on calories, fat, fiber, and carbohydrates for both brand-name and generic products. The site also includes articles on nutrition, a free newsletter, and interactive exercises.

### Weight-Control Information Network (WIN)

1 WIN Way  
Bethesda, MD 20892  
877-946-4627 (toll-free)  
<http://win.niddk.nih.gov>

This information service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) provides health professionals and consumers with science-based information on obesity, weight control, and nutrition.

## Books and publications

### Beating Diabetes: Lower Your Blood Sugar, Lose Weight, and Stop Diabetes and Its Complications in Their Tracks

David Nathan, M.D., and Linda Delahanty, M.S., R.D.  
(McGraw-Hill Education, 2006)

Written by the medical editors of this Special Health Report, this book takes an in-depth look at simple-to-adopt lifestyle changes that can control diabetes and prevent complications, if you have the disease—or prevent it, if you don't.

### The Diabetes Breakthrough: Based on a Scientifically Proven Plan to Lose Weight and Cut Medications

Osama Hamdy, M.D., Ph.D., and Sheri R. Colberg  
(Harlequin, 2014)

Osama Hamdy, assistant professor of medicine at Harvard Medical School and medical director of the clinical obesity program at Joslin Diabetes Center, shows how to lose weight and reduce blood sugar with a step-by-step, 12-week program that he uses with patients.

### Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating

Walter C. Willett, M.D., with P.J. Skerrett  
(Simon & Schuster, 2005)

A noted Harvard nutrition expert provides state-of-the-art information about the links between diet and health. An extensive selection of recipes helps readers put nutrition findings into practice.

### The Harvard Medical School 6-Week Plan for Healthy Eating

Teresa Fung, S.C., R.D., L.D.N., and Kathy McManus, M.S., R.D., L.D.N., Medical Editors  
(Harvard Medical School, 2015)

Knowing how you ought to eat and actually making it happen are two different things. This Special Health Report from Harvard Medical School walks you through a set of weekly changes that will help you transform your diet in healthy ways. To order, call 877-649-9457 (toll-free) or go to [www.health.harvard.edu](http://www.health.harvard.edu).

## Glossary

**alpha cell:** A type of cell in the pancreas that makes glucagon.

**beta cell:** A type of cell in the pancreas that makes insulin.

**body mass index (BMI):** A measure of weight for height that is often used to determine if an individual is at a healthy weight, overweight, or obese.

**calorie:** A measurement of the energy supplied by food.

**diabetes:** A chronic disease characterized by increased blood sugar levels and the risk of developing long-term complications affecting the eyes, kidneys, heart, and peripheral nervous system.

**glucagon:** A hormone produced by the alpha cells of the pancreas that increases the concentration of glucose in the blood.

**glucose:** A sugar produced from the breakdown of food in the digestive system. It is the main source of energy for your cells.

**glycemic index:** A numeric scale developed to show the effect of different foods on blood sugar as compared with white bread or glucose.

**glycemic load:** A calculation of the glycemic index multiplied by the actual amount of carbohydrate in a serving of food and divided by 100. This value gives a more accurate picture of how much a food can affect blood sugar.

**hemoglobin A1c:** A compound formed when glucose attaches to hemoglobin, the protein in red blood cells that carries oxygen. The hemoglobin A1c (HbA1c) test measures the percentage of hemoglobin molecules with glucose attached.

**high-density lipoprotein (HDL):** A particle that carries cholesterol and other fats through the bloodstream. Often called “good” cholesterol because it removes cholesterol from artery walls and the bloodstream.

**hypoglycemia:** A condition in which the blood sugar drops to an abnormally low level.

**insulin:** A hormone produced by the pancreas; it directs the passage of glucose, amino acids, and fatty acids into the cells and promotes their storage and use for growth and development.

**insulin resistance:** A reduced sensitivity to insulin’s action; underlies type 2 diabetes.

**islets of Langerhans:** Clusters of cells in the pancreas that make insulin.

**lipids:** Fat particles that travel in the bloodstream and are stored in the body as energy reserves. Cholesterol and triglycerides are types of lipids.

**low-density lipoprotein (LDL):** A particle that carries cholesterol and other fats through the bloodstream. Often called “bad” cholesterol because it can deposit cholesterol in artery walls, an early step in the development of heart disease.

**metformin:** A type of oral diabetes medication that almost everyone newly diagnosed with type 2 diabetes should take.

**monounsaturated fat:** A type of fat found in vegetable oils such as olive and canola. It has a healthful effect on blood cholesterol levels and may reduce risk for heart disease.

**non-nutritive sweeteners:** A class of sweeteners that don’t provide any calories. These include artificial sweeteners and extracts from plants.

**pancreas:** An elongated gland located against the back wall of the abdomen; it produces digestive enzymes and manufactures hormones, including insulin and glucagon, which are central to the metabolism of sugar, fat, and protein.

**polyunsaturated fat:** A type of fat found in corn, safflower, soybean, and other vegetable oils. It has a healthful effect on blood lipids.

**prediabetes:** A condition in which a fasting plasma glucose test or an oral glucose tolerance test provides readings that are elevated, but not quite diabetic; raises the risk for diabetes.

**saturated fat:** A type of fat found in animal foods; it raises unhealthy LDL cholesterol levels.

**trans fat:** A type of fat, found in hydrogenated and partially hydrogenated oils, that has an unhealthy effect on blood lipid levels.



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