

## 2. THE HIDDEN RISK: DIABETES

### CONTENTS (of this packet)

#### Lesson 2

Objectives

Introduction

Recipe Notes

Type 2 Diabetes: What Is It?

Symptoms Checklist

Treatment

MyPyramid

Who Is at a Greater Risk for Type 2 Diabetes?

What Can You Do?

**Information Sheet: Some Common Questions and Their Answers**

Sugar and diabetes; diagnosing diabetes; insulin-dependent, or type 1 diabetes mellitus; taking insulin; cow's milk and type 1 diabetes; diabetic health problems

**Worksheet: Are You at Risk for Type 2 Diabetes?**

**Fact Sheet: Sweet Nothings — Are Artificial Sweeteners Safe?**

**Recipes: Using Artificial Sweeteners**

Apple-Strawberry Crisp

Strawberry Shake

Curried Waldorf Salad

Yogurt-Cucumber Vegetable Dip

### OBJECTIVES

Complete this lesson and you will be able to

- explain what type 2 diabetes is;
- list the symptoms of diabetes;
- estimate your personal risk of having type 2 diabetes and not knowing it;
- describe the different types of artificial sweeteners;
- decide whether you want to use artificial sweeteners.

### INTRODUCTION

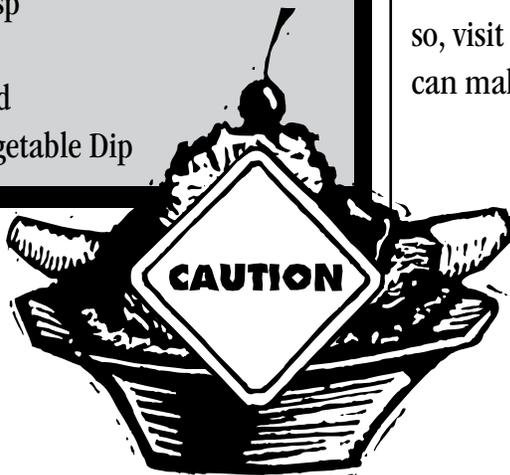
Lesson 2 looks at non-insulin-dependent diabetes, which is called type 2 diabetes. As we age, more of us will develop this disease. About 7 million people have been told they have type 2 diabetes, but experts think only half of the actual cases are identified. This means another 7 million adults are walking around with type 2 and don't realize it. If this disease is not treated, it causes serious damage to the body.

Lesson 2 describes the symptoms of type 2 diabetes and who is likely to develop it. See if you are at risk. If so, visit your doctor for a checkup. Prompt treatment can make a difference.

### RECIPE NOTES

The recipes in this lesson use an artificial sweetener or a sugar substitute and support the following healthful eating rule:

**Choose and prepare foods and beverages with little added sugars.**



Some people use sugar substitutes to help them control their calorie intake. Others find these substitutes too sweet. After you have tried artificial sweeteners, you may find that foods sweetened with plain sugar taste too bland.

Some sweeteners can be used in baked products, others cannot. They are a common ingredient in certain manufactured food products. Be sure to compare the number of calories in a serving of a product made with sugar substitutes to the number of calories in the regular product. Sometimes there is little difference in calories and a big difference in price.

Although debates continue about the safety of artificial sweeteners, most scientists think sugar substitutes will not cause harm, *if used in moderation*. Read the fact sheet in this lesson for more information.

## TYPE 2 DIABETES: WHAT IS IT?

First, let's review the way a healthy body handles food. Food is made of carbohydrates, proteins, and fats. After a meal these substances are digested and broken down into glucose, amino acids, and fatty acids. These, in turn, are taken into the bloodstream from the intestine. An organ called the pancreas makes insulin, a hormone that helps the body deal with the products of digestion.

After a meal, the amounts of glucose and other nutrients in the blood rise. This signals the pancreas to release insulin. When enough insulin is produced, it lowers the amounts of glucose, amino acids, and fatty acids in the blood by helping these products enter cells all over the body. The cells then either use the glucose and other nutrients or store them. The glucose, amino acids, and fatty acids in the blood then drop to normal levels about two hours after a meal. Doctors use the drop in blood glucose levels at two hours as an indicator of normal insulin activity.

In a person with type 2 diabetes, the body cannot handle the glucose, amino acids, and fatty acids entering the blood after a meal and during digestion. Sometimes the pancreas no longer produces enough insulin. Cells in the body get too little of the hormone and are unable to take in the products of digestion. Sometimes the pancreas produces a lot of insulin, but the cells don't respond to it. This is called insulin resistance. In both cases, the levels of glucose and other nutrients do not go down as fast as they should. The body dumps the excess glucose into the urine. Glucose in the urine may be the first sign that something is wrong.

## SYMPTOMS CHECKLIST

The symptoms of type 2 diabetes are

- being very hungry all the time;**
- being very thirsty;**
- having to urinate a lot and passing a lot of water;**
- blurred vision or recent changes in vision;**
- being sleepy and tired;**
- tingling or numbness in legs, feet, or fingers;**
- frequent skin infections and slow healing of cuts on hands and feet.**

Check off any symptoms you have. See your doctor, especially if you have several of these symptoms at once.



## TREATMENT

Type 2 needs to be treated. If the glucose level in the blood is not reduced, it seriously damages the body's small and large blood vessels.

This leads to eye damage (and blindness), kidney

damage (and failure), and circulation problems.

Problems with circulation mean loss of feeling and the ability to fight off infections in the feet and legs. Severe circulation difficulties can lead to amputation of feet and legs. Circulation problems also affect the heart and put the person with diabetes at greater risk for heart disease and high blood pressure.

Treatment can include

- carefully regulating the amount of food eaten;
- timing of meals and snacks;
- exercise;
- oral medications or even insulin.

Surprisingly, people with type 2 can eat any food, including sweets. There is no medical evidence that a person with type 2 cannot eat sweets as long as sweets are eaten as part of a meal.

## MYPYRAMID

Usually a person with type 2 can use MyPyramid as a guide for making food choices. But people with type 2 must usually control their calorie and fat intakes and reduce their intake of saturated and trans fats. This may mean making changes in the way food is prepared, choosing lean meats and low-fat dairy products, using less butter or margarine, and eat-



ing whole grains, pasta, vegetables, and fruits more often. (Following MyPyramid is an important part of maintaining your health; Lesson 4 talks about including MyPyramid in your wellness plan.)

Two goals of treatment are to:

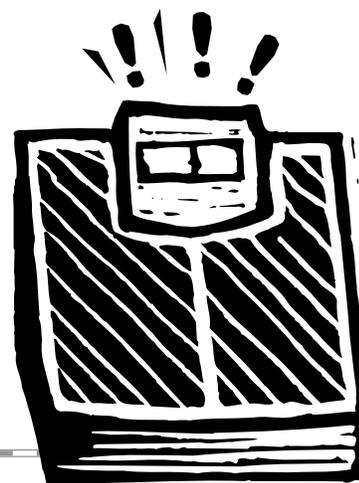
- keep blood glucose levels as near normal as possible, and
- lower blood lipid levels to the recommended range.

Individuals with type 2 diabetes can learn to regulate their own blood glucose levels using finger pricks and a glucometer. But lowering blood lipid levels usually requires eating less fat, less saturated and trans fats, and less cholesterol. These changes in what you eat can be part of the treatment.

## WHO IS AT GREATER RISK FOR TYPE 2 DIABETES?

The following people have a higher risk:

**The overweight.** Weight gain leads to insulin resistance, as we mentioned in Lesson 1. The pancreas produces insulin, but for most people, extra weight prevents cells from responding to insulin normally. So glucose remains in the bloodstream longer before it moves into cells where it is used. To correct this, the pancreas produces more insulin. Even with an overproduction of insulin, resistance can continue to build until glucose spills into the urine and



type 2 is diagnosed. You are at a greater risk if your extra pounds are on your upper body, particularly around your stomach. Measure your waist and then your hips. If your waist is bigger around than your hips, you have a higher risk.

**People with impaired glucose tolerance (IGT).** If you take a blood glucose test, your doctor may tell you that you don't have type 2, but that you do have impaired glucose tolerance. This used to be called chemical diabetes or borderline diabetes. IGT means that your body is slower than normal in clearing a glucose load from your blood. Some people with IGT go on to develop diabetes. Others return to a normal blood glucose response.

**Women who have had gestational diabetes.** This means the pregnant woman's blood glucose level is higher than normal. Gestational diabetes occurs in about 3 to 4 percent of pregnancies. Generally a test to detect this condition is done 6 months into the pregnancy. Medication or a special diet may be used to lower the mother's blood glucose to normal. This protects the developing baby. Sometimes women with gestational diabetes give birth to a large baby—over 9 pounds at birth. Such a birth is called macrosomic. That child may later have trouble with obesity. Women who develop gestational diabetes are more likely to develop type 2 diabetes later in life, especially if they have a relative with diabetes.

## WHAT CAN YOU DO?

Type 2 can be a silent disease. Take the simple test in this lesson's worksheet to see if you are at increased risk for undiagnosed diabetes. If you are at risk, visit your doctor and ask for a blood glucose test. Early treatment is best. If you are not at risk include some goals in your wellness plan that will keep your risk low. We will begin our discussion of those goals in Lesson 3.

In this lesson,

- the information sheet provides answers to some common questions about blood glucose levels that indicate diabetes, and about insulin dependent diabetes and what causes it;
- the fact sheet includes information on four of the artificial sweeteners available today and what to consider in choosing one;
- the recipes are for desserts, salads, and dips flavored with Equal® or Sugar Twin®.

Thanks for completing this lesson.

PENNSTATE



College of Agricultural Sciences • Cooperative Extension

**Prepared by J. Lynne Brown, associate professor of food science, in cooperation with Carla Miller, Frances Shacklock, and Sheila Rye**

Visit Penn State's College of Agricultural Sciences on the Web: <http://www.cas.psu.edu>

Penn State College of Agricultural Sciences research, extension, and resident education programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

This publication is available from the Publications Distribution Center, The Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802. For information telephone 814-865-6713.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Cooperative Extension is implied.

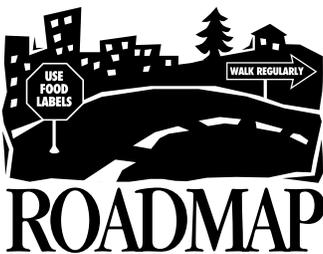
This publication is available in alternative media on request.

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, gender identity, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901; Tel 814-865-4700/V, 814-863-1150/TTY.

Produced by Information and Communication Technologies in the College of Agricultural Sciences

© The Pennsylvania State University 2006

Code# UK052 Rev4M12/06mpc 4213



## INFORMATION SHEET:

*Some common questions and their answers*

### 1. DOES EATING SUGAR CAUSE DIABETES?

No! Diabetes is caused by a lack of insulin. Because there is too little insulin, the level of glucose (sugar) in the blood stays high and eventually spills into the urine. Eating sugar raises the glucose level in blood. But glucose levels will stay high only if there is too little insulin.

### 2. IF I AM EXPERIENCING SOME OF THE SYMPTOMS OF DIABETES, HOW DO I KNOW IF I HAVE DIABETES?

See your physician promptly! Your doctor will discuss your symptoms with you and probably take a blood glucose measurement (see table at right). If you had something to eat or drink (besides water) up to 3 hours before seeing the doctor, a blood glucose level of 200 mg/dl or more means diabetes. If you have not had anything to eat or drink (are fasting), a blood glucose level of 126 mg/dl or more means diabetes. Both findings must be checked by a second test the next day.

Some doctors do additional testing of levels under 126 mg/dl as follows: If a fasting blood sample is less than 100 mg/dl, diabetes is not the problem. If the fasting blood sample is between 100 and 125 mg/dl, your doctor may ask you to take an oral glucose tolerance test (OGTT). This is an additional tool for determining diabetes. The idea is to give a person a drink with sugar and then test the blood glucose level 30 minutes, 1 hour, and 2 hours afterward. A

high blood glucose level (of 200 mg or greater) at 2 hours and one of the other two measurements indicates diabetes.

#### Diagnosing Diabetes

Testing conditions	Test results	Diabetes
Nonfasting blood sample	200 mg/dl or greater	yes
Fasting blood sample	Less than 100 mg/dl	no
Fasting blood sample	100–125 mg/dl	OGTT needed
Fasting blood sample	126 mg/dl or greater	yes

mg/dl = milligrams per deciliter

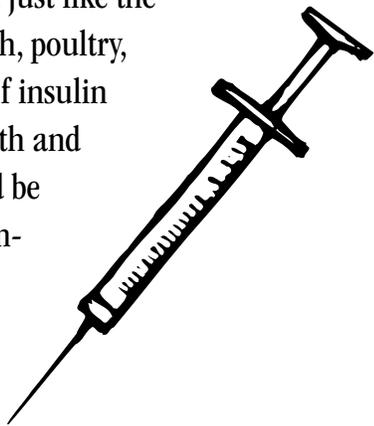
### 3. WHAT IS INSULIN-DEPENDENT DIABETES MELLITUS (TYPE 1)?

Type 1 diabetes often appears in childhood, although sometimes it appears in an adult. It occurs more frequently in whites than in other racial groups. Type 1 happens suddenly with the following symptoms: extreme hunger and thirst, frequent urination, sudden weight loss, weakness, being sleepy or tired, sudden changes in eyesight, and nausea and vomiting. The person's body cannot produce any insulin at all.

The cause is a mystery. Some experts think type 1 is the result of an autoimmune disease—a condition in which the body attacks itself. An infection may set it off. New cases of type 1 are more common following viral infections such as mumps, measles, encephalitis, and rubella. Type 1 must be treated with daily injections of insulin when food is eaten.

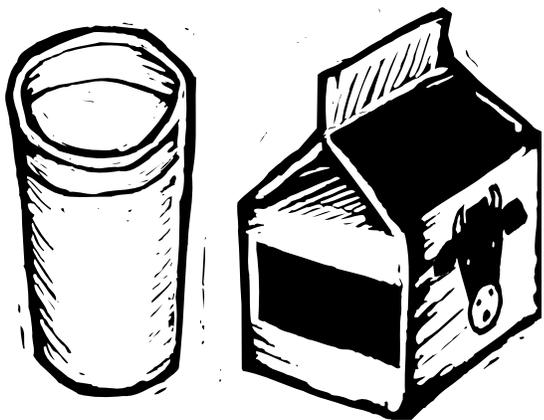
#### 4. WHY IS INSULIN GIVEN AS AN INJECTION INSTEAD OF AS A PILL?

Insulin is a protein just like the protein in meat, fish, poultry, or dairy products. If insulin were taken by mouth and swallowed, it would be digested in the stomach just as those foods are. Once digested, insulin no longer works to control blood glucose. It is not effective unless injected directly into the bloodstream.



#### 5. CAN DRINKING COW'S MILK CAUSE TYPE 1 DIABETES?

This question continues to be investigated. A theory that a particular type of milk protein, A1 beta casein, could cause an immune response that could lead to type 1 diabetes has not found good support. However, recent research from Europe suggests that several infant-feeding practices may increase some children's risk of developing type 1 diabetes. These practices include breastfeeding for less than 2 months, introduction of cow's milk formula for feeding earlier than 6 months, and introducing gluten-containing (cereal-based) food before 3 months of age.



Not every child is at equal risk. Children of a parent with diabetes are more at risk to develop type 1 diabetes. Males are somewhat more likely than females to develop this disease. Siblings of children with type 1 diabetes who drink more than 3 cups of milk a day appear to have a somewhat elevated risk of also developing type 1 diabetes.

Following recommended infant-feeding practices may decrease children's risk of developing type 1 diabetes.

#### 6. WHY DO PEOPLE WITH DIABETES EXPERIENCE SO MANY OTHER HEALTH PROBLEMS?

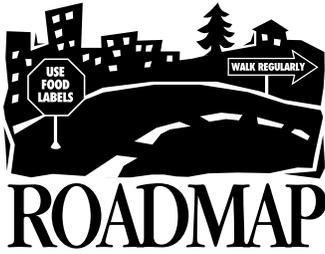
Many of the health problems or complications of diabetes are caused by changes in blood vessels. These changes are often brought about by the high glucose levels in a diabetic's blood. Sometimes, changes occur in the large blood vessels, like the veins and arteries. The inside lining becomes thick, reducing the space in the vessel. Blood has a hard time flowing through. Heart disease or a stroke can result.

Changes can also occur in the small blood vessels, called capillaries, that distribute the blood to individual cells. Damage to the small blood vessels is often most severe in the eyes and kidneys of people with diabetes. When the damaged blood vessels in the eye break open, the eye tissue is injured. High blood glucose levels also damage kidney tissue.



Circulation in the legs and feet is also affected. Sores and infections on legs and feet don't heal. Severe damage often leads to loss of a toe, foot, or leg. Keeping blood glucose levels close to normal helps prevent or delay such complications. This is why controlling blood glucose levels is so important.

Your **WELLNESS**



The effects of type 2 can start 9 to 12 years before you or your doctor realize you have it. When type 2 is finally diagnosed, eye, kidney, and nerve damage may already be present. Early detection and treatment can reduce the complications of this disease.

Take the following test to see if you are at risk. Select the group that corresponds to your current age. Then answer all the questions for that age-group.

**I am 20–44 years of age.**

My weight is equal to or above that listed in the chart (shown at right).  
(Choose the column for your sex and then find your height. Compare your weight to the weight listed.)

yes \_\_\_\_  
no \_\_\_\_

I get little or no exercise during a usual day.

yes \_\_\_\_  
no \_\_\_\_

If you answered yes to both questions, you are at risk!

**I am 45–64 years of age.**

My weight is equal to or above that listed in the chart.  
(Choose the column for your sex and then find your height. Compare your weight to the weight listed.)

yes \_\_\_\_  
no \_\_\_\_

I get little or no exercise during a usual day.

yes \_\_\_\_  
no \_\_\_\_

If you answered yes to either question, you are at risk!

**WORKSHEET:**  
*Are you at risk for type 2 diabetes?*

**I am 65 or more years of age.**

My weight is equal to or above that listed in the chart.  
(Choose the column for your sex and then find your height. Compare your weight to the weight listed.)

yes \_\_\_\_  
no \_\_\_\_

My mother, father, sister, or brother had diabetes.

yes \_\_\_\_  
no \_\_\_\_

I have given birth to a baby weighing more than 9 pounds.

yes \_\_\_\_  
no \_\_\_\_

If you answered yes to any question, you are at risk!

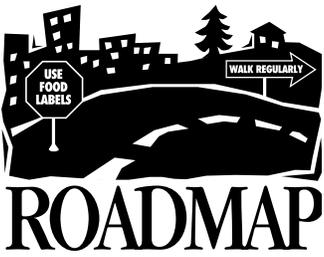
Do your answers indicate that you are at risk? Ask your doctor about a blood glucose test. Guard your health.

Source: W. H. Herman, P. J. Smith, T. J. Thompson, M. M. Engelgau, and R. E. Aubert (1995). A new and simple questionnaire to identify people at increased risk for undiagnosed diabetes. *Diabetes Care* 18(3), 382-387.

Women Height Feet and inches	Weight Pounds	Men Height Feet and inches	Weight Pounds
4 ft 9 inches	134	5 ft 1 inch	157
4 ft 10	137	5 ft 2	160
4 ft 11	140	5 ft 3	162
5 ft 0	143	5 ft 4	165
5 ft 1	146	5 ft 5	168
5 ft 2	150	5 ft 6	172
5 ft 3	154	5 ft 7	175
5 ft 4	157	5 ft 8	179
5 ft 5	161	5 ft 9	182
5 ft 6	164	5 ft 10	186
5 ft 7	168	5 ft 11	190
5 ft 8	172	6 ft 0	194
5 ft 9	175	6 ft 1	199
5 ft 10	179	6 ft 2	203
5 ft 11	182	6 ft 3	209

Height is without shoes and weight is without clothes.

This chart shows weights that are 20 percent heavier than what is recommended for women and men with a medium frame. If your weight is above the amount shown for your height, you may be at risk for developing diabetes.



## FACT SHEET:

### *Sweet nothings— are artificial sweeteners safe?*

We are born with a desire for sweet foods. Newborns don't learn to like sugar; they just naturally like it. Perhaps this explains why the average person eats about 43 pounds of sugar a year. Sugar contains calories, however. Many people want the sweet taste, but not the calories.

Supermarkets now offer many low-calorie or no-calorie foods made with artificial sweeteners. It is possible to buy no-calorie soft drinks that have the same sweetness as the original formula. Can we really enjoy this gift from food science, or is there a hidden cost? Let's review the sweeteners and the evidence for their safety.

### **SACCHARIN**

Saccharin is the grandfather of all artificial sweeteners. It was first made in 1879 for use as an antiseptic. However, scientists soon discovered its ability to provide sweetness. Food processors use it as a sugar substitute in canned foods and beverages. Saccharin is 300 to 400 times sweeter than table sugar or sucrose. Today it is sold as Sweet 'N Low®, Sugar Twin®, or Sweetmate® and appears in a wide variety of food products.

Saccharin is not broken down by the digestive system, so it is calorie free. It is stable in heat and can be used in cooking. It sometimes gives food a bitter aftertaste.

In 1977 the Food and Drug Administration (FDA) proposed a ban on saccharin after studies found

it increased bladder cancer in rats. Because of the intense public outcry against the ban, Congress postponed the ban but required that a warning statement be placed on labels of foods containing saccharin. In 1991 the FDA withdrew the proposal to ban saccharin. The consumer warning remains on the food label if saccharin is used in the food product. Saccharin is approved for use in more than 90 countries. The FDA considers it safe for the general public at current levels of intake.

Most public health officials feel that using saccharin poses only a small risk. They recommend that children eat no more than 500 mg/day of saccharin and that adults eat no more than 1,000 mg/day. (See table that follows on acceptable daily intakes.) Currently, most adults and children consume much less saccharin, partly because of the availability of other artificial sweeteners. Saccharin can affect a baby during pregnancy. While there is no evidence that saccharin can harm a fetus, it is wise to avoid using much of it if you are pregnant.



## ASPARTAME

Aspartame was first approved in 1981. Equal®, Equal® Spoonful, and NatraTaste® are tabletop sweeteners that contain aspartame.

Aspartame is made of two amino acids, phenylalanine and aspartic acid, linked to methanol, a natural alcohol. The body digests aspartame like a protein and provides 20 calories per teaspoon. Because aspartame is 200 times sweeter than sugar (see sugar substitutes and equivalents table), very little is needed to produce the desired sweetness.

The sweetener is used in lower-calorie versions of traditional sweet foods. It appears in carbonated beverages, fruit juice, milk beverages, frozen desserts, puddings, yogurt products, and in packets for home use. Because aspartame is broken down by heat, it cannot be used in baking. But it may be added to foods after they are cooked.

The products of aspartame digestion—phenylalanine, aspartic acid, and methanol—occur naturally in many foods. Studies of humans who used aspartame in large doses (200 mg/kg of body weight or over 60 cans of diet soda for a 120-pound woman) for months or several years did not show any significant bad effects. People with phenylketonuria (PKU) should not use aspartame because it may affect the levels of phenylalanine in their blood. Breast-feeding women who use aspartame at levels recommended for healthy adults (no more than 50 mg/kg of body weight) appear to bring no risk to their child. But scientists continue to investigate the safety of aspartame for use by children and by pregnant or breast-feeding women.

A recent study suggested aspartame use might be associated with an increased risk of brain cancer. FDA examined the National Cancer Institute database on cancer occurrence and found no evidence of such



an association. Moderate use of aspartame is unlikely to be harmful. Ninety percent of the people who use aspartame eat a very small amount of it per day.

## ACESULFAME-K

This sweetener was discovered in 1967 in Frankfurt, Germany. Hoechst, a German company, introduced it in the United States in 1989 under the name of Sunette®. Acesulfame-K is the major ingredient in two tabletop sweeteners, Sweet One® and Swiss Sweet®. It is 200 times sweeter than sugar. If used alone at high concentrations in certain food products, it may produce a slightly bitter aftertaste, similar to that produced by saccharin.

Acesulfame-K is not broken down by the body's digestive system. Thus, it is calorie free.

Some consumer groups have asked if large doses of this sweetener might cause cancer. The FDA has stated that a detailed analysis of all the research data showed that any tumors found in animals were not caused by feeding the animals acesulfame-K.

In the United States, acesulfame-K has been approved for use in chewing gum, powdered beverages, gelatins, puddings, instant coffees, and nondairy creamers. Unlike aspartame, it is heat stable and

can be used in baking. It can be combined with other sweeteners to produce an even sweeter taste, a practice common in other countries. It has been approved for use in over 40 countries.

## SUCRALOSE

Since its approval in 1998, sucralose has become the most popular sugar substitute. It is sold under the brand name Splenda® and can be found in thousands of food and beverage products around the world. It is about 600 times sweeter than sugar.

A patented process is used to create sucralose from cane sugar. The process involves replacing three hydrogen-oxygen groups on the sugar molecule with three chlorine atoms. Chlorine is found naturally in many foods and beverages such as tomatoes, peanut butter, and table salt. In this case, the addition of chlorine is what converts sugar into sucralose. The body does not recognize this sweetener as sugar or a carbohydrate. Thus, it is not metabolized by the body and does not provide any calories.

Sucralose can be used in cooking and baking. Unlike some other artificial sweeteners, it maintains its sweetness when heated and does not produce a bitter aftertaste.

More than 100 scientific studies have been conducted over a 20-year period on the safety of this product. Based on the results of these studies, the FDA and other health authorities have concluded that sucralose can be safely consumed by everyone, including pregnant and nursing women. Products containing sucralose are not required to carry any warning labels or safety information.

### Acceptable Daily Intakes (ADI)

<i>Sugar substitute</i>	<i>ADI</i>	<i>Amount of product to give ADI</i>
Saccharin	Children: 500 mg/day	13 packets Sweet 'N Low®
	Adults: 1,000 mg/day	25 packets Sweet 'N Low®
Aspartame	50 mg/kg body weight	
	For 50-lb (23 kg) child:	32 packets of Equal® or 7 12-oz cans of diet soda
	For 150-lb (68 kg) adult:	97 packets of Equal® or 20 12-oz cans of diet soda
Acesulfame-K	15 mg/kg body weight	
	For 50-lb (23 kg) child	7 packets of Sweet One®
	For 150-lb (68 kg) adult	20 packets of Sweet One®
Sucralose	5 mg/kg body weight	
	For 50-lb (23 kg) child	9 packets of Splenda®
	For 150-lb (68 kg) adult	28 packets of Splenda®

Note: To determine your weight in kilograms, divide your weight in pounds by 2.2. (Example: 150 pounds divided by 2.2 = 68 kilograms)  
mg = milligrams

### Sugar and Equivalents of Sugar Substitute

<i>Sugar</i>	<i>Equal®</i>	<i>Sweet' N Low®</i>	<i>Sweet One®</i>	<i>Splenda®</i>
2 teaspoons	1 packet	1/5 teaspoon	1 packet	1 packet
1 tablespoon	1 1/2 packets	1/3 teaspoon	1 1/4 packets	1 1/2 packets
1/4 cup	6 packets	3 packets	3 packets	6 packets
1/3 cup	8 packets	4 packets	4 packets	8 packets
1/2 cup	12 packets	6 packets	6 packets	12 packets
1 cup	24 packets	12 packets	12 packets	24 packets



## SELECTING A SUGAR SUBSTITUTE

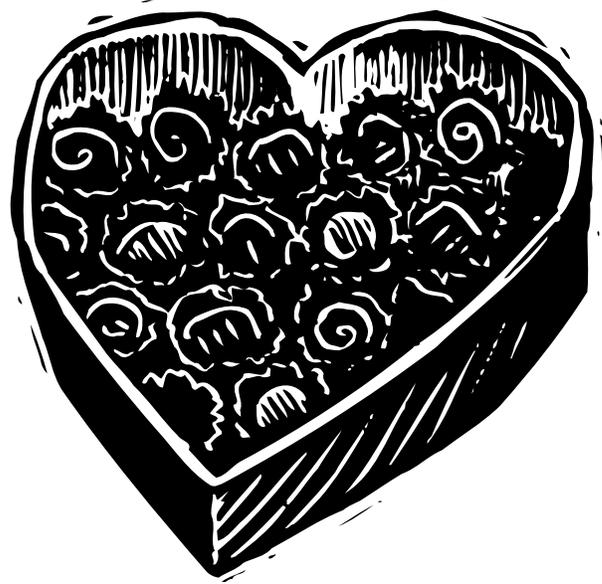
Choosing a sugar substitute is no longer easy. Which sweetener tastes best? How much should you eat in a day? To learn which sweetener you like best, try a variety of food products that contain different sweeteners. Some sweeteners taste better in baked products, others better in beverages. Review the recipes in this lesson to learn how to cook with them.

Think about the risks and benefits of sweeteners. Look at diet soft drinks, for example. The benefit of drinking artificially sweetened drinks is that you take in fewer calories. How many can you drink in a day and still avoid any risks? To help you, the FDA has established an acceptable daily intake (ADI) for each sweetener. This is the amount that humans can eat over a lifetime and still be considered safe by one hundredfold. In other words, this is 1/100th of the amount shown to have no toxic effects on test animals. The ADI is reported as an amount per kilogram of body weight. One kilogram is 2.2 pounds. If you decide to use sweeteners, limit your daily intake to less than the levels given in the ADI table on the opposite page.

If you wish to use sweeteners during pregnancy, aspartame and sucralose are the best choices. Avoid saccharin.

## SELECTING A LOW-CALORIE FOOD PRODUCT

Labels of food products that contain artificial sweeteners may say “sugar free,” “calorie free,” or “reduced calories.” A sugar-free food has less than 0.5 gram of sugar per serving. A calorie-free food has less than 5 calories per serving. A “reduced-calorie” food has at least one-quarter or 25 percent fewer calories than the original food. These statements on the front of the package are the first sign of a low-calorie product.



Not all “sugar-free” or “reduced-calorie” foods are low in calories, however. The food may contain fat, which provides calories. Sometimes a sugar-free food doesn’t save you many calories, compared with the food it is replacing. Be sure to examine the Nutrition Facts panel on all low-calorie food products to be informed of what you are really getting. Use artificially sweetened foods in moderation and they can be part of your wellness plan.

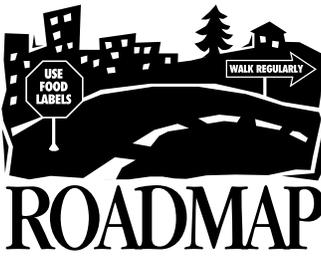
## SUGAR ALCOHOLS

Sugar alcohols are also called polyols. They include sorbitol, mannitol, xylitol, maltitol, maltitol syrup, lactitol, isomalt, and hydrogenated starch hydrolysates. Most of these are half as sweet as table sugar. Maltitol and xylitol are about as sweet as table sugar.

Manufacturers use sugar alcohols to sweeten some foods and often combine them with other sweeteners like acesulfame-K or saccharin. Sugar alcohols do not lose their sweetness when heated and can be used to sweeten hot drinks and cooked foods. They are not used in baked goods because they do not give foods the desired brown color.

These compounds provide fewer calories than table sugar. In Europe they are given an average caloric value of 2.4 calories per gram. They are not easily passed from the intestine to the bloodstream. When taken into the blood, they are converted to energy by a process that does not involve insulin. Sugar alcohols passing through the intestine are broken down by bacteria. If eaten in large amounts, they can cause gas and act like a laxative. Unlike sugars they do not cause tooth decay.

If a food contains sugar alcohols, they must be listed in the ingredient list. A food manufacturer may list the grams of sugar alcohol in a serving on the Nutrition Facts panel. This is voluntary unless a nutrient content claim like “sugar free” is made on the label. If such a claim is made, the sugar alcohol content must be listed. If only one sugar alcohol is used, it may be listed by specific name. If several are used, the manufacturer may simply call them “sugar alcohol.”



## RECIPES:

### *Using artificial sweeteners*

#### APPLE-STRAWBERRY CRISP

Makes 4 servings

One serving (1/4 of crisp) contains:  
 191 calories  
 20 g carbohydrate  
 2 g protein  
 12 g fat  
 135 mg sodium  
 0 mg cholesterol  
 2 g dietary fiber

#### Ingredients:

Nonstick vegetable spray  
 1/4 cup margarine  
 1/4 cup quick-cooking oats  
 1/4 cup flour  
 1/4 tsp brown sugar substitute\*  
 1/2 pint fresh strawberries  
 1 large tart cooking apple, peeled and cut into 1/4-inch slices  
 2 tsp lemon juice  
 1/2 tsp cinnamon  
 1/2 tsp lemon peel, grated  
 1/2 tsp vanilla

\*If Sugar Twin® or another brown sugar substitute cannot be found, use regular brown sugar.

#### Procedure:

Preheat oven to 400°F. Spray 8-inch round baking dish with nonstick vegetable spray. Combine margarine, oats, flour, and brown sugar substitute in small bowl until crumbly and set aside. Combine remaining ingredients to coat fruit. Pour into prepared dish. Top with oat mixture. Bake for 15–20 minutes or until slightly browned.

Adapted from The American Diabetes Association and the American Dietetic Association Family Cookbook, Vol. III. New York: Prentice Hall Press, 1987.

#### Microwave tip:

Pour fruit mixture into unsprayed, 8-inch microwave-safe dish. Top with oats mixture. Cook on high power for 6–8 minutes, rotating dish halfway through cooking time. Let stand for 4–5 minutes before serving. Serve warm with low-calorie whipped topping, if desired.

#### STRAWBERRY SHAKE

Makes 1 serving (1 cup)

One serving contains:  
 88 calories  
 11 g carbohydrate  
 7 g protein  
 2 g fat  
 92 mg sodium  
 7.5 mg cholesterol  
 0 g dietary fiber

#### Ingredients:

1/2 cup plain low-fat yogurt  
 1/4 cup sugar-free, strawberry-flavored carbonated beverage  
 1/2 packet Equal® brand sweetener  
 2 Tbsp unsweetened frozen strawberries, slightly thawed

#### Procedure:

Blend all ingredients in blender. Pour into chilled glass. Store leftovers in the refrigerator.

#### Time-saving tip:

Make a couple hours ahead and keep in refrigerator until serving.

Reprinted, with permission, from The Joy of Snacks © 1991 International Diabetes Center, Minneapolis. All rights reserved.



## CURRIED WALDORF SALAD

Makes 4 servings

One serving (3/4 cup) contains:

198 calories  
8 g carbohydrate  
17 g protein  
11 g fat  
226 mg sodium  
48 mg cholesterol  
1 g dietary fiber

### Ingredients:

8 oz (1 1/2 cups) cubed  
skinned smoked turkey  
1 cup cubed apple  
1/2 cup sliced celery  
1/2 cup low-calorie  
mayonnaise  
1/2 tsp curry powder  
2 packets Equal® brand  
sweetener

### Procedure:

Combine turkey, apple, and celery in a large bowl. In a separate bowl, blend together mayonnaise, curry powder, and Equal®. Toss turkey mixture with dressing. Chill. Serve on lettuce leaves.

Store leftovers in the refrigerator.

## YOGURT-CUCUMBER VEGETABLE DIP

Makes 1 1/2 cups or 24 tablespoons

One serving (1 Tbsp) contains:

9 calories  
1 g carbohydrate  
1 g protein  
0 g fat  
52 mg sodium  
1 mg cholesterol  
0 g dietary fiber

### Ingredients:

1 cup pared, shredded cucum-  
ber, drained  
1/2 tsp onion powder  
1 cup plain low-fat yogurt  
3 packets Equal® brand  
sweetener  
1/2 tsp salt  
1/8 tsp pepper  
1 tsp garlic powder  
1 Tbsp lemon juice

### Procedure:

Shred peeled cucumber with grater. Press cucumber with paper towels to remove as much moisture as possible. Combine cucumber and onion in a bowl. Combine remaining ingredients and mix with cucumber. Blend thoroughly. Cover and chill. Serve with fresh vegetables. Best if used within one week.

Reprinted, with permission, from The Joy of Snacks © 1991 International Diabetes Center, Minneapolis. All rights reserved.

