



TECHNIQUES OF  
**healthy cooking**

FOURTH EDITION

the culinary institute of america



# TECHNIQUES OF HEALTHY COOKING





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FOURTH EDITION

THE CULINARY INSTITUTE OF AMERICA



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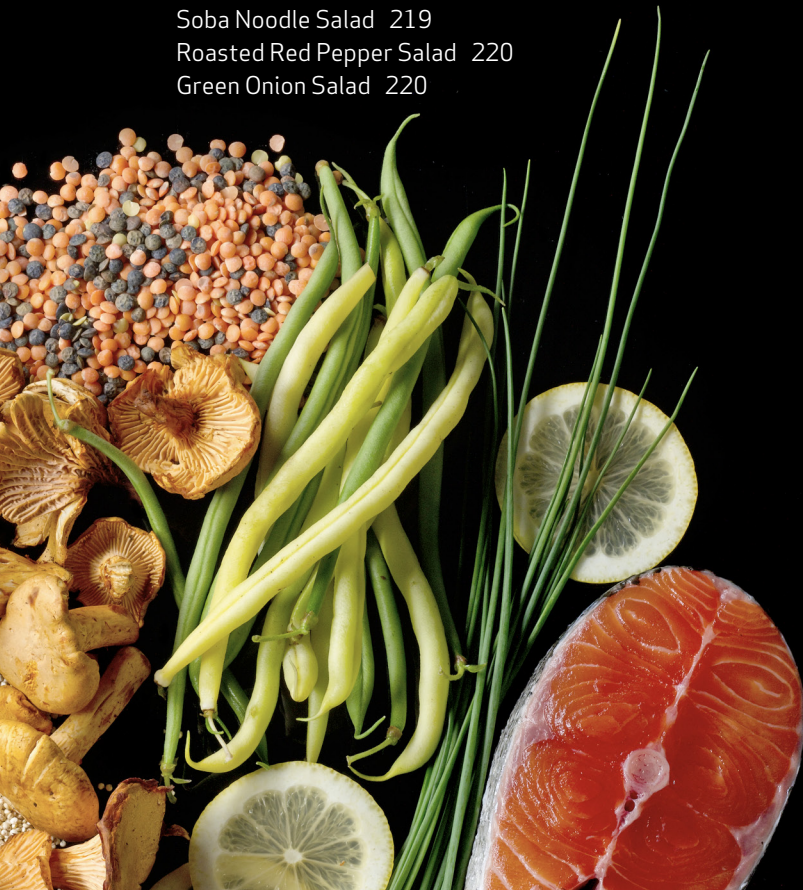
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# Preface

Obesity is an epidemic of global proportions.

—WORLD HEALTH ORGANIZATION

Overweight and obesity may soon cause as much preventable disease and death as cigarette smoking.

—DAVID SATCHER, former U.S. Surgeon General

**CHOOSING A HEALTHY EATING PATTERN** is vitally important, as diet directly influences health.

Obesity causes at least 300,000 deaths a year, while the combination of excess weight and lack of physical activity are responsible for more than 400,000 deaths a year. The problem isn't limited to the United States—it affects both rich and poor countries around the world.

Americans need to understand that excess weight and obesity are literally killing us. Each small step makes a difference: A healthy diet (combined with regular exercise and not smoking) can help prevent not only excess weight and obesity but also heart disease, diabetes, some cancers, and other chronic diseases. A healthy diet can also help control many health conditions. The problem for most people is how to understand what constitutes healthy eating. It's a daunting task, even for people who consider themselves nutrition savvy.

Dozens of new diet books are published each year, but few are based on solid scientific principles. An independent team, led by Dr. Walter C. Willett, chairman of the Department of Nutrition at the Harvard School of Public Health, has been working to clear up the confusion by defining what constitutes a healthy diet according to the best scientific evidence available. Their work complements research from a range of leaders in the field of nutrition from all over the world. In many cases, this work is running ahead of government policy-makers' ability to translate it into accurate, up-to-date public health messages.

The Culinary Institute of America's first Worlds of Healthy Flavors Leadership Retreat was held in 2004 on our Greystone campus to address the needs of leaders in the food-service industry. We invited several internationally acclaimed chefs and cookbook authors to prepare meals and to showcase the healthful nature of their native kitchens. Aromatic, stimulating, and delicious beyond words, the lunches and dinners confirmed that the world's cuisines abound in healthful ideas: from India's spicy lemon broth with lentils to Mexico's green mole with vegetables to a Spanish salad of greens, figs, and gazpacho vinaigrette.

As food experts from Mexico, Greece, India, and Vietnam displayed the riches of their native table at the Worlds of Healthy Flavors gathering, one point crystallized: Americans still have a lot to discover. With the recipes and healthy cooking techniques in this book, and the drive to continue your study of how food and health are intertwined, the lessons of the world's most intriguing cuisines can translate into healthier menu options both in your restaurant and in your home.

# Introduction

**WHEN THE CIA FIRST APPROACHED** the idea of nutritional cooking, we set out to prepare a manual for our students to use in the two courses we then offered in nutrition and nutritional cooking. That manual grew to become the 500-plus-page volume we are now proud to present in its Fourth Edition. Over the years and through each edition of this book, more information has come to the fore about healthy cooking. And with each passing year, our guests have continued to call for great-tasting food that is good for you in every sense of the word.

Our knowledge of nutrition continues to grow. Every day, it seems, the news features a newly released study on how the foods we eat affect our health. In addition, we have learned that the way foods are grown and distributed can also have a significant impact on our health and the health of our planet's farmland and overall food supply.

People have become increasingly aware that, as part of a lifestyle that also includes such elements as proper amounts of rest and exercise, good nutrition is important in maintaining physical health and overall well-being. Consequently, the demand for products and services designed to help support the quest for good health has increased dramatically.

Chefs, restaurateurs, and other food-service professionals are rising to the challenge of offering foods that appeal to patrons' desire for a healthy lifestyle. We now know that a healthy diet is based on eating a wide variety of high-quality foods that provide balanced nutrition. Chefs are in the vanguard of efforts to revitalize regional food systems and are urging a conscious evaluation of how we choose to buy, cook, and serve foods.

Chapter 1 covers some of the basics of nutrition by defining the various roles that foods play in sustaining life. This material is not intended as a replacement for more in-depth study of nutrition. We introduce a number of important concepts, including the importance of calories, and discuss dietary guidelines, healthy diets, and food guide pyramids. We know that a healthy, balanced diet plays a role in maintaining optimum health, along with regular physical activity. When we examine the diets and dining habits of cultures whose members exhibit low levels of heart disease, obesity, and other diet-related health concerns, we can begin to identify the foundations of healthy cooking.

Based on the combined knowledge of dozens of professional chefs, dietitians, and food-service professionals, and on the lessons of the pyramids, The Culinary Institute of America has revised its own set of principles for healthy cooking. These guidelines are an invitation to think about the foods you select, the cooking techniques you use, and the types of beverages you offer. They are not ironclad rules. Instead, they should be regarded as ways to explore the possibilities of flavor and healthy cooking.



To begin cooking for good health, we have to revise the way we think of meals and shift our focus to those foods that once were relegated to the side. The major challenge in such an undertaking is the preservation of flavor.

Our recipes offer practical solutions for putting healthy cooking into effect. The recipes in this book are written to help you learn, or relearn, how portion sizes and ingredient measurements look when using healthy cooking guidelines.

At first, it may seem cumbersome and time-consuming to measure out certain ingredients, but the extra time will pay off. As you grow familiar with the correct measures and portion sizes, using them consistently becomes easier. You will probably discover that it is always best to weigh or measure ingredients that could add extra calories, cholesterol, sodium, and fats not intended to be part of the dish.

The analysis provided at the end of each recipe is based on the exact measurements supplied in the ingredient list. Adding a few more teaspoons of butter, an extra ounce of heavy cream, or another slice of bacon is likely to have a negative effect on the dish's nutritional profile.

Not every component needs the same careful monitoring, though. Adding more basil to the pasta, for example, or increasing the amount of vegetable garnish in a soup will probably not make much difference, nutritionally speaking, but the flavor of the dish might benefit dramatically.

Many factors affect the nutrients in each ingredient (season, ripeness, soil conditions, etc.), and many factors affect the nutrients in the cooking process (how long, what temperature, storage conditions, etc.). The nutritional analysis we have provided for each recipe is a reliable estimation of the nutrients that are in that dish. The nutrients selected for analysis are based on the current food label and include calories, total fat, saturated fat, cholesterol, sodium, total carbohydrate, dietary fiber, sugars, and protein. To standardize the process and to ensure consistency in the nutritional analysis, the following standards were used:

Each analysis includes only the ingredients in the main ingredient list. Serving suggestions are not included in the analysis.

All ingredients were measured using the U.S. measurement system.

Nutrient values were rounded using the FDA food label standards.

When a range of ingredient measures is given, the smallest amount is used in the analysis.

When an ingredient, such as pepper, is listed as "as needed" or "optional," it is not included in the analysis.

When more than one ingredient is listed, such as "chicken or vegetable stock," the first ingredient is the one used in the analysis.

# 1

The benefits and importance of a healthy, balanced diet are more apparent than ever to the general public. Every chef must meet the general needs of their customer base. In order

# HEALTHY EATING PATTERNS

for chefs to provide selections that are both delicious and healthful, they need to understand and be able to apply the techniques and concepts involved in healthy cooking.



# WHAT IS A HEALTHY EATING PATTERN?

**THE ANSWER RARELY IS A SIMPLE ONE.** Our individual needs differ greatly for a variety of reasons, including age, gender, activity level, and health status. As more studies are conducted and the results are analyzed, the media continue to report about miracle weight-loss diets and wonder cures that don't necessarily lead to healthy eating patterns.

At its simplest, *diet* means the foods we normally eat and drink. The definition also encompasses the notion of foods that are prescribed to an individual for a specific reason. However, diets are popularly thought of as restricting the foods someone might normally eat. Most popular weight-loss diets fall into this category. These diets are often described with an emphasis on the “delicious and bountiful” aspects of the foods the dieter is permitted to counteract the perception that diets are mainly about deprivation. Diets prescribed by a health-care professional might also include a number of restrictions, eliminating or curtailing some foods, reducing portions, or even changing someone's typical eating pattern. Some of these restrictions help control the number of calories consumed, while others are meant to prevent disagreeable, or even harmful, consequences.

A “poor” diet once meant a diet that did not supply sufficient basic nutrients to prevent an individual from starving to death or developing deficiency diseases. There are still many places in the world where these issues are of vital concern. However, in most industrialized nations the reason a diet is described as “poor” has more to do with excess: too many calories, too much sodium, or too much fat. Ironically, an excess in one area can also lead to a deficiency in another area; too many calories in the form of sugary or fatty foods may indicate a corresponding lack of fiber or vitamins.

As an individual, you may want to know about diets in order to keep yourself healthy or to lose weight. As a professional, your motivation for knowing more about a healthy diet might be to develop entire menus

for clients with specific dietary needs—for instance, clients with diabetes or hypertension, schoolchildren, or the residents of an assisted-living facility. If your clientele is composed of a group that has a variety of needs or desires when it comes to eating, your challenge is developing menu items that are good options for those with a personal concern in healthier foods.

The history of medical and culinary science is littered with dietary plans, special foods, and products meant to control weight, build muscle, or treat illnesses. Graham crackers, for instance, were a health food when they first arrived on the market. Today, they are simply sweet crackers, not the cornerstone of a dietary program. Part of the issue is that today's media climate is more frenetic. There are genuine alarms about the dangers of foods that should be taken seriously, like mercury in seafood or trans fats in snack foods. However, many times the evidence for “alarming” issues is overturned almost before the ink is dry on the newspaper in which they are reported.

Today, the public is becoming increasingly aware that schoolchildren are more and more at risk for some very “adult” diseases like diabetes and hypertension. Also, baby boomers are nearly or well into their retirements and are waking up to the fact that staying healthy means learning new dietary behaviors from professionals. Chefs are not necessarily going to have all the answers about what foods are best to eat. But we believe firmly that people need to learn as much as they can about nutrition so that they can apply that knowledge in the kitchen—not as a laboratory exercise, but in the pursuit of foods and flavors that feed a hunger for satisfying, sustaining, and healthful dishes.

Chefs have a responsibility to offer foods that their patrons will want to eat that are also good for them. No one has all the answers about which foods are best, but in order to do a good job, today's chefs are honor bound to learn about the basics of food and nutrition so they can apply that knowledge as part of the techniques of healthy cooking.

In this chapter, we will examine basic nutrition concepts. If you are interested in learning more about nutrition, please review the Recommended Resources and Readings (page 515).

## NUTRITION 101

**WE EAT BECAUSE WE MUST.** Our bodies need food in order to function properly. Human beings eat for more reasons than actual hunger, however. Very often, we eat simply because we want to eat. Our love affair with food is the basis of the culinary profession. Chefs have always been in the business of preparing and presenting foods that do much more than fill an empty belly. It is precisely because chefs have the job of enticing us to the table that they need to incorporate lessons from nutrition about food and health in the dishes they prepare.

At the same time that nearly every industrialized country is reporting a growing number of overweight and obese citizens, we are also growing increasingly aware of the relationship between the foods we eat and the consequences to our health. Nutrition is the study of how foods affect us. Simply eating “enough” is not sufficient to ensure that a diet is healthy. It is vital that we eat enough of the right foods.

The appropriate foods are those that supply us with a full array of all the nutrients we need in order to be properly nourished. In 1900, Escoffier used to talk about the “nutritive” aspects of a dish. However, at that time we were just beginning to identify the elements in foods necessary to maintain or improve our health. Because nutrition is a dynamic science, our knowledge of it changes as studies unveil new and sometimes contradictory findings. Behind the controversies and inconsistencies there remain some basic principles. We know, for instance, that getting the “right” foods generally means eating a variety of foods; no single food contains enough of all the important nutrients our bodies need. This section is a brief overview of those nutrients, as well as some basic concepts in nutrition: calories, protein, fat, carbohydrates, vitamins, and minerals.

## CALORIES COUNT

**FOODS PROVIDE OUR BODIES WITH ENERGY.** We use this energy for physical activity as well as for basic functions like respiration, digestion, circulation, and temperature regulation. The energy used for these involuntary bodily functions is known as resting energy expenditure. Energy from food is measured in kilocalories, or the amount of energy or heat required to raise the temperature of 1 kilogram of water by 1 degree Celsius. The term *calorie* is often substituted for kilocalorie.

Calories affect body weight directly: If we consume more calories than we burn, our bodies will convert the extra calories (energy) to fat and store it throughout the body. If we burn more calories than we consume, our bodies will draw on stored energy, or fat, to perform the basic functions and to fuel physical activities.

### SOURCES OF CALORIES

Calories come from four sources—carbohydrates, protein, fat, and alcohol. The majority of calories should come from carbohydrates, protein, and fat. (Alcohol does not provide any nutrients and is therefore considered nonnutritive.) Generally, nutrition experts recommend that most people get 50 to 55 percent of their total calories from carbohydrates, 12 to 15 percent from protein, and no more than 35 percent from fat, with an emphasis on limiting saturated fat to no more than 10 percent of total calories. Similarly, the United States Department of Agriculture’s Dietary Guidelines recommend ranges of 45 to 65 percent of calories from carbohydrates, and 20 to 35 percent of calories from fat, with the remaining 20 to 35 percent coming from protein. This allows for flexibility based on individual or cultural preferences, and for some health conditions.

## COUNTING CALORIES

Not all sources of calories are created equal. Fat supplies more than two times the calories per gram that carbohydrates and protein do, so fats and foods that are high in fat are said to be calorie dense. But these foods may also be dense in nutrients. Alcohol also supplies significantly more calories per gram than carbohydrates and protein.

CARBOHYDRATES: 4 calories per gram

PROTEIN: 4 calories per gram

FAT: 9 calories per gram

ALCOHOL: 7 calories per gram

(Note: There are 28 grams in an ounce.)

## FACTORS THAT INFLUENCE CALORIC NEEDS

Throughout this book, nutrition needs are discussed in the context of a 2,000-calorie day. This amount was chosen because it is the basis for the Nutrition Facts label that appears on all packaged food as mandated by federal law, and because it represents the average caloric needs for males and females between the ages of two and sixty. The actual number of calories an individual requires depends on a number of factors:

**WEIGHT:** In the same way that heavier vehicles use more fuel than lighter ones, heavier people require more calories than lighter individuals to maintain their weight.

## ESTIMATED DAILY CALORIE NEEDS CALORIE RANGE

| AGE AND GENDER      | LEVEL AGE (YEARS) | PHYSICAL ACTIVITY |                   |              |
|---------------------|-------------------|-------------------|-------------------|--------------|
|                     |                   | SEDENTARY         | MODERATELY ACTIVE | ACTIVE       |
| VERY YOUNG CHILDREN | 2-3               | 1,000-1,200c      | 1,000-1,400c      | 1,000-1,400c |
| FEMALES             | 4-8               | 1,200-1,400       | 1,400-1,600       | 1,400-1,800  |
|                     | 9-13              | 1,400-1,600       | 1,600-2,000       | 1,800-2,200  |
|                     | 14-18             | 1,800             | 2,000             | 2,400        |
|                     | 31-50             | 1,800             | 2,000             | 2,200        |
|                     | 51+               | 1,600             | 1,800             | 2,000-2,200  |
| MALES               | 4-8               | 1,200-1,400       | 1,400-1,600       | 1,600-2,000  |
|                     | 9-13              | 1,600-2,000       | 1,800-2,200       | 2,000-2,600  |
|                     | 14-18             | 2,000-2,400       | 2,400-2,800       | 2,800-3,200  |
|                     | 19-30             | 2,400-2,600       | 2,600-2,800       | 3,000        |
|                     | 31-50             | 2,200-2,400       | 2,400-2,600       | 2,800-3,000  |
|                     | 51+               | 2,000-2,200       | 2,200-2,400       | 2,400-2,800  |

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*U.S. Department of Agriculture Center for Nutrition Policy and Promotion*

**AGE AND LIFE CYCLE:** People who are growing rapidly, especially infants and adolescents, as well as pregnant and nursing women, have greater caloric needs. As we age, our metabolism often slows down and we require fewer calories.

**ACTIVITY LEVEL:** Inactive people require fewer calories than people who move frequently. Physically demanding jobs, strenuous exercise, and even fidgeting translate into more calories expended.

**GENDER:** Men typically have leaner body mass or more muscle mass than women, and thus have higher basal metabolic rates than women do because muscle burns more calories than fat.

## ESSENTIAL NUTRIENTS

**WHEN NUTRITION SCIENTISTS** use the word *essential*, they don't just mean that a nutrient is important; an essential nutrient is one that the body does not manufacture. Cholesterol, for example, performs several important functions in the body and is critical for good health. However, the human body manufactures all the cholesterol it needs, so cholesterol is not an essential nutrient.

Carbohydrates, proteins, fats, vitamins, minerals, and water are all essential nutrients. The first three are considered nutritive—that is, they supply calories. The last three are nonnutritive because they are calorie-free.

### CARBOHYDRATES

Carbohydrates are the body's preferred source of energy. They fuel physical activity and basal metabolic functions and help burn fat efficiently. As carbohydrates are digested, they are broken down into sugars that the body can absorb, and use, easily. Carbohydrates provide energy for the nervous system and red blood cells, and should be 45 to 65 percent of the daily caloric intake. If carbohydrates are not

consumed in sufficient quantities, the body is forced to inefficiently use protein as fuel.

CARBOHYDRATES are the main source of glucose

GLUCOSE is the body's primary energy source

GLUCOSE is the only energy source for the brain and red blood cells

EXCESS CARBOHYDRATES are stored for future energy

EXCESS CARBOHYDRATES are stored as fat

### TYPES OF CARBOHYDRATES

#### SIMPLE CARBOHYDRATES (SUGARS)

Contain calories but few nutrients

Contain "empty" calories

Simple carbohydrates, also known as *simple sugars*, contain only one or two types of sugar molecules and are called monosaccharides or disaccharides. Easy to digest, simple carbohydrates are found in fruit, fruit juices, dairy products, and sweets.

Simple carbohydrates are often considered empty calories. Fruits contain nutrients like vitamins and fiber, and for this reason are more nutritionally dense than honey or table sugar. Sugar does not directly cause diabetes, hypoglycemia, or hyperactivity, but it can worsen an existing condition.

## Carbohydrate Facts

**1 gram of carbohydrate = 4 calories**

**Carbohydrates are found in milk, fruit, vegetables, grains, and legumes**

**Not all carbohydrates contain fiber (milk is an example of this)**

### TYPES OF SIMPLE SUGARS

Glucose  
Fructose  
Lactose  
Maltose  
Sucrose

### COMPLEX CARBOHYDRATES

Are a great source of energy, vitamins, and minerals

Generally contain some fiber

Not all complex carbohydrates are whole grains

Are found in cereals, oatmeal, grains, vegetables, nuts, legumes, and breads

Complex carbohydrates contain chains of sugars and are called polysaccharides. They are more difficult to digest because they must be broken down into simple sugars first. Because complex carbohydrates take longer to digest than simple carbohydrates, they provide a sense of fullness and satiety. Whole grains, legumes, nuts, and vegetables contain complex carbohydrates. It is important to note that all carbohydrates influence blood sugar levels.

During digestion, carbohydrates are broken down into glucose, which is absorbed by the body and released into the blood. When blood sugar levels increase, the pancreas releases insulin, a hormone that makes it possible for glucose to enter the cells and be used for energy.

### WHOLE GRAINS

For thousands of years, humans ate grains straight from the plant. Limited processing, if any, meant that these complex carbohydrates were rich in fiber, minerals, vitamins, and phytochemicals. Advances in grinding technology made these grains easier to chew, digest, cook, and store, but also made them less nutritionally dense.

### WHOLE GRAINS

Comprise the entire grain, seed, or kernel

The kernel has three parts:

BRAN, which is the most fiber-rich portion of the kernel

GERM, which contains unsaturated fats, vitamins, and minerals

ENDOSPERM, which contains starch

During the milling process, the kernel is crushed or cracked

After processing, if the grain retains its original proportions of bran, germ, and endosperm, it can be considered a whole grain

### REFINED GRAINS

A portion of the germ and or bran has been removed

Since the refining process strips away nutrients, they are added back through an enrichment process

### THE GLYCEMIC INDEX

The Glycemic Index, or GI, is a tool some scientists use to measure the effects of carbohydrates on blood sugar levels. Carbohydrates in some foods are digested rapidly, and they can cause blood sugar levels to rise and then drop rapidly. The GI measures how quickly 50 grams of carbohydrates from a particular food—not 50 grams of the food itself—raise blood sugar levels compared to 50 grams of glucose. A food's GI is expressed as a percentage, with pure glucose at 100 percent.

There are a few caveats with the GI that you should keep in mind. The first is that a GI value does not address the serving sizes of foods. Consider carrots and bagels. Carrots have a GI of 71, and bagels have a GI of 72. The logical conclusion is that eating carrots will raise your blood sugar as much as eating a bagel will. But remember that the GI is based on the amount of carbohydrate in a food. One 4- to 5-ounce bagel contains about 70 grams of carbohydrates, but



1 cup of cooked carrots supplies only 13 grams. To eat 50 grams of carbohydrates from carrots, you'd have to eat about 1½ pounds of them. A serving of carrots, in fact, has a much lower impact on blood sugar levels than does a bagel.

In addition, eating foods in combination, whether that's butter or cream cheese on a bagel, or carrots in a stew or as a side dish, can affect the rate at which the sugars from these foods enter the bloodstream.

### NUTRITIONAL ANALYSIS OF SELECTED GRAINS, LEGUMES, VEGETABLES, AND STARCHES

|                      | AMOUNT* | CALORIES | PROTEIN (GRAMS) | FAT (GRAMS) | CARBOHYDRATES (GRAMS) |
|----------------------|---------|----------|-----------------|-------------|-----------------------|
| Amaranth, dry        | 1 cup   | 716      | 26.17           | 13.54       | 125.93                |
| Barley (pearl), dry  | 1 cup   | 704      | 19.82           | 2.32        | 155.44                |
| Buckwheat, dry       | 1 cup   | 583      | 22.5            | 5.78        | 121.5                 |
| Buckwheat flour      | 1 cup   | 402      | 15.14           | 3.72        | 84.7                  |
| Bulgur wheat, dry    | 1 cup   | 479      | 17.2            | 1.86        | 106.2                 |
| Chickpeas, cooked    | 1 cup   | 270      | 14              | 4           | 46                    |
| Corn                 | 1 cup   | 178      | 5.4             | 2.2         | 41.2                  |
| Cornmeal             | 1 cup   | 441      | 9.9             | 4.38        | 93.8                  |
| Couscous, dry        | 1 cup   | 650      | 22              | 1.1         | 133.9                 |
| Kidney beans, cooked | 1 cup   | 218      | 16              | 0           | 40                    |
| Lentils, dry         | 1 cup   | 678      | 49.5            | 2           | 115.2                 |
| Millet, dry          | 1 cup   | 756      | 22              | 8.44        | 145.7                 |
| Peas, cooked         | 1 cup   | 110      | 8               | 0.5         | 19                    |
| Quinoa, dry          | 1 cup   | 626      | 24              | 10.3        | 109.01                |
| Rice (brown), dry    | 1 cup   | 885      | 14.68           | 5.4         | 142                   |
| Rice (white), dry    | 1 cup   | 675      | 13              | 1.22        | 147                   |
| Rolled oats, dry     | 1 cup   | 160      | 6               | 3           | 28                    |
| Spelt, dry           | 1 cup   | 588      | 25.35           | 4.2         | 122.13                |
| Teff, dry            | 1 cup   | 708      | 25.6            | 4.59        | 141.14                |
| Triticale, dry       | 1 cup   | 645      | 25              | 4           | 138.48                |
| Whole wheat flour    | 1 cup   | 408      | 15.8            | 3           | 86.36                 |
| Wheat germ           | 1 cup   | 414      | 26.62           | 11.17       | 59.6                  |
| Wild rice, dry       | 1 cup   | 357      | 23.56           | 1.72        | 119.8                 |

\*All figures based on grains and legumes cooked in water.

Similar foods may have very different GIs. An oatmeal cookie may have a much lower GI than a chocolate chip cookie. That's because whole grains like oatmeal are digested more slowly than refined grains like all-purpose flour, in part because fiber can slow the rate at which sugar is absorbed by the bloodstream.

Determining GI is a labor-intensive process. To measure a food's effect on blood sugar, a person first must eat the food, and then blood must be drawn and analyzed. Blood sugar levels must be noted before and after the food is consumed, and because individuals respond differently to foods, these tests must be conducted on several people before a GI can

## Blood Sugar, Insulin, and Diabetes: What's the Connection?

**DURING DIGESTION**, carbohydrates are broken down into glucose, which goes into the bloodstream to become blood sugar. In a healthy person, insulin—a hormone produced by the pancreas—regulates blood sugar levels and helps carry blood sugar into cells for energy.

In a person with diabetes, insulin either is produced in insufficient amounts or does not perform its functions. Rather than passing from the blood into the body's cells, glucose builds up in the bloodstream. Excess blood sugar goes into the kidneys to be excreted, causing more work for the kidneys. Over time, high blood sugar levels can cause damage to the kidneys, eyes, circulatory system, and nervous system.

Type I diabetes is an autoimmune disease (like lupus or rheumatoid arthritis) that occurs when the cells in the pancreas responsible for

producing insulin have been destroyed by the body's immune system. It accounts for only 5 to 10 percent of all diabetes cases. Type II diabetes occurs when the body stops producing as much insulin or becomes resistant to it; it is most often diagnosed in people who are overweight, physically inactive, and older. There is increasing concern among the health-care and public health community about the increasing rates of Type II diabetes among children in the U.S. It is estimated that 1 out of every 3 American children born after the year 2000 will develop Type II diabetes unless rates of childhood obesity start to decrease.

There is no cure for diabetes, but it can be managed. Type I diabetes requires daily insulin, as well as a careful management of diet and physical activity and stress. Type II diabetes can often be controlled through diet, physical activity, and weight management alone, but sometimes oral medication or insulin is necessary.

For information about dietary recommendations for people with diabetes, see page 29.

# Is Juice Bad for You?

**THERE'S CURRENTLY A DEBATE RAGING** over juice. One side says it's a healthful beverage—much better for you than sugary sodas. The other side says it can contribute to weight gain and tooth decay every bit as much as soda does.

The truth is that both sides are right. Compared to sodas, “elixirs,” and sport drinks, juices are a fairly nutritious choice. While all contain sugars in comparable amounts, no-sugar-added juices get their sweetness from naturally occurring fruit sugar

called fructose, whereas most sugar-sweetened drinks get their sweetness from high-fructose corn syrup. Both types of sugar are metabolized in the same way. Juice, however, does supply some vitamins and minerals, as well as antioxidants and phytochemicals, which are found in the fruits from which they are made.

But if you compare an 8-ounce glass of fruit juice to the medium-size fruit from which it's made, it doesn't look so nutritious:

| FOOD           | CALORIES | CARBOHYDRATES (GRAMS) | SUGAR (GRAMS) | FIBER (GRAMS) |
|----------------|----------|-----------------------|---------------|---------------|
| Orange juice   | 120      | 28                    | 22            | 0.5           |
| Orange         | 60       | 15                    | 12            | 3             |
| Apple juice    | 120      | 28                    | 24            | 0.2           |
| Apple (w/skin) | 100      | 25                    | 19            | 4             |

**Bottom line:** Juice contains nutrients that other beverages don't, but it lacks the fiber that fruit contains.

be determined. At present, only a limited number of foods have been tested.

To review the GI of various foods, visit [www.glycemicindex.com](http://www.glycemicindex.com).

## FIBER

Fiber is a form of carbohydrate that is indigestible and nonnutritive. It is a mixture of several compounds, and the proportion of these compounds in a food varies. Fiber is divided into two basic types: soluble and insoluble.

Soluble fiber dissolves in water. Pectins and gums are components of soluble fiber. Soluble fiber

regulates the body's use of sugars by slowing their digestion and release into the bloodstream. Soluble fiber binds with cholesterol-rich bile acids in the intestine, which may help to reduce serum cholesterol levels. Beans, fruits, oats, and barley are good sources of soluble fiber.

Insoluble fiber does not dissolve in water. Instead, it absorbs water and provides bulk in the diet. Cellulose, hemicellulose, and lignin are components of insoluble fiber. Insoluble fiber helps clear out the intestinal tract and may reduce the risk of certain types of cancer and the risk of Type II diabetes. Fruits and vegetables, wheat bran, whole-grain flours, and popcorn are good sources of insoluble fiber.