All About Carbohydrates and Health
After completion of this module, the registered dietitian or dietetic technician, registered will be able to:

• Describe the forms, digestion, and metabolism of carbohydrates and fiber.
• Identify the health effects of various carbohydrates, fiber, and whole grain foods.
• Explain glycemic index and glycemic load.
• Identify dietary carbohydrate recommendations.
• Utilize consumer research to develop effective communications about carbohydrates.
Forms of Carbohydrates
Technically, carbohydrates are any compound containing carbon, hydrogen, and oxygen, with twice as many hydrogens as oxygens. They are the main energy source for the body and the only direct energy source for the brain. Carbohydrates can be found in varying amounts in fruits, vegetables, grain foods, dairy products, and as ingredients in many foods prepared at home, eaten at a restaurant, or purchased at grocery stores. Carbohydrates include sugars, starches, and fiber.
There are two main types of sugars, often referred to as “simple carbohydrates”:
- Monosaccharides
- Disaccharides
All monosaccharides have 6 carbons.

**Glucose:** Rarely occurs as a monosaccharide in food, it is bonded to other monosaccharides or to other glucose molecules. Glucose supplies energy to cells, the body regulates blood glucose levels to ensure a constant fuel source for vital body functions.

**Fructose:** Fructose occurs naturally in fruits and vegetables and tastes sweetest of all sugars (see disaccharides on next slide).

**Galactose:** Galactose rarely occurs as a monosaccharide in food. Rather, it is usually bonded to glucose to form lactose.
Two monosaccharides joined together are a disaccharide. The most common include:

- Sucrose, or table sugar, composed of glucose and fructose.
- Lactose, or milk sugar, composed of glucose and galactose.
- Maltose, in molasses and malt barley, composed of two glucose molecules.
Table sugar is made up of equal amounts of the simple sugars glucose and fructose. In table sugar the glucose and fructose units are joined together by chemical bonds.

Starches and fiber are made up of many simple sugars joined together chemically. Any carbohydrate that is made up of more than two simple sugars is referred to as a polysaccharide.
Fructose: A simple sugar found in fruits, honey, and root vegetables. It is also a caloric sweetener added to foods and beverages in the form of crystalline fructose (made from corn starch) and it makes up about half the sugar in sucrose or high fructose corn syrup (see below). Fructose does not elicit a glycemic response so it is sometimes used as a sweetener for foods intended for people with diabetes, although the American Diabetes Association does not recommend it due to concerns that fructose may adversely affect plasma lipids.

Glucose: The main source of energy for the body and the sugar produced when you digest carbohydrates. Glucose is sometimes referred to as dextrose. Starch is comprised of long chains of glucose. Glucose makes up about half of the sugar in sucrose and in high fructose corn syrup (see below).

Lactose: The natural sugar found in milk, it is composed of one galactose unit and one glucose unit; sometimes called milk sugar.

Maltose: A disaccharide composed of two glucose units. It is found in molasses and is also used for fermentation.

Sucrose: Commonly referred to as table sugar, it is composed of one glucose unit and one fructose unit bonded together.

Corn Syrup: Made from corn and composed mainly of glucose.

High-Fructose Corn Syrup: A mixture of glucose and fructose produced from corn. The most common form of high fructose corn syrup (HFCS) has 55 percent fructose and 45 percent glucose.
Added sugars are added to foods in manufacturing, cooking, or at the table. Examples of added sugars include sucrose, corn syrup, high-fructose corn syrup, honey, and molasses. Naturally occurring sugars are inherent in certain foods and beverages, such as fructose in fruit and lactose in milk. During the process of breaking down carbohydrates into glucose, the body does not distinguish between sugars that occur naturally in foods and sugars that are added to foods because they are chemically the same.
Functions of Sugar in Food

- Sweeten
- Tenderize in baking
- Caramelize under heat
- Enhance growth of yeast in baked goods
- Control gelling process when making fruit jams, jellies, and preserves
- Preserve/ Prevent spoilage
- Add to smoothness of ice creams and frozen desserts

Sugar contributes to structure and texture, sweetening and flavor enhancement, controlling crystallization, providing food for yeast in baked goods, and preventing spoilage.
Polysaccharides are composed of many (poly) linked glucose molecules. In animals, the polysaccharide glycogen is stored in muscle. The polysaccharides stored in plants are starches. Dietary starches are found in vegetables, cooked dry beans and peas, grains, nuts, seeds.
Oligosaccharides are a class of carbohydrate that have from 3 to 10 bonded sugar molecules. They are the breakdown products of polysaccharides in the gut, but also occur naturally in foods such as legumes (e.g., raffinose, stachyose, verbascose), and are added as dietary ingredients (e.g., inulin).
Dietary fiber provides structure in plant cell walls. It is found in all types of plant foods, including fruits, vegetables, legumes, and whole grains. Fibers also consist of many bonded sugar units bonded together, but cannot be enzymatically digested. In the large intestine, some fiber binds water, increasing stool weight. Some fiber may be fermented by colonic microflora, which is increasingly understood to have independent health benefits. Fiber fermentation also produces short chain fatty acids which are absorbed and used for energy in the body, although they provide less energy than the 4 calories derived from each gram of digestible carbohydrate.
Dietary fibers include the following:

- **Cellulose** gives the cell walls of nearly all plants their strength and rigidity. For example, it forms the woody fibers that support tall trees. In addition to its natural occurrence in plant foods, it is also extracted from plants and added as a food ingredient.

- **Hemicellulose** is mixed with cellulose in plant cell walls. The outer layer of cereal grains and whole grain cereals is made of hemicellulose.

- **Pectins** are gel-forming polysaccharides found in all plants, especially fruits. They give body and shape to fruits. When fruits become overripe, pectins are broken down into monosaccharides and the fruit becomes mushy. When fruits are mixed with sugar and acid, the fruit pectin forms a gel that adds firmness to jellies, jams, sauces, and salad dressings.

- **Gums and Mucilages** are thick, gel-forming fibers that help hold plant cells together. They are used to thicken, stabilize, or add texture to foods like salad dressings, puddings, pie fillings, candies, and sauces (e.g., guar gum).
Regardless of how they are produced, whole grains or foods made from whole grains contain the essential parts and naturally occurring nutrients of the entire grain seed. A whole-grain food product must deliver approximately the same proportions of bran, germ, and endosperm, and the same balance of nutrients, as the original grain seed. In addition to providing fiber, whole-grain foods provide vitamins, minerals, and literally hundreds of phytonutrients, including phytoestrogens, antioxidants, polyphenols, and beneficial enzyme inhibitors. Phytonutrients are substances in plant-based foods with physiologically active components that have functional health benefits.

The fiber content of different whole-grain foods can vary considerably, between 0.5 and 4 grams of fiber per serving, depending on the food category and serving size. Grain foods with more than 4 grams of fiber usually contain an isolated fiber source, such as bran. The presence of at least half of the grains in a product as “whole grain,” rather than the fiber content, defines the food product as whole grain.
Whole grains may be whole, cracked, split, flaked, or ground. They may be consumed as a single food, or as ingredients in foods. Examples include: whole wheat, whole oats/oatmeal, whole-kernel corn, popcorn, whole rye, whole barley, brown rice, wild rice, buckwheat, triticale, bulgur (cracked wheat), millet, quinoa, and sorghum. Other less common whole grains include amaranth, emmer, farro, grano (lightly pearled wheat), spelt, and wheat berries.
Functions of Carbohydrates
Carbohydrate digestion starts in the **mouth** where salivary amylase breaks starch into polysaccharides and maltose. In the **stomach**, acid stops the action of amylase and halts digestion. Soluble dietary fiber provides a feeling of fullness in the stomach and tends to delay digestive activity by slowing stomach emptying into the intestine.

Most carbohydrate digestion takes place in the **small intestine**. Once stomach contents reach the small intestine, the pancreas secretes pancreatic amylase. Pancreatic amylase breaks down starch into maltose. Digestive enzymes in the intestinal brush border break down maltose into two glucose molecules, sucrase splits sucrose into glucose and fructose, and lactase splits lactose into glucose and galactose. These monosaccharides are then absorbed. The body does not distinguish between sugars that are added to foods and sugars that occur naturally in foods, since they are chemically the same. Some starches are resistant to digestive enzymes, however, and are commonly referred to as "resistant starches."

Fiber is made of bonded sugars, but human digestive enzymes cannot break the bonds. Therefore, dietary fiber is not digested in the gastrointestinal (GI) tract. It may be fermented in the gut, producing a small source of energy as short chain fatty acids. Or, fibers may pass through the large intestine intact, removing waste from the body.
Most carbohydrates are broken down into the monosaccharide glucose. Glucose is the primary fuel utilized by the brain and working muscles. Excess dietary glucose can be stored in the liver and muscle cells as glycogen.
To protect the brain from a potential fuel shortage, the body tries to maintain a constant glucose level in the blood. When the level of glucose in the blood starts to drop, glycogen can be converted to glucose to maintain steady blood glucose levels. Several hormones, including insulin, work rapidly to regulate the flow of glucose between blood and cells to meet energy needs and keep blood glucose levels steady.
Research demonstrates that the health-promoting benefits of whole grains are attributed to more than just fiber. These health advantages are largely associated with the “package” of nutrients in whole grains.

**Heart disease:** Evidence clearly points to an association between consuming whole grains as part of a low-fat diet and lower risk of heart disease. Low-fat diets rich in whole-grains tend to decrease LDL cholesterol and triglycerides.

**Diabetes:** Increased intake of whole grains and fiber in combination with a low-fat diet has been associated with managing risk factors accompanying diabetes. Whole grains appear to improve glucose responses and decrease insulin sensitivity.

**Cancer:** Whole-grain foods may be associated with reduced risk of certain cancers by a variety of mechanisms. Fiber and certain starches found in whole grains ferment in the colon to help improve GI health. Whole grains also contain antioxidants that may help protect against oxidative damage. Some scientists believe that other substances in whole grains may affect overall hormone levels and possibly lower the risk of hormone-related cancers like breast cancer.

**Weight management:** Studies show that people who eat whole grains in place of fattier foods tend to weigh less and typically gain less weight over time than those who do not. In addition, whole grains may help to satisfy hunger for longer periods, resulting in people eating less.
The most well-known health effect of fiber is laxation. Additionally, some fibers may help to maintain healthy blood lipid concentrations, lower the post-prandial blood glucose response, and enhance production of beneficial bacteria in the gut microbiome.
Sugars and Health
Glycemic index (GI) is a research tool that measures how carbohydrate-containing foods affect blood glucose levels.

It is calculated by having one or more people eat a specific amount of a single food [usually the amount of food containing 50 grams of digestible carbohydrates (total carbohydrate minus fiber)] and then measuring the change in blood sugar levels compared with the levels achieved after they have eaten a control food containing the same amount of digestible carbohydrates, such as white bread or glucose.

The average change in blood sugar levels over a set period of time relative to the levels after consumption of the control food, usually white bread or glucose, is the food’s glycemic index.
Glycemic load (GL) is a related concept that considers both the GI and the amount of carbohydrate in a typical serving of food, providing a somewhat more accurate picture of a food’s effect on blood sugar. It does not account for other foods eaten at a meal.

Glycemic load (GL) is a related concept that considers both the GI and the amount of carbohydrate in a typical serving of food, giving a somewhat more accurate picture of a food’s effect on blood sugar.

For example, carrots have a relatively high GI because the carbohydrates in carrots are mostly sugars. But carrots contain a low amount of carbohydrate per serving, compared to other high GI foods such as bread and potatoes.

To calculate glycemic load, you multiply the grams of carbohydrate in a serving of food by that food’s glycemic index. Carrots, which have a glycemic index of 71, have 8 grams of carbohydrates per serving and are assigned a glycemic load of 6 (8 x 0.71).
On the surface glycemic index (GI) and glycemic load (GL) sound like straightforward concepts for enabling meal and diet planning, but experts say it’s not that simple.

The GI value of a food varies among related cultivars or agricultural varieties of the same food. It also depends on the ripeness of the foods, and how it is processed then cooked. Also, GI is determined using standard test portions of foods, which are not the usual portion sizes that people consume.

Many variables affect GI calculations, including the fact that the GI of a food depends on whether it is eaten alone or consumed with another food. People eat meals and diets, not single foods. A high GI food combined with a low GI food produces a moderate glycemic response. Think of spreading some strawberry jam on whole wheat bread with peanut butter. The protein, fat, and fiber in the sandwich temper the relatively high GI of the jam.

What about using glycemic load instead of GI? Again, it’s not that simple, since the GL calculation begins with a food’s glycemic index and thus includes all the inherent uncertainties that pertain to GI.
The prevailing wisdom for the practical application of glycemic load and/or glycemic index is summarized in this statement from the 2010 Dietary Guidelines Advisory Committee.

“When selecting carbohydrate foods, there is no need for concern with their glycemic index or glycemic load. What is important to heed is their calories, caloric density, and fiber content.”

2010 Report of the Dietary Guidelines Advisory Committee
Sugars and Diabetes

- Dietary sugars no longer “off limits” for people with diabetes
- American Diabetes Association recommends
  - Monitor total carbohydrate intake
  - Individualize macronutrient ratios per metabolic goals and personal preferences
  - Limits on saturated fat, cholesterol, and trans fats, and inclusion of fatty fish to reduce risk of cardiovascular disease
  - No specific limit for intake of sugars

Diabetes is a metabolic disorder that occurs when the body cannot regulate blood glucose levels properly. Either the pancreas does not make enough insulin (type 1) or the body can not respond normally to the insulin that is made (type 2). Exact causes of diabetes continue to be investigated; both genetics and environmental factors play a role.

Dietary sugars are no longer consider totally “off limits” for people with diabetes. Current American Diabetes Association nutritional recommendations do not provide a specific limit for intake of sugars, except that total carbohydrate intake should be monitored, and macronutrient ratios should be customized to meet metabolic goals and personal preferences. On the other hand, recommendations for dietary fats target cardiovascular disease risk reduction, including limits on saturated fat (< 7% calories), cholesterol (< 200 mg), and trans fats (minimized), as well as the inclusion of two fatty fish meals a week.
Sugars and cooked starches are fermentable carbohydrates, which play a role in dental caries formation. The degree of dental risk from a specific carbohydrate-rich food is related to several factors. Most important are proper oral hygiene, use of topical fluorides, fluoridated toothpaste, and fluoridated water. A balanced diet in line with current dietary guidelines also enhances oral health.
Another term for sugar alcohols is polyols. They are a group of caloric sweeteners that are incompletely absorbed and metabolized by the body, and consequently contribute fewer calories than sugars. Some of these polyols are sweeter than sugar so you can use less to get equal sweetness and as a result consume fewer calories.

Due to their incomplete absorption, the polyol sweeteners may produce a lower glycemic response than glucose or sucrose and may be useful for people with diabetes. Sugar alcohol sweetened products may have fewer calories than comparable products sweetened with sucrose or corn syrup and hence could play a useful role in weight management.
It should be noted that overconsumption of sugar alcohols may produce abdominal discomfort in some people. Total daily consumption, as well as the amount consumed at one eating occasion should both be considered. Reducing intake or spreading intake out in smaller amounts throughout the day may each help to reduce or resolve GI disturbances or laxative effects.
High Fructose Corn Syrup (HFCS)

- Liquid sweetener
- Enzymatic conversion of corn starch into glucose and fructose
- 62% of HFCS is HFCS-55
  - 55% fructose and 45% glucose
  - Table sugar/sucrose has a 1:1 ratio
- Named in relation to corn syrup, which contains only glucose

In the late 1960s scientists developed an enzymatic process that transforms dextrose (glucose) from corn starch into a mixture of fructose and glucose. This sweetener, high fructose corn syrup (HFCS), is a liquid sweetener used in the manufacture of foods and beverages. The most commonly used form is HFCS-55, which contains 55% fructose and 45% glucose. In comparison, sucrose contains 50% fructose and 50% glucose. HFCS and sucrose have similar sweetness intensity.
HFCS is used in soft drinks, fruit drinks, sports drinks, baked goods, candies, jams, yogurts, condiments, canned and packaged foods, and other sweetened foods.
Fruit juices contain similar amounts of fructose and glucose as does HFCS. Sucrose is digested to fructose and glucose. Therefore, the use of HFCS is similar to drinking fruit juice or consuming table sugar.
Although the increased availability of HFCS appears dramatic, it must be noted that as the availability of HFCS has increased, the availability of table sugar has decreased at nearly the same rate. For example, per capita U.S. sugar consumption has declined from 72.5 pounds per year in 1970 to 45.2 pounds per year in 2005.

**HFCS and Obesity?**

- Hypothesized association with obesity due to increased availability since 1970s
- As a percentage of all caloric sweeteners (added sugars and sweeteners) in the U.S. food supply, use has increased from less than 0.5 percent in 1970 to 38 percent in 2009.
- During same time period, use of table sugar decreased by 60 percent.
Fructose does not directly stimulate pancreatic insulin production or require insulin for metabolism. It therefore does not influence blood glucose or insulin levels as efficiently as dietary glucose does. The blunting of blood glucose and insulin response hypothesized to reduce leptin sensitivity—may interfere with long-term regulation of food intake and body weight.

Fructose does not directly stimulate pancreatic insulin production or require insulin for metabolism. It therefore does not influence blood glucose or insulin levels as efficiently as dietary glucose does. The blunting of blood glucose and insulin response hypothesized to reduce leptin sensitivity—may interfere with long-term regulation of food intake and body weight. On the other hand, proponents of low-glycemic diets hypothesize that low-glycemic index foods, such as fructose, help people lose weight. More research is needed to fully investigate these hypotheses.
Physiological response to fructose varies
- Health condition
- Physical activity status
- Intake levels
- Consumption patterns (i.e. alone or with other foods)
- Intake of other macronutrients and fiber

The physiological response to fructose depends on an individual’s health condition, physical activity status, intake levels, consumption pattern (alone or with other foods), and intake of fiber and other macronutrients.
This cartoon illustrates the tendency of the media and consumer to blame obesity on the food or nutrient “du jour.” HFCS has recently had its time in the spotlight and has been blamed for rising rates of obesity. However, it is always important to remember the multi-factorial nature of obesity and the critical importance of energy balance.
In fact, this view is affirmed in the current ADA Position Paper on “Use of Nutritive and Nonnutritive Sweeteners” (JADA February 2004 (Vol. 104, Issue 2, Pages 255-275). The position states, “…consumers can safely enjoy a range of nutritive and nonnutritive sweeteners when consumed in a diet that is guided by current federal nutrition recommendations, such as those in the Dietary Guidelines for Americans and the Dietary Reference Intakes, as well as individual health goals.”

*This includes fructose from HFCS or from table sugar.*
Carbohydrate Recommendations
Recommendations for Carbohydrate Consumption

- Institute of Medicine Dietary Reference Intakes (DRIs)
  - At least 130 grams total carbohydrate per day
  - Acceptable Macronutrient Distribution Range:
    ✓ 45-65% calories from carbohydrates
    ✓ 20-35% calories from fat
    ✓ 10-35% from protein
  - ≤ 25% calories from added sugars

The Institute of Medicine determined that at least 130 grams of total carbohydrates per day is needed to properly fuel the brain. The Acceptable Macronutrient Distribution Range for carbohydrates is 45 to 65 percent of calories, to be balanced with fat and protein. The Institute also recommended a limit on added sugars of no more than 25 percent of calories, based on ensuring adequate micronutrient intake, as adding sugar does not also add micronutrients.
On food labels, the **Daily Value (DV)** for carbohydrates is 300 grams, or about 60 percent of calories in a 2,000 calorie diet.

**MyPlate** recommends:
- 5-8 ounces grains *(1/2 as whole grains)*
- 2-3 cups vegetables
- 1½-2 cups fruits
- 3 cups milk
The amount of grains you need to eat depends on your age, sex, and level of physical activity. Most Americans consume enough grains, but few are whole grains. At least ½ of all the grains eaten should be whole grains (or at least 48 grams of whole grains per day as suggested by 2010 Dietary Guidelines for Americans); refined grains can make up the balance. In general, 1 slice of bread, 1 cup of ready-to-eat cereal, or ½ cup of cooked rice, cooked pasta, or cooked cereal can be considered as 1 ounce equivalent from the grains group. According to current estimates, whole grains make up about 10 percent of grains on supermarket shelves. This number is expected to grow, especially as whole-grain cereals, breads, and pastas continue to become more available. Here are some clues for finding them:

- Check out the ingredient statement for the grains listed on slide 17
- Look for the phrase “whole grain” or “whole” before the grain’s name and look for this to be the first ingredient.
- If there are many whole grains listed, the product is probably whole grain even if the first ingredient is a refined grain.
- Some descriptive words in the product’s name, such as stone-ground, multi-grain, 100 percent wheat, or bran, do not necessarily indicate that a product is whole grain. Words to look for include “whole grain” or “100 percent whole wheat.” Even so, it’s wise to look beyond the product’s name.
Current intake of whole grains is much less than the recommended three daily servings. Unlike other dietary recommendations that often require major changes in food choices, eating more whole grains involves only a simple switch. With awareness and education, along with increased availability of easy-to-identify whole-grain products, consumers can easily reach their whole-grain goal. Sugar (refined cane and beet sugar) consumption (adjusted for loss) declined from 72.5 pounds per person per year in 1970 to 45.2 pounds in 2005.

- **Carbohydrates**
  - About 50 percent of energy
- **Added Sugars**
  - ¼ natural sugars in milk, fruit, and grains; ¾ added sugars
  - About 25 g per day
  - 13% of Americans eating more than 25% calories from added sugars
- **Whole Grains**
  - < 1 serving per day
- **Fiber**
  - About 15 g per day
  - Only 0 to 5% met or exceeded AI
The popularity of low carbohydrate diets waxes and wanes over time. The nutritional quality of such diets varies considerably from plan to plan and from individual to individual. It is noteworthy, however, that authors of a 2007 comparison of Atkins, Ornish, Zone, and LEARN diets concluded that some lower carbohydrate diets do not have negative metabolic consequences and may provide modest benefits for premenopausal women. (Gardner et al 2007)
Nutrient-Rich Eating

The 2010 Dietary Guidelines for Americans outline how important it is to eat nutrient-rich foods that are within one’s caloric needs.

The 2010 Dietary Guidelines for Americans emphasizes the importance of eating nutrient-rich foods within one’s caloric needs.
The compelling truth for nutrition communicators is simple. There is an enormous opportunity to communicate do-able ideas, new ideas, novel ideas, and creative ideas to encourage consumers to incorporate healthier behaviors into their regular lifestyle - all without the need to drastically change their lives or give up the things they love.

Fortunately, consumers have told us exactly how they want those ideas communicated to them. They want us to develop actionable tips with these principles in mind:

- Be positive.
- Keep it short and simple.
- Create it just for me.
- Make it specific and manageable.
- Provide the payoff.
- Talk food and fun.

On the next few slides, we’ll show you some examples of how to give consumers the tips they need - and want - to put the latest guidance about carbohydrates into healthy action in their busy lives.
First and foremost, **be positive**!

**Set an example for your children. Order a small or medium soft drink instead of extra large, and skip the refills!**

This tip works on several levels. First of all, it is positive - reminding parents and other adults that they are the most important role models for children’s healthy behaviors.

It also focuses on what consumers said was “doable” for them - using moderation when it comes to foods with sugars. By ordering a small or medium instead of a large and skipping the refills, the individual is putting moderation into practice. Or occasionally, drink milk or water when dining out.
Make tips short and simple. You’ll lose consumers with tips that are too wordy, have too many steps, or use too many numbers. Remember, consumers want ideas that make their lives easier - not more complicated.

Here’s a tip that also gets right to the point about portion size. This reinforces what consumers already know - that in addition to WHAT we eat, HOW MUCH we eat is important:

**Have a single dip ice cream cone instead of a double.**

This tip reassures consumers that they can continuing enjoy foods they love to eat, like ice cream, in moderation - and it also has some important side benefits. Choosing smaller sizes of foods and beverages not only helps you cut back on calories, sugars, and fats - it also help cut back on money you spend on food.
Here’s a tip tailored to the needs of people who love chocolate:

**Are you a serious chocolate lover? For an after-meal treat, ask for two forks and share with a friend.**

This tip really does illustrate the ideal way to have your cake and enjoy a healthy eating style too - by sharing! Of course, sharing doesn’t have to be limited to desserts. People can share appetizers, entrées, or an order of fries. Sharing food items is another way to double the benefits - you save on calories and you save money too!
People who are ready to change their behavior need small, specific steps to reach their goals. **Make tips specific and manageable** to encourage more whole grains:

**Not a fan of plain fiber cereals? Create your own breakfast brand by mixing 2 or 3. Choose at least one that’s labeled, “high in fiber.”**

This is another one of those tips that works on several levels. It is positive - you can keep eating the cereal you like. It is also personalized for people who don’t like plain fiber cereals - or for anyone who just wants their own personal “brand” of cereal.
Whenever possible, **provide the payoff**. Knowing the benefit up front is very motivating for some people. When it comes to health, many people are motivated to make changes because they believe that they’ll have more energy, look better, and enjoy life more. Your clients and patients may have their own reasons for improving their habits. It is important to build those reasons into your tips.

This tip provides the payoff right up front - and it also reinforces the benefits of **fortified** breads and cereals:

*Need more iron for energy, strong muscles, and brain power? Fortified breads and cereals are one easy - and tasty - way to pump up your iron intake.*
Help consumers realize that healthy eating can be a delicious every day thing - even when it comes to cookies:

**Want a cookie? Eat a cookie! Just don’t eat 10 cookies.**

The point is that a small amount of added sugars in cookies or other foods can fit into any healthy eating style. The goal is to enjoy smaller amounts - and savor every bite for maximum enjoyment.
When it comes to making decisions about food, the consumer is king. As one focus group participant pointed out, “I am the gatekeeper of my mouth.” If we want to communicate effectively with consumers, it makes sense to always keep their needs in mind— and to include their opinions— when developing our nutrition messages and tips.

Lecturing, force-feeding a point of view, and restricting choice may lead people to resent, ignore, or rebel against our suggestions. When we listen carefully to consumers and really hear what they are saying about the type of nutrition advice that works for them, we can guide them to begin taking those small steps toward good health.
Summary

- Carbohydrates include sugars and starches, providing 4 calories/gram, and fibers which are incompletely or not digested.
- Carbohydrate-containing foods, such as grains, fruits, vegetables, dairy, nuts, seeds, and legumes provide many other important nutrients.
- The form of sugar (sucrose, HFCS, etc) is less important than the total amount consumed.
- Most Americans do not get enough fiber to reap the benefits of a healthy gut and healthy blood lipid and glucose concentrations.
Summary

- Whole grain intake is associated with reduced risk of chronic diseases, including cardiovascular disease, certain cancers, and diabetes.
- A range of carbohydrate intakes are recommended and can be individualized based on health goals and preferences for healthy people, as well as those with diabetes or weight management needs.
- Consumer messages about carbohydrates should speak to the individual and her needs, motivations, and barriers in terms that are positive and fun. Tell why change are needed, and how to achieve them in a way that is concise and achievable.
Additional Resources

• “The Science of Sugars” in *Nutrition Today*
  - Part I: “A Closer Look at Sugars”
  - Part II: “Sugars and a Healthful Diet”
  - Part III: “Sugars and Chronic Disease Risks”
  - Part IV: “Sugars and Other Health Issues”

• IFIC Foundation Materials
  - Sugars and Health Resource Page

For more information on the role of sugars in health, “The Science of Sugars” is now published in the peer-reviewed journal, *Nutrition Today*. Part I appears in the May/June 2012 issue. Part II-IV are available now online ahead-of-print and will appear in print in coming issues of *Nutrition Today*.

Part I, “A Closer Look at Sugars,” examines the types of sugars, their functions in foods, and the various words used to describe sweeteners. As a bonus, readers can receive Continuing Professional Education (CPE) credit for reading Part I.

Part II, “Sugars and a Healthful Diet,” looks at the association between sugars and indices of dietary quality as well as dietary recommendations for sugar.

Part III, “Sugars and Chronic Disease Risks,” explores associations between intake of sugars and obesity and chronic diseases such as diabetes mellitus and cardiovascular disease.

Part IV, “Sugars and Other Health Issues,” reviews associations between sugars and dental health, between sugars and cognitive function, and between sugars and physical activity.

For more great materials on sugars and health, please visit our resource page on foodinsight.org!