

## About Glycemic Index

Up until several years ago, scientists believed that carbohydrates converted to sugar in the body according to their type. Complex carbohydrates, such as potatoes or whole grain bread, were thought to break down into sugar more slowly. Simple carbohydrates, such as an orange or apple, were believed to turn into sugar more quickly. With research, however, it appears that the way food is converted into sugar is more complicated.

When a person eats a piece of food, it is broken down and digested in the body. The speed at which the food raises glucose (blood sugar) is called the glycemic response. Researchers studied the glycemic response of foods and developed the glycemic index (GI), which is now used to rank more than 1,000 foods.

To determine the glycemic index of a specific food, scientists used two methods. In one, they measured the time it takes for blood glucose levels to be affected after the food is eaten compared to the glycemic index of a slice of white bread, which is ranked 100. In the second way, scientists used glucose, which is given a rank of 143. Foods that are given a GI of less than 100 are converted into sugar more slowly than white bread or glucose. Foods with a GI greater than 100 turn into sugar more quickly. In general, the high-GI foods cause a rapid jump in blood glucose, whereas the low-GI foods raise blood glucose at a slow, steady pace.

GI score	Rank
Less than 55	Low
55 to 70	Intermediate/moderate
More than 70	High

The benefits of using the glycemic index for controlling diabetes are not entirely clear. Some researchers believe that eating low-GI foods will help keep blood glucose levels steady, lower blood fats (lipids) and reduce the risk for obesity. Others believe that the GI of foods is not accurate enough to determine the effect on blood glucose levels because too many factors not reflected in the GI may cause different reactions in individuals. Also, consistent pre- and post-testing of meals is necessary to determine whether some foods raise blood glucose levels more than others.

Patients should seek advice from a physician, nutritionist or registered dietician before choosing to follow a GI diet. Decisions on foods must be made on the basis of overall nutrition, as well as the effect on blood glucose. Only knowledgeable professionals can determine if the use of the glycemic index is beneficial for an individual with diabetes

## Glycemic Index in Foods

The body converts all carbohydrates into glucose (blood sugar), which is burned for energy or stored in the body. In the glycemic index theory, the faster the carbohydrates are broken down by the digestive system, the faster they travel to the blood and the quicker the glucose rises. This causes greater insulin production, and a person with diabetes must handle the extra glucose in the body. The rapid rise in glucose may result in a burst of energy quickly followed by hunger. This cycle is not considered healthy for people with diabetes.

Examples of high-glycemic foods with a GI over 70 include:

- White bread
- Mashed potatoes
- Carrots
- Some cereals
- Snacks such as corn chips, potato chips and pretzels
- Honey and jams

Although high-glycemic foods may be considered the “bad” carbohydrates, some of the foods are valuable in the diet. People with diabetes should not totally avoid high-GI foods. Instead, they are advised to look for high-GI foods that are more nutritious and lower in calories. For example, a high-fiber cereal may have a GI index of 80. However, it provides more nutrients than corn chips, which have a GI of 72.

Some carbohydrates cause a rise in glucose that is not as dramatic as with the high-glycemic foods. These foods are categorized as having an intermediate/moderate glycemic index. The GI for this category is 55 to 70 and includes:

- Some cereals
- White and brown rice
- Crackers and whole-grain breads
- Canned fruits
- Table sugar

Along with the high-GI foods, it is important for people with diabetes to realize that the foods in this category are not all the same. Some foods should be eaten sparingly as they have the same GI but little nutritional value. Table sugar and beets both have a GI of 65, but beets contain far more nutrients.

The food that produces the most gradual rise in glucose is placed in the low-glycemic group. These foods are considered the easiest on the body and may control hunger for a longer period of time. Foods with a GI lower than 55 include:

- Green vegetables
- Most fresh fruit
- Whole grains and beans
- Some fruit juices

In general, the low-glycemic carbohydrate foods are lower in fat and higher in fiber. There are still some foods in this category that contain empty calories. Peanut candies and frozen lima beans have the same GI of 32, but the lima beans are more beneficial in nutrients and fiber.

Using the glycemic index can be complicated and confusing. In addition to checking the GI value, the individual must consider the type of food, its nutrients and the overall diet. There are several factors beyond just the GI number that influence the effect of foods on glucose. These factors include:

- Region where an individual lives. For example, foods are processed differently in different parts of the United States, and an item such as rice can be grown in many ways depending which part of the world the rice is coming from.
- The way the food is prepared (e.g. cooked, chopped, mashed).
- How it combines with other food (e.g., the protein and fat-containing food in a meal).
- The type of carbohydrate in the food.
- The amount of processing the food item has undergone.
- The ripeness of the fruit or vegetable.
- Fiber, fat and protein content of the food.
- What the individuals' blood glucose level is before eating.
- How quickly the body digests food (this varies from person to person).
- The individual's activity level.

Knowing the general glycemic index of foods is therefore not enough information to plan a safe diabetic diet

### **Glycemic Index and Glycemic Load**

The glycemic index (GI) measures only how quickly a particular carbohydrate turns into glucose (blood sugar) in the body. . It does not show how much of the carbohydrate is in a certain food, or the influence on glucose of a variety of foods consumed in a single meal. Some foods have high-GI carbohydrate but do not have a great deal of it. It is important to know both of these factors:

- How much carbohydrate is in a food
- How quickly it converts into glucose

The glycemic load (GL) calculates this information to more clearly determine the effect of food on blood glucose. The glycemic load of food is calculated using the following formula:

- Take the amount of carbohydrates in a serving of food.
- Multiply that number by the food's GI.
- Divide by 100 for glycemic load.

For a half-cup serving of carrots, the GL would be calculated as:

8 (grams of carbohydrates) X 131 (GI) = 1048 / 100 = 10.4.

For a half-cup serving of white rice, the GL would be calculated as:

35 (grams of carbohydrates) X 81 (GI) = 2835 / 100 = 28.3.

Based on these calculations, if people chose foods using only the glycemic index, they might avoid some healthy items. The carrots have a higher GI than rice but are actually better for the individual. This comparison demonstrates the importance of using the glycemic load rather than just the glycemic index in choosing food. A lower glycemic load means less carbohydrates and more nutrients and fiber. In general, lower-glycemic foods provide a healthier diet.

### Glycemic Index vs. Glycemic Load Table of Common Foods

Food (one serving)	Carbohydrate content (grams)	Glycemic index	Glycemic load
Carrots	8	131	10
Lentils	20	41	8
White bread	24	100	22
Whole-grain bread	24	64	15
Baked potato	37	121	45

### Ranges for GI and GL

	GI	GL
High	70 or more	20 or more
Medium	56 to 69	11 to 19
Low	55 or less	10 or less

Calculating the GL is time-consuming and not always easy. It may be difficult to determine how many carbohydrates are in a serving of food or if that number changes in preparation and in combination with other foods, such as protein. This is another reason use of the glycemic index is viewed with caution when dealing with people with diabetes and why people with diabetes should consult a dietician

### Estimating Personal Glycemic Index

The glycemic index (GI) that is assigned to foods is an average of the glycemic responses of many individuals. It is possible for people with diabetes to measure their own personal response to a food to determine how it affects the glucose (blood sugar) level. By testing individually, people with diabetes are able to get their own glycemic response for specific foods. The process requires consistent, timed blood testing that is usually more involved than what would be done for normal glucose monitoring.

The first step in determining how food affects the glucose level requires testing blood glucose immediately before and two hours after eating. This reading will give the person with diabetes a general idea of the way the food raises glucose. However, because different foods raise the glucose level at different speeds, this testing may not provide enough information. Eating an apple may peak the blood glucose at 60 minutes, whereas a piece of bread may peak at 90 minutes.

The way to overcome this problem is to test more often after eating a specific food. By testing at numerous times, the person with diabetes will produce a glucose curve. This curve will show the baseline, when the blood glucose peaks and when it returns back to the baseline.

To be completely accurate, the testing of foods should be done at different times of the day. A person may respond differently to a food in the morning or after activity. If a person chooses to do glycemic testing, it should be done at the time when the food is usually eaten.

The difficulties in calculating personal glycemic responses for food include:

- Multiple finger sticks and testing (always use same blood source - either capillary or vein)
- Time consuming
- Must follow strict schedule for accurate results
- Responses may vary for many reasons
- Questionable accuracy due to variables with testing

Glycemic testing can be a difficult process with less-than-accurate results due to the variables. If a person with diabetes wishes to calculate the GI for foods, this should be done after consulting medical professionals for specific recommendations and guidelines.

### **Future of Glycemic Index**

Research continues on using the glycemic index in the treatment of diabetes. Scientists differ in opinions regarding its effect on glucose (blood sugar) control, weight loss and the prevention of obesity. Some researchers have pushed to have the glycemic index placed on food labels. Others would like the carbohydrate information on labels replaced with information about glycemic index and load.

Because food testing for the glycemic index is not universal, this information is not placed on labels. There are contrasting views about the glycemic index, and the use of a low-GI diet for diabetes remains controversial. More carefully designed research studies are necessary to develop an understanding of the role of the glycemic index in a healthy diet

Before making any changes with your diet, please consult with Dr Tanner at Diabetes and Lipid Clinic of Alaska