

The Glycemic Index (Handout for Step 3)

The glycemic index of food is a ranking of foods based on their immediate effect on blood glucose (blood sugar) levels. Carbohydrate foods that breakdown quickly during digestion have the highest glycemic indexes. Their blood sugar response is fast and high. Carbohydrates that breakdown slowly, releasing glucose gradually into the blood stream, have low glycemic indexes.

What is the significance of Glycemic Index?

- ✚ A smaller rise in blood sugar and can help control established diabetes
- ✚ Can help people lose weight and lower blood lipids
- ✚ Can improve the body's sensitivity to insulin
- ✚ High GI foods can help re-fuel carbohydrate stores after exercise

How to switch to a low GI diet

- ✚ Breakfast cereals based on wheat bran, barley and oats
- ✚ "Grainy" breads made with whole seeds
- ✚ Pasta and rice in place of potatoes
- ✚ Vinegar and lemon juice dressings

In short, the goal should be to build a good plan including the low Glycemic Index foods. This way, hunger is minimized, and there is less tendency to "cheat" or overeat. Consequently, you can continue to lose body fat or maintain your weight - once the excess pounds have been lost.

Even for those whose main objective is not fat loss, foods that are low on the glycemic index will help alleviate mood swings and regulate energy levels.

- ✚ Foods that stimulate insulin surges can cause people to eat 60 - 70% more calories at the following meal.
- ✚ People who consume foods relatively high in glucose (such as white bread, most commercial whole wheat bread, and raisins) eat an average of 200 calories more at the next meal than those who eat fructose (a sugar found in fruits).

Low glycemic index foods can be mixed with modest quantities of high glycemic foods without losing their hunger reducing effect.

The purpose of the chart is not to have you eliminate those nutritious choices from your diet. Instead, balance the foods that are "less desirable" by eating them with foods that are "desirable."

A low glycemic food plan can be beneficial to:

- ✚ Diabetics
- ✚ Hypoglycemics
- ✚ Persons with insulin resistance or Syndrome X
- ✚ Dieters
- ✚ Athletes

High glycemic foods:

- ✚ Elevate insulin and blood glucose
- ✚ Stimulate fat-storage
- ✚ Exacerbate hyperactivity
- ✚ Reduce sports performance.
- ✚ Low glycemic foods do not.

A low glycemic food plan is beneficial for:

- ✚ Helping balance blood glucose and insulin levels
- ✚ Reducing excess body fat levels
- ✚ Increasing sports performance.

Low glycemic food plans are not based on starvation or deprivation. Eating is a part of our lives and we should not have to sacrifice tasty foods in order to stay healthy.

Low glycemic food plans focus on reducing ingestion of foods that elevate insulin and stimulate fat-storage. We can't totally eliminate high glycemic foods from our diet, but we can be aware of the glycemic reaction that foods have so we can make better choice.

Low glycemic food plans have been proven to reduce incidence of Type II diabetes and to help control Type I and II diabetes, hypoglycemia and hypertension. Low glycemic foods do not stimulate food-craving hormones like Neuropeptide Y and Lipoprotein Lipase. Stimulation of these hormones can cause chemically-triggered cravings for food and uncontrolled eating binges.

It would be ideal for everyone to cook balanced meals at home, but the reality is that most families are too busy to make home cooked meals every day. The Low Glycemic Food Plan for Women is a sample of realistic food planning, which is why fast-foods are included. Though the Food Plan contains fast-foods, the daily fat calories still meet the heart healthy guidelines of the American Heart Association, Harvard University, the American Cancer Society, and the UDG (Unified Dietary Guidelines)

Obviously, low glycemic food plans can be followed for more than 7 days. You can create your own low glycemic food plan with many variations. Be sure to ingest enough calories per day to meet the needs of your own body.

For optimum health, select a wide variety of vegetables, fruits, and foods daily. This helps assure an adequate intake of Phytochemicals, vitamins, and minerals.

The GI of foods has important implications for the food industry. Terms such as complex carbohydrates and sugars, which commonly appear on food labels, are now recognised as having little nutritional or physiological significance. The WHO/FAO recommend that these terms be removed and replaced with the total carbohydrate content of the food and its GI value. However, the GI rating of a food must be tested physiologically and only a few nutrition research groups around the world currently provide a legitimate testing service. The Human Nutrition Unit at the University of Sydney has been at the forefront of glycemic index research for over a decade and has tested dozens of foods as an integral part of its program. Jennie Brand Miller (JBM) is the senior author of International Tables of Glycemic Index published by the American Journal of Clinical Nutrition in 1995.

Desirable Foods	Moderately Desirable	Less Desirable Foods
Breads: Coarse European -Style, Whole Grain wheat or Rye Pita Bread, Cracked or Sprouted Whole wheat	Breads: 100% Stone Ground whole Wheat, Pumpernickel, 100% whole grain Rye Cracker	Breads: White bread, most commercial whole wheat breads, English muffins, bagel, French bread, most commercial matzoh
Cereals: Compact noodle-like high bran cereals (All-Bran, Fiber One) Coarse Oatmeal, Porridge, Coarse Whole Grain (Kashi) Cereal mixed with Psyllium (Fiberwise)	Cereals: Grape-nut cereal, medium-fine grain oatmeal, (5-minute variety)	Cereals: Corn flakes, puffed rice, puffed wheat, flaked cereals, instant "Quick" or pre-cooked cereals. Oatbran, rolled oats. Shredded wheat, Muesli.'
Pasta, Grains and Starchy Vegetables: Pasta (all types) Barley, Bulgur, Buckwheat (kasha) Couscous, Kidney Beans dry, (Lentils, Black-eyed peas, Chick-peas Kidney beans, Lima beans, Peas, Sweet Potato, Yam (soybeans lowest) Most Vegetables.	Pasta, Grains and Starchy Vegetables: Rice, Boiled Potato, Corn Navy beans, Kidney beans (canned), Baked beans. Beets.	Pasta, Grains and Starchy Vegetables: Instant rice, Brown rice, instant precooked grains, Baked potato, micro-waved potato, instant potato, Winter squash (acorn, butternut), carrots, parsnips.
Milk Products: Skim, 1%, cottage cheese, (lowfat or regular), Buttermilk, Low-fat plain yogurt, Low-fat fruited yogurt, Low-fat frozen yogurt (artificial sweetener)	Milk Products: 2% milk, cheese, Regular plain yogurt	Milk Products: Whole milk, ice milk, ice cream, Yogurt sweetened with sugar, Low-fat frozen desserts with sugar added, Low-fat and regular frozen yogurt with sugar added. Tofu ice cream.
Fruit: Most fruit and natural fruit	Fruit: Banana, Kiwi, Mango, papaya, orange juice.	Fruit: Pineapple, raisins, watermelon, fruit juices sweetened with sugar.
	Meats: Higher fat fish, (salmon, herring, lean cuts of Beef, Pork, Veal. Low-fat imitation luncheon meat, low-fat. cheese, Eggs.	

juices, including apple, berries, cantaloupe, grapefruit, honeydew, oranges, pears, grapes, peaches, applesauce, (Cherries, plums and grapefruit lowest).

Meats:

Shellfish, "white" fish (cod, flounder, trout, tuna in water), Chicken, turkey, cornish hen, venison (white meat no skin), Egg substitutes (cholesterol free) cottage cheese

Meats:

Most cuts of beef, pork, lamb, hot dogs (including "low-fat" versions) cheese, luncheon meats, peanut butter.

Commonly Asked Questions

Does following a low glycemic food plan mean that you can never eat high glycemic foods?

No. it just means that the meals and snacks eaten will be glycemicly balanced. For example, carrots are very high glycemic. But, a small amount of carrot eaten with other foods will not significantly elevate insulin levels. If you sat down to a meal consisting of a pound of carrots, your insulin levels would be elevated.

Does a low glycemic food plan ban the use of all sugars?

No. Some diet books do warn against the use of sugar in any form, but [GRI's Low Glycemic Food Plans](#) do not. Research has shown that about 5 tablespoons of refined sugar may be consumed per day without compromising blood sugar control. If the sugars are eaten with foods (like protein in ice cream) that reduce the glycemic impact of the sugar, then the total glycemic response is acceptable.

Since fat lowers the glycemic response of a food, can't I eat high-fat french fries instead of baked potatoes or rice with a lot of butter?

The theory is correct. Fried potatoes, like french fries and potato chips do have lower glycemic indices than baked potatoes, but the GI is still in the unacceptable range. Additionally, high-fat foods can reduce the glycemic response of a meal without reducing the insulin response. High-fat foods are not heart-healthy and they stimulate LPL, the fat-storing enzyme.

Adding butter to rice does reduce the glycemic response, but the combination of butter-fat with fat-storing carbohydrate like rice, programs the body to store the food in the fat cells. To reduce the glycemic response of rice, make sure the rice is not "sticky." Cooked rice should be dry with the grains separate, and not gooey or clumped. Chinese and Japanese rice is typically high glycemic.

If you add fat to a food, thus reducing the glycemic response of the food, is the insulin response reduced too?

Not necessarily. You can add fat to a high glycemic food, which will reduce the glycemic response, but the insulin response could remain unchanged. The blood sugar response to foods is related to, but not identical to, the rise in blood insulin levels. Blood insulin levels can rise to twice that of blood sugar in response to the same high glycemic meal or food ingested. If the food or meal eaten is low glycemic, there should be no rise in blood sugar or insulin. When high glycemic foods are totally replaced with low glycemic foods, the result is an overall decline in blood sugar and insulin levels.

Sucrose is a good example of the difference between glycemic response and insulin response. Sugar (sucrose) is insulinogenic (meaning it elevates insulin), but the insulin-stimulation caused by ingesting sugar is greater than its glycemic index would indicate. When you add dietary fat to sugar, lipoprotein lipase (LPL) is stimulated while chylomicron triglycerides are secreted into the blood in large quantities. In other words, the combination of fat and sucrose produces a mild glycemic response, but a powerful fat-storing insulin response.

If two different foods contain the same calories but different glycemic indices, aren't they both equally fattening?

No. Foods with similar or identical calories do not stimulate fat-storage equally. As an example, table sugar (sucrose) has the same caloric value as maltitol. When 30 grams of maltitol is given to fasting humans, there is only a slight response in serum glucose and insulin. After sucrose is ingested (in the same group) increases in these parameters are significant. Sucrose stimulates LPL activity in adipose tissue, while maltitol does not. Lower adipose tissue LPL activity results in lower body fat accumulation.

Why is pasta included in the Low Glycemic Food Plans, but rice is not?

The glycemic index of almost all pasta is low, while the glycemic index of almost all rice is high. It is very difficult to identify a lower glycemic rice by looking at the label. The higher the amylose content, the lower the glycemic index. Amylose content is not revealed on labels. Also, cooking methods affect the glycemic response of the rice. Rice cooked too long will have an elevated glycemic response. Contrary to popular belief, brown rice does not have a lower glycemic index than white rice.

Can I eat as much low glycemic food as I want and still lose weight?

Unfortunately not. Though low glycemic foods do not stimulate fat-storage as efficiently as high glycemic foods, they still contain calories. If you eat 4,000 calories a day, low or high glycemic, and do not exercise, it's likely that you will be very overweight. The good news is that you can consume more calories on a low glycemic food plan than on a typical diet.

Can I eat any amount of low glycemic carbohydrates and still maintain low insulin levels?

No. The total amount of carbohydrates in a food or meal has to be added to the equation. Blood insulin responses increase as carbohydrate intake increases. Blood insulin levels can incrementally increase even if blood sugar response does not. The rise in insulin is dose-dependent, meaning the amount of carbohydrate ingested can affect insulin levels even if the food does not elevate blood sugar.

For example, a piece of sponge cake is eaten. No significant change in blood sugar or insulin is evidenced. Three additional pieces of sponge cake are eaten. Blood sugar rises and insulin rises. Three more pieces of sponge cake are eaten. Blood sugar does not continue to rise while insulin does.

Can I add fiber to a meal to reduce its glycemic response?

Yes and no. There are different forms of fiber. Fiber that slows digestion (soluble fiber) reduces glycemic impact. Insoluble fiber typically does not slow digestion and therefore does not reduce glycemic impact, but there are exceptions.

Why aren't sugars listed in the Acceptable and Unacceptable Food List?

The topic of sugars and sweeteners is so complicated that we created a separate report dedicated to that subject. A listing of sugars is found in the "GRI Sugars and Sweeteners Report 2001".

Why don't food manufacturers state the glycemic response of their products on the label?

Food manufacturers probably will not reveal the glycemic response of foods and drinks on labels until forced to do so by the FDA. One reason is that many of the prepared foods in the grocery store are very high glycemic. If labels revealed the glycemic response as "high glycemic," it could negatively effect sales of the product. Glycemic testing can also be expensive, and many food companies are unwilling to commit funds to costly testing.

It has been incorrectly stated by Australian researchers that the first incidence of a food company adding glycemic information to their product labels was in early 1999. In fact, the first product marketed to the public that provided glycemic information on a product label was in 1982. Another company (publicly traded on the NASDAQ) in the U.S. has been marketing, selling, and labeling low glycemic food and drink products since 1995.

The Glycemic Research Institute offers a Seal of Approval to companies whose products qualify. There is no charge for the Seal of Approval. Go to www.glycemic.com for more information.

Why doesn't the Food List state the numerical index of the foods?

The glycemic index of a food depends on many factors including harvest time, gene species, cooking methods, age of food, type of processing, protein and fat content, fiber content, nutritional profile, and many other variables. Different studies of the same food have resulted in glycemic variations ranging from 20-40 points.

There are also two reference foods, glucose and bread, with different numerical values, and most people do not know the difference between them. There are currently only three recognized research organizations in the world conducting glycemic research, and their glycemic indices for the same foods do not match. When people use a numerical value to determine the glycemic response of a food or meal, they need to factor in every variable, including cooking methods. This becomes an impossible test, even for nutritional biochemists.

Further, the human variable has to be taken into account. Glycemic index variations occur in the average person, the diabetic and the non-

diabetic. These variables can change the glycemic response to a food or meal by as much as 100 percent. This means that the same person can have different blood sugar responses to the same food on different days.

When low glycemic food plans contain numerical values, many people use the numbers to MIS-calculate the glycemic response of a meal. They will add up the numerical value of the foods and then divide by the number of foods, to obtain an average glycemic index. This calculation works for mathematical problems, but it doesn't work for the glycemic index. There is a calculation that can be used to ascertain an average GI for a meal, but it is complicated and requires knowledge of the carbohydrate content of each ingredient, the percent total carbohydrate, the GI of each ingredient, and the percent of each ingredient in the food or meal.

It would be quite a task to figure out the glycemic response of every meal and snack eaten. We have found that many people will still revert to using the averaging-method which renders an inaccurate value. This can be dangerous for diabetics who need an accurate glycemic response. Even if all the calculations were done within plus or minus (~) 5% accuracy, the other variables as discussed above can render the data inaccurate.

The Low Glycemic Food Plans were designed to allow anyone, from a mathematics professor, to a foreign exchange student who speaks very little English, the ability to adopt and follow a glycemically balanced program.

The Glycemic Research Institute (GRI) has been conducting glycemic research for eighteen years, longer than any other organization. GRI also holds patents in the field of low glycemic technology, and has been monitoring the results of low glycemic foods and drinks in humans for almost two decades. Aside from the field of weight gain and obesity, our research includes designing and monitoring low glycemic food plans and products for professional athletes at the peak of their careers. GRI has designed the Low Glycemic Food Plans based on our extensive research and expertise in the glycemic field.

Chart courteously provided by Dr. Ann de Wees Allen Glycemic Research Institute. More information can be found at www.glycemic.com

You can also search for specific GI's of foods via a comprehensive Jennie Brand Miller's database at <http://www.glycemicindex.com/>

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