EXTENSION
UtahState UNIVERSITY
Practical Solutions for a Complex World
FACT SHEET
COOPERATIVE EXTENSION

April 2004 FN/2004-01

The Glycemic Index

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What is the Glycemic Index?

The glycemic index is a ranking of carbohydrate containing foods. Foods are ranked according to their immediate effect on blood sugar levels. The higher a food raises blood sugar, the higher its glycemic index. Scientists published the first index in 1981 when they were researching diet therapy for diabetes. This first list contained 51 foods, and the list has continued to expand, with the most recent official list containing 750 foods. Fruits, grains, dairy products, some vegetables, pastas, and sugary desserts all contain carbohydrates, but have a wide range of glycemic indices. Meats, fats and some vegetables have none or very small amounts of carbohydrates and thus the glycemic index of these foods is low or close to zero.

Pure glucose is used as the standard to which other foods are compared, and is given the glycemic index of 100. Most of today's researchers use pure glucose as the standard mainly because it is the end product of digestion. However, white bread was the original reference food used when determining glycemic index levels. Glucose has a set index level of 100, which is considered the top of the scale. All other foods containing carbohydrates are ranked from 0 to 100 based on their effects on blood sugar compared to glucose. A few foods do have a higher glycemic index than glucose, with indexes over 100, such as jasmine rice, dates, and tofu based frozen desserts. Refined sugars and processed foods such as cookies, cakes, white breads, and crackers generally have high glycemic indexes. Whole grains and some fruits generally have lower glycemic indexes.

Figure 1 shows an example of a person's blood sugar response to a high versus a low glycemic index food. The graph shows how glucose, a high glycemic index food, raises blood sugar levels higher and faster than whole grains, a low glycemic index food.

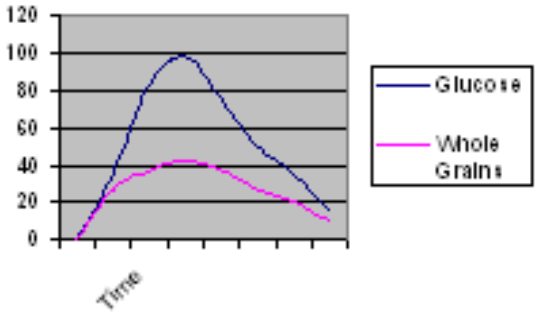

Figure 1. Glycemic Index. The 2 hour blood sugar response of a high glycermic food (glucose) compared to a low glycemic food (whole grains).

Influences on the Glycemic Index

Different factors that influence a food's glycemic index include:

Cooking Methods – the more cooking and processing a food goes through, the higher the glycemic index.

Physical Forms of Food – the more fibrous the food, such as whole grain seed, the slower it is digested and the lower the glycemic index.

Type of Starch – A food made of amylose starch has a lower glycemic effect than food composed of amylopectin starch. Amylose starch breaks down slower than amylopectin. Amylose is found in legumes such as kidney beans and lentils and some types of rice. Amylopectin is found in vegetables such as potatoes and corn.

Fiber – Soluble fibers slow digestion and effectively slow the availability of the starch to digestion which usually lowers a food's glycemic index. Soluble fiber is found in oatmeal, dried beans, and some fruits and vegetables.

Sugar – Foods contain various types of sugars. Fructose, found in fruits, is metabolized slowly, which lowers the glycemic index of fruit.

Which Foods Have a Low Glycemic Index?

High glycemic index foods are those foods with an index greater than 70. Low glycemic index foods have an index less than 55. One can't tell the glycemic index of a food by its food group classification, but in general low glycemic foods include:

Grains – Oatmeal, pumpernickel bread, whole wheat bread, bran cereal, brown rice, most pasta

Fruits – apples, apple juice, apricots (dried), cherries, grapefruit, grapefruit juice, grapes, peaches, pears, pineapple juice, plums, oranges, and orange juice.

Vegetables – yams, non-starchy vegetables such as broccoli, green beans, beets, and celery.

Legumes – lentils, kidney beans, butter beans, split peas, chickpeas, lima beans, navy beans, pinto beans, baked beans

Dairy – milk, yogurt, low-fat ice cream

Table 1 (following page) shows the glycemic index of some commonly eaten foods:

Glycemic Index and Type 2 Diabetes

Long-term studies have found that consumption of a high glycemic load diet is a predictor of type 2 diabetes. Though diet is not the only predictor of the development of type 2 diabetes, adults who replace high glycemic foods in their diet with low glycemic foods can reduce their risk of diabetes.

The major objective of diabetes control is to reduce high blood sugars. Constant high blood sugar in diabetes causes complications such as nerve damage, kidney disease, eye disease, and cardiovascular disease. Eating low glycemic foods may reduce frequent and rapid raises in blood sugar and as a result may decrease the potential complications from diabetes. A low glycemic diet may also increase the body's sensitivity to insulin. Changes in blood sugar caused from low glycemic foods are lower and more gradual, leaving more time for insulin to respond to the raised blood sugar levels.

Heart Disease and the Glycemic Index

A low glycemic diet may have a positive effect on those with heart disease. Eating low glycemic index foods is associated with decreased total cholesterol, decreased low density lipoproteins (LDL) or "bad cholesterol," and increased high-density lipoprotein cholesterol (HDL) or "good" cholesterol. Lower total cholesterol levels, lower LDL cholesterol, and high HDL cholesterol levels are protective against heart disease.

Obesity and the Glycemic Index

A diet combining low fat foods with low glycemic foods promotes better weight control than a low fat diet alone. Low glycemic foods promote satiety and fat oxidation. Studies show that low-glycemic meals decrease hunger and subsequent eating. Eating low glycemic foods is appropriate in the treatment and prevention of obesity.

Table 1. Glycemic Index of Commonly Eaten Foods

Food	Glycemic Index	Grams of Carbohydrates per serving
Beans and Legumes		
Kidney Beans, canned, ½ cup	52	19
Baked Beans, ½ cup	48	24
Navy Beans, ½ cup	38	19
Split Peas, boiled, ½ cup	32	21
Breads		
White, 1 oz slice	73	12
Bagel, 1 each, 2 oz	72	30
Sourdough, 1.5 oz slice	54	20
!00% Stone-ground Whole Wheat, 1.5 oz slice	53	12
Rye Bread, 1 oz slice	50	15
Breakfast Cereals		
Corn Flakes™, 1 cup (1 oz)	81	24
Total™, 3/4 cup	76	27
Cheerios™, 1 cup (.5 oz)	74	23
Special K™, 1 cup	69	22
Mini Wheats™, 1 cup	58	21
Frosted Flakes™, 3/4 cup	55	28
All-Bran Cereal™, ½ cup (.5 oz)	42	22
Dairy Foods		
Vanilla Ice Cream, ½ cup	61	16
Skim Milk, 1 cup	32	12
Nonfat Yogurt, artificial sweetener, 8 oz	24	17
Grains		
Instant Rice, 1 cup	69	37
White Rice, 1 cup	64	42
Brown Rice, 1 cup	55	37
Macaroni, 1 cup	47	42
Spaghetti, 1 cup	42	42
Fettuccine, 1 cup	40	57
Fruits		
Watermelon, 1 cup	72	8
Cranberry Juice, 8 oz	68	31
Pineapple, fresh, 2 slices	59	10
Banana, 1 medium	52	32
Orange, 1 medium	42	10
Apple, 1 medium	38	18
Pear, 1 medium	38	21
Grapefruit, ½ medium	25	5
Potatoes		
Instant mashed, ½ cup	85	14
Baked white skinned, 1 medium	85	30
French Fries. 4.3 oz	75	49
Sweet Potato, ½ cup	61	20
Potato Chips, 12 pieces	54	15
Vegetables		
Parsnips, ½ cup	97	15
Corn canned, ½ cup	54	15
Peas frozen, ½ cup	48	10
Carrots boiled, ½ cup	47	3
Yams, 3 oz	37	24

Choosing to Eat a Low Glycemic Diet

Eating more low glycemic foods will benefit people at risk for heart disease, diabetes, and obesity. Many people will find it too time consuming to look up the glycemic index numbers on every food. In the future, glycemic indexes may be available as part of the nutrition information label. Until then here are some basic guidelines to help you to choose a low glycemic diet:

- Reduce your consumption of refined and highly processed grain products like most prepared cold cereals and white bread. Choose whole grain breads, brown rice, and whole grain cereals such as oatmeal.
- Eat non-starchy vegetables including leafy green vegetables.
- Eat plenty of fruits. Most have low glycemic indexes.
- Choose foods that are high in fiber, they take longer to digest which usually helps lower the rate that the starch is broken down.
- Remember that combining foods and adding fat while cooking can change the glycemic index of foods – usually lowering the glycemic index.

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