



**Health Sciences  
Shaklee Corporation**

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## **Glycemic Index Scientific Communications Brief**

Despite the current trend and popularity of weight loss diets promoting low carbohydrate intake, carbohydrate is the most widely consumed substance in the world after water. In fact, carbohydrates hold a special place in human nutrition. Glucose, the simplest carbohydrate, is an essential fuel for the brain, red blood cells and a growing fetus, and the main source of energy for muscles during strenuous exercise. Carbohydrate is a vital energy source and despite current diet trends, it's not smart to leave them out of a healthy diet. However, it is smart to know, that not all carbohydrates are created equal. Scientific evidence suggests that the type of carbohydrate you eat can make a difference in your overall wellbeing.

Nutrition science has traditionally viewed carbohydrates as either simple or complex (sugars or starches). Simple sugars were believed to be digested and absorbed rapidly, while complex carbohydrates were believed to be slowly digested and absorbed. And simply by the virtue of their molecular size, simple and complex carbohydrates were believed to have different effects on blood sugar response. The glycemic index however, is a concept with growing scientific evidence that challenges that traditional view.

### **What is the Glycemic Index?**

The glycemic index was introduced over twenty years ago and first conceived by David Jenkins and fellow researchers at the University of Toronto, as a dietary tool for managing diabetes. As just mentioned, it was originally thought that all simple sugars caused a more rapid rise in blood sugar levels than did complex carbohydrates. But some studies were beginning to emerge that challenged this belief. As a response to that challenge, Jenkins and colleagues sought to systematically test the impact of different types of carbohydrates on blood sugar levels, compared to glucose. By ranking the values compared to that for glucose, the glycemic index was born.

The glycemic index (GI) ranks carbohydrate-containing foods based upon how quickly they elevate blood sugar levels. It is measured by comparing the increase in blood sugar after eating a standardized amount of carbohydrate from a single food with the increase in blood sugar after eating the same quality of carbohydrate from a reference food. Historically, glucose or white bread had been used as the reference food. However, today the recommended standard is glucose. The actual GI value of a food is measured by comparing the average change in blood sugar level over a two hour period compared to the change in blood sugar after consumption of glucose in a group of test subjects.

Foods containing carbohydrates that are quickly digested tend to have the highest glycemic index, since the blood sugar response is fast and high. Slowly digested carbohydrates tend to have a low glycemic index, since they release glucose gradually into the blood stream. In general, the most refined and highly processed carbohydrate-rich foods have a high glycemic index while non-starchy vegetables, fruits and legumes tend to have a low glycemic index. Glycemic index values are generally grouped into three categories:

<b>Glycemic Index Category</b>	
High GI	70 or higher
Intermediate GI	56 - 69
Low GI	0 - 55

### **What is Glycemic Load?**

While the glycemic index compares equal amounts of carbohydrate from foods, the actual quantity eaten of that food can differ dramatically. Therefore researchers at Harvard University introduced the concept of the glycemic load. The glycemic load takes into consideration the impact of the amount of food customarily eaten in the diet. The glycemic load is calculated by multiplying the glycemic index value of a food by the amount of total carbohydrate per serving and divided by 100.

$$\text{Glycemic load} = \text{GI value} \times \text{carbohydrate per serving} \div 100$$

### **Factors that Influence the GI Value**

The glycemic index value can vary because of a number of food-related factors.

- **Cooking Method:** Heat, the amount of water and cooking time can affect a foods glycemic index.
- **Processing Method:** Grinding, rolling, and milling of starchy foods reduces particle size and makes it easier for water to be absorbed and digestive enzymes to attack food. Processing removes the fiber in grains that slows carbohydrate digestion.
- **Type of Starch:** Two types of starch in foods, amylose and amylopectin have different effects on glycemic index. Amylose molecules are harder to digest than amylopectin molecules. Certain foods have a higher ratio of amylose to amylopectin and therefore have a lower glycemic index.

- **Fiber:** Researchers believe that viscous, soluble fiber thickens the mixture of food in the digestive tract, slowing down enzymes from digesting starch. This results in a lower blood sugar response and a lower glycemic index.
- **Sugar:** Glycemic index is affected by the type of sugar in a food. Sucrose (table sugar), which is made up of glucose and fructose has a lower GI than glucose because half of the sucrose molecule is made up of fructose, a type of sugar that elicits a very small blood sugar response.
- **Fat:** Fat increase the time it takes for a food to leave the stomach and enter the intestine. By slowing the rate of carbohydrates digestion, fat containing foods may temper the rise in blood sugar and yield a lower glycemic index than similar foods without the fat.
- **Acidity:** Acid in food slows down stomach emptying, which slows the rate that carbohydrates are digested. Increasing the acidity in a meal can lower its glycemic index and the blood sugar response.

### **The Relationship Between The Glycemic Index and Disease**

In recent years, the concept of the glycemic index has transformed from just a potentially useful tool for the management of diabetes to a key player in the prevention of diabetes and obesity, abnormal blood lipids, cardiovascular disease and even certain cancers. The theory behind most of these diet and disease relationships is that a rise in blood glucose results in a rise in insulin response. High insulin response has been related to several physiological outcomes such as; increased food intake leading to obesity<sup>1</sup>, hyper-insulinemia leading to insulin resistance<sup>2</sup>, pancreatic beta cell exhaustion leading to type 2 diabetes<sup>3</sup>, abnormal blood lipids leading to cardiovascular disease<sup>4</sup> and unknown factors leading to certain kinds of cancers<sup>5</sup>.

**Satiety and Obesity** – Research has clearly shown that obesity is a complex issue and that many factors are involved in its etiology. These factors include; genes, lifestyle, emotions and other dietary habits. However, the glycemic index and glycemic load may be two additional dietary factors to consider when looking for ways to address the obesity epidemic.

The importance of different types of carbohydrate on long-term body weight regulation has until now, not been investigated to a large extent. However, some useful studies are starting to emerge. Recent reviews of 16 short term studies relating glycemic index to hunger, satiety and voluntary food intake demonstrated beneficial effects of low glycemic index meals compared to high glycemic meals<sup>6 7</sup>. For example, in one study obese children were given a high glycemic index meal or low glycemic meals with identical calorie and fat, protein and carbohydrate content for breakfast and lunch. Their voluntary food intake/ energy consumption was monitored throughout the following afternoon. Energy intakes were 53% higher after the high glycemic index compared with the low glycemic index meals<sup>8</sup>. In another study, obese, hyper-insulinemic women lost significantly more weight (16 pounds vs 10 pounds) after 12 weeks of consuming an energy restricted low glycemic diet compared with a high glycemic index diet<sup>9</sup>. In 2002,

researchers evaluated whether a low glycemic diet versus a high glycemic index diet could modify blood glucose and lipid metabolism as well as total body fat in healthy, but moderately overweight men. Surprisingly this was the first study to show that replacing low glycemic carbohydrates for high glycemic index carbohydrates could result in a decline in body fat. Although there was no significant differences between the diet periods in terms of total weight loss, after 5 weeks of the low glycemic index diet, compared with the high glycemic diet period, resulted in a reduction in total fat mass (~1 lb of abdominal fat) and a small gain in lean body mass<sup>10</sup>. Lastly, in a recent study with 14 obese adolescents, subjects were treated with either a reduced glycemic load diet or a conventional, low fat diet. Both groups also received behavioral therapy and physical activity recommendations. After 6 months of treatment, subjects on the reduced glycemic load diet experienced a significant decrease in body mass index (BMI) and fat mass compared to those in the conventional diet treatment group<sup>11</sup>.

**Preventing & Treating Diabetes**- Large, prospective, population based studies have helped formed the hypothesis that a diet with a high glycemic load or index may lead to type 2 diabetes. For example, findings from the Nurses Health Study using data from over 65,000 women, found those eating the highest glycemic load diets had a 40% greater risk of developing type 2 diabetes than women with the lowest glycemic load diets<sup>12</sup>. In addition, in the Physician's Health Study using data from over 42,000 men, those with the highest glycemic load diet in combination with lowest fiber intake had a 2 fold increase in diabetes risk<sup>13</sup>. However, not all studies have found similar results. For example in the Iowa Women's Study of nearly 36,000 postmenopausal women, no association between dietary glycemic index or load and diabetes incidence was found<sup>14</sup>. Although not all studies have been positive, it's important to realize that these types of studies (epidemiological studies) can only show associations and do not prove cause and effect like randomized controlled trials do.

For those with diabetes, randomized controlled trials have been conducted examining the efficacy of low glycemic index for blood sugar management. The findings however have been mixed and as a result, the issue of the glycemic index and its utility for managing diabetes has been fraught with controversy among leading diabetes experts. To help resolve this controversy, researchers recently conducted a meta-analysis of available studies on this topic<sup>15</sup>. The findings of this analysis provide evidence that low glycemic index diets improve blood sugar control over and above that obtained by conventional or high glycemic index diets. For people with diabetes, implementing a low glycemic index diet lowered A1C values (a blood test measuring long term blood sugar control) by 0.43% when compared with a high-glycemic index diet. These results were also consistent with findings from the EURODIAB study, a study involving nearly 3000 Europeans with diabetes which found glycemic index of self selected diets was positively and independently related to A1C levels<sup>16</sup>.

**Heart Disease & Lipid Metabolism**- The glycemic index or glycemic load of the diet has been linked to heart disease and abnormal blood lipids in several ways. First, high blood sugar and insulin levels that result after eating a high glycemic index diet may worsen existing or contribute to the development of insulin resistance or metabolic syndrome. In these conditions insulin, the hormone produced by the pancreas that helps move sugar from the blood into cells is not working properly. As a result, blood sugar

levels remain too high leading to a number of health issues (for example diabetes and its complications). Insulin resistance has also been associated with high blood triglycerides, low levels of HDL cholesterol (the good cholesterol) and high blood pressure - all risk factors of heart disease. Like the relationship between glycemic index and diabetes risk, a relationship between dietary glycemic index and heart disease risk was also seen in the Nurses Health Study. Women in that study who consumed the highest glycemic index diet increased their risk of heart disease by 57%<sup>17</sup>. Data from the NHANES III study indicates a relationship between dietary glycemic index and low and HDL cholesterol levels US adults. HDL cholesterol is a powerful predictor of the development of heart disease. The higher the HDL cholesterol level the less likely the development of heart disease. In this study, subjects with the highest glycemic index or load diets had the lowest HDL blood cholesterol levels<sup>18</sup>. And most recently, a 10 week randomized controlled trial compared the effects of a low fat, high glycemic index diet and low fat, low glycemic index diet on weight loss, appetite and blood lipids. All diets were equal in the number of calories, fiber and vitamin and mineral content. Results of the study found no difference in weight loss among subjects however, those subjects on the low fat, low glycemic index diet had a 10% drop in LDL cholesterol compared to a small increase of about 2% in the group fed the low fat, high glycemic index diet<sup>19</sup>.

**Cancer**- The hypothesis that a high glycemic diet may be associated with an increased risk of certain forms of cancer is just beginning to be studied. It has been suggested that high glycemic index foods result in high levels of circulating insulin, which may promote cancer by boosting certain factors that promote abnormal cell growth. Most studies suggesting this connection are observational in nature. For example, a case controlled study in over 5000 Italian women showed a significant association between breast cancer risk and glycemic index and load of the diet. Women with the highest glycemic index or load diets had a 30% increased risk of breast cancer<sup>20</sup>. Other recent studies suggest dietary glycemic load may increase pancreatic and ovarian cancer risk<sup>21</sup><sup>22</sup>. Because a number of dietary factors could be related to cancer risk (ie. fiber, fat, vitamins and mineral intake) more long term studies are needed in this area.

### **Why the Controversy?**

Despite the growing scientific evidence linking the glycemic index and glycemic load of the diet to disease risk, the nutrition community is still deeply divided over what role the glycemic index should play in dietary recommendations for the general public. In Europe, Canada and Australia the concept of the glycemic index is widely accepted and incorporated into dietary guidelines for managing diabetes<sup>23</sup>. However, despite their acknowledgment that use of low glycemic index foods may reduce the rise in blood sugar that occurs after eating, organizations like the American Diabetes Association have yet to recommend low glycemic diets as a primary dietary strategy for diabetes management<sup>24</sup>. So why the big difference in opinion? Well, most of the controversy stems from the mixed results of many studies, concerns about how to determine the GI and GL value of foods and individual variations in blood sugar response to carbohydrates. While these are important issues that need to be resolved, the concept of the glycemic index is not harmful and when not used in isolation can be a useful tool in helping to make healthy food choices.

## How to Use the Glycemic Index

Despite the lack of nutrition expert consensus, research does show a positive relationship between a low glycemic index diet and reduced risk of heart disease, diabetes and certain forms of cancer. And additional studies suggest a low glycemic index diet can help increase satiety, help maintain blood sugar control and improve blood lipid levels. Using the glycemic index doesn't have to be complicated. The first step is to begin by eating a healthy, balanced diet based on a variety of foods. Choose a plant based diet, low in saturated fat, high in fiber and rich in vitamins, minerals and antioxidants nutrients. Nutrition experts do agree that this type of diet can help achieve a healthy weight, is associated with feelings of fullness and satiety and reduces chronic disease risk. The second step is to begin looking at the type of carbohydrate foods you eat. Substituting a high glycemic index food choice with a lower glycemic index food choice at each meal or snack can significantly reduce the overall glycemic index value of your diet. In addition combining lean protein foods and healthy fats (unsaturated fats) with a high glycemic index carbohydrate food choice can also help reduce the overall glycemic index value of a meal. For detailed information about the glycemic index and glycemic load of commonly eaten foods visit:

<http://www.ajcn.org/cgi/content/full/76/1/5>.

## Shaklee Products Make it Even Easier!

And to make it even easier to use the glycemic index to guide your food choices, Shaklee introduces four great products scientifically proven to have a low glycemic index value<sup>25</sup>. **Shaklee Meal Shakes, Slim Plan Gold™, Energizing Soy Protein** and **Multi-Munch Protein Boost Energy Bar**. **Shaklee Meal Shakes** is a great tasting, drink mix packed with vitamins, minerals and fiber designed for use as a meal or snack for the entire family. **Shaklee Slim Plan Gold™**, provides a combination of protein, carbohydrate, healthy fat and a good source of fiber to help sustain energy while trying to lose weight. **Energizing Soy Protein** is a great source of high quality protein offering all the health benefits of soy and **Shaklee Multi-Munch Protein Boost Energy Bar** is a great snack chocked full of soy and whey protein, fiber and essential vitamins and minerals. All four products have been designed to help you achieve a healthy, well balanced diet while maintaining stable blood sugar levels sustained feelings of energy.

Using scientifically valid methods to assess the glycemic index value of foods, all four Shaklee products underwent recent GI testing at the Human Nutrition Unit at Sydney University in Australia. Sydney University has been at the forefront of glycemic index testing research for over a decade and has determined the GI value of more than 400 foods. In 1999, the Human Nutrition Unit established a commercial GI testing unit called Sydney University's Glycaemic Index Research Service to meet the increasing demand for GI research by food manufacturers and pharmaceutical companies world-wide.

Shaklee products were tested in human subjects and compared to a reference food (glucose) to determine their glycemic index value. Here are the results:

<b>Shaklee Product</b>	<b>GI Value</b>	<b>GI Category</b>
Meal Shakes	44	Low
Energizing Soy Protein	39	Low
Multi-Munch Honey Peanut Bar	32	Low
Slim Plan Gold	14	Low
Reference (glucose)	100	High

When compared to other products available in the marketplace - Shaklee products were also found to have a similar or lower glycemic index values:

<b>Product</b>	<b>GI Value</b>	<b>GI Category</b>
Skim Milk	32	Low
Soy Milk	40	Low
Ensure Vanilla	48	Low
Power Bar – Chocolate	83	High
Usana Fibergy Bar	45	Low
Cliff Bar Cookies & Crème	101	High
Ensure Bar	43	Low

### **Feel Great with Shaklee Low Glycemic Index Products**

Shaklee’s approach to achieving optimal health has always included recommendations to eat a well balanced diet, get regular physical activity and take dietary supplements. Together these lifestyle behaviors offer protection from developing many debilitating, chronic diseases. But what’s a healthy diet? Well – one thing nutritionists do agree on is a healthy diet is one that is moderate in carbohydrate and low in saturated fat and based on plant foods including fresh fruits and vegetables, soy protein and unprocessed, whole grains. Although controversy still exists about how best to incorporate the glycemic index into public health practice, learning how to use it in combination with basic nutrition principles makes good scientific sense. While you can be assured Shaklee health scientists will follow the progression of GI science closely, you now have four great Shaklee products with a low glycemic index to incorporate into your daily routine, starting today. Simply substitute these items for high glycemic index food choices every day and you will notice the difference in how you feel. **Shaklee Meal Shakes, Energizing Soy Protein, Multi-Munch** and **Slim Plan Gold™** - scientifically proven to have a low glycemic index value to help to stabilize blood sugar and make you feel great.

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