



The Glycemic Index and Performance



So you know that carbohydrates give us the fuel to train and excel in sport, but with so many food sources to choose from it can be difficult to know which ones to eat and when we should be eating them.

Carbohydrates, used to be thought of as either 'simple' or 'complex'. With foods high in sugars considered 'simple', and it was assumed they would be digested quickly and cause a rapid increase in blood sugar levels shortly after their intake. Whereas foods high in starches are known as 'complex' and thought to be digested and absorbed slower, causing a flatter and sustained blood glucose response.

However research into food and blood glucose response has changed this classification system with the actual response to the consumption of foods being measured. Blood glucose responses can be measured by eating 50g of carbohydrate from a test food, compared with the response from 50g portion of glucose. These figures are converted into a percentage or index, known as the glycemic index (GI).

Some 'simple' carbohydrates foods have a low GI while some 'complex' carbohydrate foods have a high GI therefore it is impossible to predict the response from the chemical composition. GI is also affected by the composition of the meal with protein and fat slowing the digestion and absorption of the carbohydrates lowering the GI, i.e. potato crisps have a lower GI than a baked potato. GI is also influenced by the type of carbohydrate, the cooking method and processing, dietary fibre, anti nutrients such as phytes and tannins. And it is important to consider the whole meal when considering the GI and not just the carbohydrate component so interpret it with caution.

Low GI foods have an index of 55 or less and result in a slow and small rise of blood glucose concentration and insulin. Moderate GI foods have a GI of 56 – 70. High GI foods have a GI of 71 or higher and result in a rapid rise in blood glucose concentration. See the diagrams for lentils (low GI) and baked potato (high GI) below.

Low GI response...

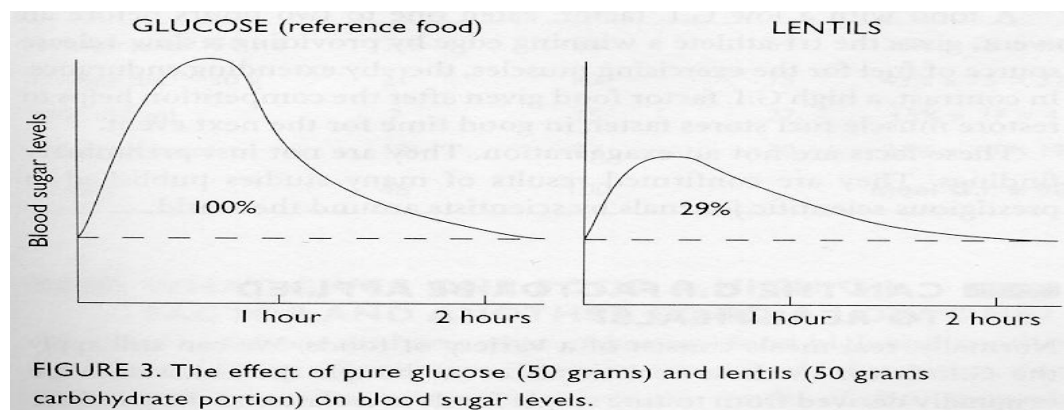
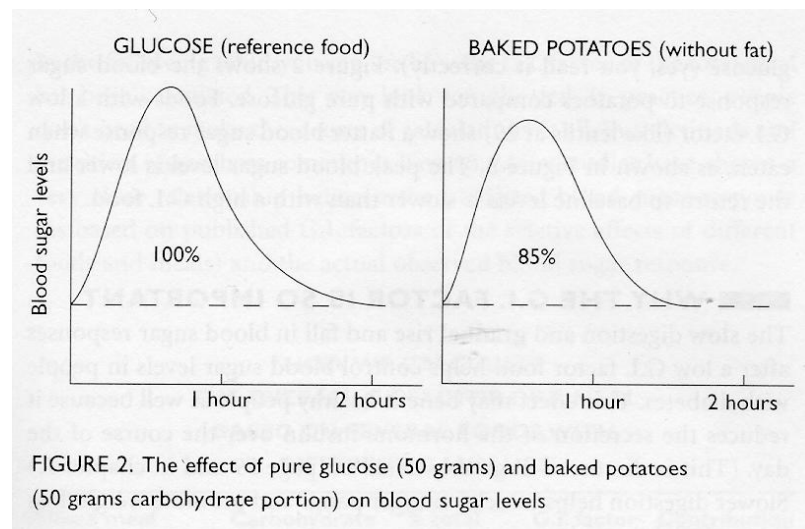


FIGURE 3. The effect of pure glucose (50 grams) and lentils (50 grams carbohydrate portion) on blood sugar levels.

High GI response...



The GI value indicates how rapidly a particular carbohydrate appears as glucose in the circulation but does not take into account the amount of food that is normally consumed. This is measured by glycemic load (GL), taking in account composite meals. For example the carbohydrate of a watermelon has a high GI but there is not a lot of carbohydrates in it, so the GL of watermelon is relatively low. GL of 20 or more is high, GL of 11-19 is medium and GL of 10 or less is low.

Below lists a number of foods with high, moderate and low GI with their GL.

High GI (>70)	GI	GL (per serve)	Moderate GI (56-70)	GI	GL (per serve)	Low (<55)	GI	GL (per serve)
Glucose	99	10	Boiled rice, white	64	23	Honey	55	10
Boiled potato	101	17	Porridge	58	13	Sweetcorn	54	9
Baked Pot	85	26	Croissant	67	17	Carrots	47	3
Isostar	70	13	Muffin	60	17	All Bran	42	9
Bagel	72	25	Coca Cola	58	16	Baked beans	48	7
Baguette	95	27	Fruit cocktail	55	9	Orange juice	50	13
Cornflakes	81	21	Mars bar	65	26	Lentils	30	5
Rice cakes	78	17	Ice cream	61	8	Boiled spaghetti	38	18
Shredded wheat	75	15	Baguette & butter/jam	62	26	Kidney beans	28	7
Cereal bar	77	19	Digestive	59	10	Wheat bread	53	11
Scones	92	7	Cookies	64	20	Rye bread	41	5
popcorn	72	8				Smoothie	33	14
Cheerios	74	15				Muesli	49	10
Watermelon	72	4				Potato crisp/chip	54	11
Lucozade, original	95	40				Low fat ice cream	50	3
						Plain milk chocolate	43	12
						Skim milk	32	4
						Full fat milk	27	3
						Yoghurt	36	3
						Apple	38	6
						Banana	52	12
						Peanuts	14	1
						Fructose	19	2
						Grapes	46	8
						Peach	42	5
						Orange	42	5

So why consider the GI..?

The GI is a valuable nutrition education tool in a number of areas of clinical nutrition. Following a low GI diet can be useful for Diabetes where blood glucose control is vital, reducing the blood glucose response to ingested carbohydrates. A low GI diet can help manage body weight, reducing the insulin response and help reduce the appetite. And it has been shown to reduce high blood lipid levels.

Manipulating the GI of meals may be useful in sports nutrition to optimise carbohydrate availability for exercise. This is particularly useful for sports or activities involving prolonged, moderate intensity exercise.

Pre Exercise

A high carbohydrate meal or snack within the 4 hour period before exercise improves endurance or performance and helps provide additional energy late in exercise by topping up liver and muscle stores by gradually releasing carbohydrates during the activity. However, a potential disadvantage of eating too many carbohydrates prior to **prolonged exercise** is the that the muscle rely more on carbohydrate for fuel and may cause a drop in blood glucose levels during the first 30 minutes of exercise, this

suppressing the release of fat as an energy supply and cause a reliance on the carbohydrate stores. Therefore it is important that the athlete eats enough carbohydrates daily and at regular intervals to allow the body to have back up stores to metabolise once the energy consumed prior to the exercise has been used. However in most situations blood glucose is self corrected and have no ill effect, only affecting a few sensitive individuals. These effects have been found in a few **endurance athletes** during prolonged exercise.

By consuming a lower GI meal prior to prolonged exercise may help stabilise blood glucose levels and enhance carbohydrate availability throughout. Good low GI options within the 4 hour period are porridge, milk and sugar, flavoured yoghurt and apple juice or baked beans on multi grain bread. However low GI foods are often high in fibre and may cause gastro intestinal problems if consumed too close to intense exercise.

During Exercise

The metabolic impact of the pre exercise meal will be minimised if carbohydrates are consumed throughout from an early stage, this also prolongs the carbohydrate stores and energy available for the exercise bout. Choices should be easily digested and absorbed to provide a rapid source of energy. Good sources are sports drinks and bars.

Post exercise

In recovery glycogen resynthesis is maximised with high GI foods. It is important to enhance post exercise refuelling by consuming adequate amounts of carbohydrate (1-1.2g per kg body weight immediately after exercise and a total of 6-8g per kg body weight per day depending on activity levels). While low GI carbohydrate rich foods can contribute to total carbohydrate intake, it makes sense to focus on carbohydrate rich foods and drinks with a moderate to high GI. Good choices post exercise would be sports drinks, soft drinks, and honey sandwich etc followed up with a meal.

Training Diet

The GI can be a useful tool when considering what and when to eat but as an athlete following a strict low GI diet is unlikely to provide all the nutrients and energy required for a heavy training load. Low GI foods are often low in energy and high in fibre and may not provide enough overall energy for training as the available carbohydrates will be lower.

Therefore the nutritional value of carbohydrates should still be the number one consideration. And as an athlete it is also vital to consider gastric comfort, practicality, cost and taste and especially the goals and needs of the situation.

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