Glycaemic Index – Is it the right measure?

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Glycaemic Index (GI) is currently being embraced by the media and some food manufacturers as a valuable tool in weight management. GI is a very useful 'ranking' system for similar carbohydrate-rich foods. It is a measure of the relative area under the glycaemic response curve when 50 grams of available carbohydrate is consumed relative to a standard food such as glucose. Other terminology such as glycaemic load (GL), glycaemic response (GR), insulin index (II) and glycaemic glucose equivalents (GGE) are also being debated, particularly in healthcare professional circles.

This article discusses the viability of these different terms and asks which definitions are likely to most appropriately reflect post-prandial glycaemic and insulin response benefits, whilst facilitating consumer understanding and acceptance. The article highlights the need for the food industry to be responsible and avoid making misleading claims. Existing labelling formats and strategies are compared and expert opinions offer a balanced, authoritative viewpoint.

Introduction

Glycaemic index (GI) is the current hot topic in weight management. Magazine stands and bookshops are laden with publications advising on how to "GI your plate" to achieve lasting weight loss results [1]. More recently, the public has been introduced to the concept of glycaemic load [2]. But what is the most accurate way of describing the glycaemic effect of carbohydrates?

This article explores the terminology currently being embraced in the consumer and healthcare professional arena, and offers areas of reflection that may help us to agree an appropriate description.

To begin to answer this question, it is relevant to examine the definitions of the different terms used to discuss post-prandial blood glucose responses.

Glycaemic index (GI)

This is the relative area under the glycaemic response curve when 50 grams of available carbohydrate is consumed relative to a standard food such as white bread or glucose. 'Available carbohydrate' means carbohydrate digested in the small intestine. So, if a food were 50 per cent available carbohydrate and 50 per cent fibre (unavailable carbohydrate) then 100 grams would be consumed and compared to 50 grams of glucose. GI is a very useful 'ranking' system for similar carbohydrate-rich foods.

Most current scientifically-validated methods use glucose as the reference food. Using glucose as the standard gives glucose a GI value of 100. This has the advantages in that it is universal and it results in maximum GI values of approximately 100. The GI value when using white bread as a standard is 1.4 times the GI value when glucose is used as the standard. In Japan, boiled white rice is also used as a standard as this is more meaningful than white bread.

The first categorisation of GI was published by Jenkins et al [3]. Ranges for low, medium and high GI values have been proposed as follows:

- Low GI - 55 or less
- Medium GI - between 56 and 69
- High GI - 70 or more

The glycolic effect of foods depends on a number of factors, such as:

- the type of starch (relative amounts of amylose and amylopectin)
- amount and physical structure of the food
- fat content
- protein content
- pH level of the meal.

GI applies to foods that contain carbohydrate. High fat and high protein foods, such as meat, eggs, nuts and cheese, are not relevant for GI measurement. Furthermore, because many fruits and vegetables (but not potatoes) contain very little available carbohydrate per portion, they may have very low GI values.

Any foods with very low available carbohydrate are difficult to measure the GI. For example, for raw carrots with a carbohydrate content of only 6 per cent, to consume 50 grams of available carbohydrate the test subjects would need to eat 833 grams (6 cups). So the GI result may be more an impact of the time taken to eat the food than the quality of the carbohydrate itself. Additionally, whether carrots test as low or high GI, they are still a valuable part of a balanced diet.

An important advantage of GI as a measure is that it is indexed to a standard and this is measured in the same subject. This reduces the inter-person variation in the result. Each individual responds differently to carbohydrates, but people who tend to have a high response to a food will also have a high response to the standard and those with a low response to a food will have a correspondingly low response to the standard – both groups will therefore have similar GI scores. This makes GI a relatively robust measure compared to simply measuring glycaemic response. The variation in measurement of GI between different test laboratories is, however, still an issue.

Glycaemic load (GL)

This provides a measure of post-prandial blood glucose response and insulin demand produced on eating an average portion of a carbohydrate-rich food. It is calculated mathematically by multiplying the GI value by the total carbohydrate content of the serving size of the test food:

$$GL = \frac{(GI \times \text{carbohydrate per serving})}{100}$$

GL will be highest in foods that provide the most carbohydrate, regardless of the quality of carbohydrate. Low GL diets are often low in carbohydrate.

Glycaemic response (GR)

This is the actual blood glucose response experienced when eating a food or meal. The speed and level of the rise and fall in blood glucose levels is described as the glycaemic response. GR is best represented by the graphical plot of the blood glucose level over time. Carbohydrates that are quickly digested into the bloodstream and cause blood glucose levels to rise rapidly have a high GR. Examples are white rice, sweet biscuits and white bread. Slowly digested carbohydrates, such as those found in raw vegetables, beans, intact wholegrains and many fibre-rich foods, are

said to have a low GR. A lower GR provokes a lower insulin demand. GR may be more relevant for evaluating products containing polyols and other non-digestible (i.e. non-available) carbohydrates, such as high-amylose resistant starch.

Insulin index (II)

This compares post-prandial insulin responses to portions of foods producing 1000 kJ (239 kcalories or Calories) of energy [4]. The test is conducted on healthy subjects and finger prick blood samples are analysed every 15 minutes over a period of two hours. An insulin score is then calculated from the area under the insulin response curve for each food using white bread as the reference food, which has a score of 100 per cent.

It has been proposed, by Holt *et al* [4], that tables of GI values are a useful guide to help people choose carbohydrates that produce a smaller GR when compared to other carbohydrate-rich foods. However, they raise the issue that the GI concept does not consider concurrent insulin responses. It is relevant to assess insulin responses, especially since this is associated with undesirable lipid profiles, body fat and insulin resistance. Insulin secretion is generally assumed to be proportional to post-prandial blood glucose levels.

It is particularly pertinent to understand that carbohydrate is not the only stimulus for provoking an insulin demand. Protein and fat can also stimulate insulin secretion and this happens without increasing blood glucose concentration.

The Holt *et al* study compares the insulin effects of isoenergetic foods and reveals some interesting results. For example, fish elicited twice as much insulin secretion as the equivalent portion of eggs. Wholemeal and white bread had similar scores, as did brown and white versions of rice and pasta. On average, protein foods may provoke a high insulin demand per gram of carbohydrate. Yoghurt scores high on the insulin index and beans score higher than cornflakes. Insulin index on its own may not offer an appropriate approach, but the findings need to be considered and the area of insulin response requires further research.

Glycaemic glucose equivalent (GGE)

This is the portion of available carbohydrate that elicits a blood glucose response. The term is similar to 'net carbohydrate' and can be a useful guide to consumers wishing to reduce their intake of sugars and fast carbohydrates, thus encouraging the consumption of non-digestible carbohydrates such as fibre (non-starch polysaccharides, NSP).

So should we be talking GI, GL, GR, II, GGE or something else?

From the emerging evidence, it appears that the crucial element is the choice of slowly digested carbohydrates over those that are more rapidly digested. It is about the quality of carbohydrate, not quantity. GI refers to the rate of digestion; it is an intrinsic property of the food, reflecting its quality.

GL is analysed from the original GI and reflects the quantity of carbohydrate in particular. Since the key is to choose low glycaemic carbohydrates, a low GL diet may not necessarily offer the glycaemic benefits of a low GI diet. For example, a low GL meal of a normal portion of pasta (a classic low GI food) could have the same GL as a small serving of mashed potato (a high GI food). However, small amounts of mashed potato have not been shown to offer the glycaemic benefits (e.g. balanced energy) of low glycaemic carbohydrate foods, whether low GI, GR or GL.

Atkinson *et al* [5] comment that GL remains an unproven concept without evidence and that the calculated GL predicts blood glucose and insulin responses to mixed meals. In their randomised crossover study of 11 overweight or obese females, they conclude that GL was significantly correlated with glucose and insulin. GI variation had a stronger effect on glucose response than

varying the carbohydrate, but only the carbohydrate amount had a significant effect on insulin response. The researchers conclude that "dietary GL has a predictable effect on day-long glucose and insulin responses in overweight and obese females. Diets with lower GL may be helpful for weight control."

Macmillan-Price *et al* [6] comment that recent meta-analyses have shown that weight loss achieved with ad-lib low fat diets is typically around 3-4 kg. Although statistically significant, they comment that this is a modest weight loss and is usually regained after the intervention stops, and also that low fat messages do not seem to impact on rising rates of obesity. They postulate that alternative approaches include low GI and high protein diets, both of which will effectively reduce the GL of the diet and may be effective in increasing satiety and ad-lib energy intake. These approaches can be used within the context of a reduced fat diet and there is emerging evidence to suggest that this may improve body composition outcomes. GI may be a particularly useful dietary strategy for the prevention of weight re-gain.

As reported recently in the *American Journal of Clinical Nutrition* [7], Nurses' Health Study researchers used GL measures to assess the impact of carbohydrate consumption on 280 postmenopausal women. They found that high GL diets (and, by extension, high GI foods and greater total carbohydrate intake) correlated with lower HDL concentrations and higher triglyceride levels. The strongest association was in overweight women with a body mass index (BMI) of more than 25. The results of the study show that both the quantity and quality of carbohydrate intake, as measured by overall GI, were directly related to HDL and triacylglycerol levels.

Diets that offer low GI carbohydrates have a favourable effect on cardiovascular risks, far more than the percentage of carbohydrate. There is evidence to suggest that low GL diets facilitate weight loss. GL can be manipulated by lowering carbohydrate and replacing it with protein or fat. Metabolic effects of high protein diets are not the same as those elicited with a low GI diet.

The Atkins way of eating appears to offer a low GL diet, where carbohydrate quantity is severely restricted. Cutting out all carbohydrates is not considered a nutritionally sound method of lowering insulin demands.

Supporters of the GL concept often highlight anomalies within the GI system, such as carrots. The data from the first study on carrots suggested a GI value of 92 ± 20 and the latest study a GI of 32 ± 5 [8]. Carrots should be considered as low GI. The first study was based on too few subjects and the resulting average was skewed. This error made the GI concept controversial from the beginning.

In general, substituting high GI carbohydrates with low GI versions appears to offer slow digestion and consequent glycaemic benefits. It is only in a small number of circumstances (chocolate and watermelon for example) where it may be considered more appropriate to evaluate both quality and quantity of carbohydrate. Professor Jennie Brand Miller *et al* [9] advise the public to ignore the GI of certain foods that contain so little carbohydrate when consumed in normal quantities. Such foods include watermelon and pumpkin.

A joint committee set up in 1997 by the Food and Agriculture Organization (FAO) of the United Nations and the World Health Organization (WHO) endorsed the use of the GI method for classifying carbohydrates [10]. They recommended that GI be used with nutrition information data to guide food choices. The committee recommended a high-carbohydrate diet (55 per cent of energy from carbohydrate).

GI has been criticised for the following reasons: a limited range of data, some variation in GI measurements, GI values affected by cooking or preparation method, difficulty in predicting GI

values within mixed meals, daily fluctuations in an individual's GR and no relation to actual serving sizes.

Dr Anthony Leeds of King's College London, comments:

> *"GI is important but it makes no more sense to focus exclusively on GI than it would to focus exclusively on the fatty-acid pattern of dietary fat. It took many years to achieve some public understanding of dietary fibre, before concepts of fibre quality and fibre-like properties of other carbohydrates could be introduced as ideas. Let's achieve public understanding of GI, then 'refine' the topic with information about GL. GI reflects food quality; GL reflects food quality and quantity. The research evidence available today shows that both have relevance to varying degrees in different areas such as blood glucose control and energy intake."*

GI is a useful measure for comparing similar types of foods but it has not received universal acceptance. It measures blood glucose, so GI is suitable for a comparison of glucose, maltodextrins and starchy foods. However, not all carbohydrates are glucose derivatives. Sucrose digests rapidly but the GI test only measures the glucose fraction, giving sucrose (white table sugar) a medium GI. Therefore, simply focusing on low and medium GI foods may encourage the consumption of less desirable foods. Another exception to the value of GI is fibre (NSP). Fibre is not digested into blood sugar, but is fermented in the large intestine and is excluded from the calculations of GI. However, fibre-rich foods are indeed an important part of a balanced diet.

GI is a number that refers to 50 grams of available carbohydrate relative to glucose, whereas GR is a term used to describe the area under the glucose curve for a serving of food as eaten (50 grams of total carbohydrate instead of excluding dietary fibre). The GR of foods can be lowered, for example by the inclusion of resistant starch – a type of dietary fibre. Since resistant starch is only partially digested in the small intestine, it helps to lower post-prandial glycaemia. Numerous studies have measured both GR and GI in foods containing high-amylose resistant starch [11]. There has been a demonstration of a trend whereby high-amylose maize starch can lower the maximum blood glucose response and reduce the area under the blood glucose response curve.

Research by Dragon Brands conducted on small focus groups in 2005 (www.fdin.co.uk/seminars) suggests that consumers believe GI dieting is based on real food and common sense and is more of a healthy lifestyle rather than a diet. The research revealed that consumers likened the GI diet to Rosemary Conley's way of eating rather than the Atkins 'fad'. Although a low GI diet appeared to be based on science, they did report a lack of medical consensus and were not sure whether doctors supported low GI eating. There were split attitudes on the appropriateness of GL and the groups were generally unaware of what GL meant. It was generally considered that GL is more relevant to strict dieters and conjures up similarities with the Atkins type of eating. It did not appear to get the approval of healthy eaters, since it implied restriction and dieting.

So what is the way forward?

What we need is a balanced approach, one that embraces current Food Standards Agency national guidelines and common sense. For example, table sugar has a lower GI than glucose and many cooked starchy foods but that is because table sugar is 50 per cent glucose-based and 50 per cent fructose-based. Fructose is a sugar that is not detected in the GI test. Yet, it does not make sense to encourage excess consumption of table sugar. Foods that do not contain carbohydrate could be assigned a GI value of zero. In theory, therefore, a low GI diet can be composed of healthy low glycaemic carbohydrates accompanied by high fat, high protein foods

such as fatty processed meat and full fat cheese. Using GI, GL or GR in isolation does not encompass sound nutritional guidelines.

Not all carbs are created equal…

Modern lifestyles have seen an increase in consumption of fast carbs and there are clear advantages to encouraging consumption of fibre, intact wholegrains and slowly digestible material. Official guidelines suggest that the best approach to healthy eating is to consume around half of our daily calories from carbohydrate foods. There is currently no differentiation between wholegrain and refined varieties, or of any relationship with glycaemia. Could it be that this view of carbohydrates is too simplistic? Or that the lack of differentiation is actually contributing to the rise in conditions such as obesity, diabetes and cardiovascular disease? Is it time to explore more fully the value of quality of carbohydrate, much in the same way we currently do for fat? So our obsession with the level of carbohydrates in foods should shift towards an informed choice based on the type (quality) of the carbohydrates.

The options out there…

1. Proprietary consumer research in the USA in 2004 conducted on behalf of National Starch Food Innovation suggested that consumers may have a negative image of GI and associate the term 'glycaemic' with words such as hypo/hyperglycaemia, mood swings, fainting, mental confusion, blood sugar, dizzy, shaky, grumpy, diabetes and insulin. This survey implies that for now, the word 'glycaemic' may have a negative image. 'Energy balance' or 'longer lasting energy' terminology may have broader appeal. There is anecdotal evidence that GI is confused with the G1 diet (G-one) and an American army official (GI as General Infantry). There also appears to be confusion as to what is better/worse in terms of high or low GI. Anecdotal evidence suggests that some consumers believe 'high GI' is better (for general health) as we all want 'more' of everything. Clearly there is a need for education and clear communication.

2. Resistant starch is naturally present in many whole foods such as fruit and vegetables, lentils, pasta and intact wholegrains. However, food processing can cause a starch to lose its resistance and become more digestible, thereby increasing the GR. As the demand for healthy yet convenient food grows, manufacturers may use resistant starch in an effort to improve the overall nutritional and glycaemic profile of their products. However, any initiative by manufacturers must be done responsibly. Simply including resistant starch to an otherwise unhealthy food to obtain a low GR is not necessarily going to offer health benefits. The food industry must be vigilant not to use GI labelling for commercial reasons only, as such labelling can mislead the consumer.

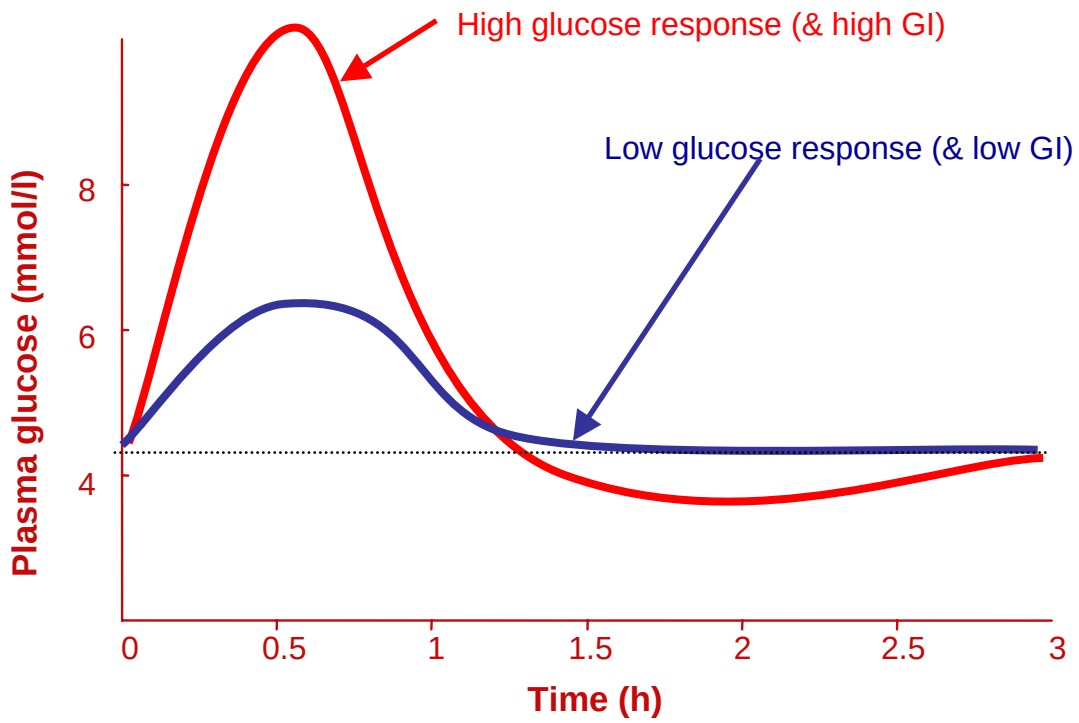
The research to date suggests that slow carbs offer glycaemic benefits to health, benefits that are not necessarily conferred by low carbs. Adding ingredients such as polyols and resistant starch can offer glycaemic benefits, but because they are not counted by GI testing methodology, it is unlikely that the addition of such ingredients will significantly alter the GI of the product. The dilemma is to convey the glycaemic benefits to consumers, which may or may not relate to GI, but which convey messages that are simple, clear and accurate. We also need to guard against GR concepts promoting low carb foods that are inconsistent with current dietary recommendations.

The use of a GR graph (see Figure 1) on packaging in the actual serving size as eaten may be a simple way of giving consumers information on what actually happens when you eat the product. Danone's EDP biscuits are an example of this.

3. The authors of the Gi Plan [12] propose a system that is based on GI, energy density and portion size. This is one example of how the limitations of using GI on its own can be reduced

while incorporating nutritional balance into meals. Foods that offer a favourable GI but are high in saturated fat or calories are given a correspondingly higher GiP (Gi Plan) value.

Figure 1: Glucose responses in healthy adults



Low glycaemic index (GI) results from low glucose response (GR) in the blood and is associated with low insulin response

Consequently, less desirable foods are discouraged, regardless of whether or not they offer a low GI value. The system does not promote low carbohydrate eating and therefore a variety of foods from all food groups is encouraged.

4. Nairns oatcakes use a combination of GI and GL on their packaging. References are made to blood sugar and energy levels. The packaging has a caption indicating that a serving of two oatcakes contains four GLs and that these oatcakes are a low GI food. In general, unsweetened oatcakes will all offer low GI/GL benefits.

5. The most prominent and successful example of how GI labelling can be more holistic than the current UK initiatives is from Australia (www.glycaemicindex.com). Foods are assigned the University of Sydney GI tested symbol (see Figure 2) only when they meet a set of strict nutritional criteria.

Figure 2

Kaye Foster-Powell, Accredited Practising Dietitian (Sydney) and co-author of The New Glucose Revolution series, remarks:

> *"Although there are self-proclaimed experts touting the benefits of a low GL diet and implying there are errors in considering the GI alone, the science tells us that the GI is really the most important characteristic of the diet and experience shows us that it is the most readily understood by consumers. Although it's possible to achieve a low GL diet by reducing carbohydrate and increasing protein or fat, this fails to deliver the benefits of low*

glycaemic index foods. One of these benefits we term the "fill-up factor" and the other is the "easy on the insulin" effect. Consumers catch on to these concepts quickly once they have the image of a slow release food in mind. We've tried sharing the definition of GL with them but find it complicates things unnecessarily and confuses them. If they are comparing like with like, i.e., bread with bread or breakfast cereal with breakfast cereal then the carbohydrate content (being similar between the foods) and hence GL loses relevance. For those with diabetes we do discuss the concept of GL, but not in so many words – we simply make sure they understand that their blood glucose level is affected by both the type and the amount of carbohydrate that they eat."

Discussion

GL provides an estimate of the quantity of carbohydrate, though since it is derived from GI, it can be a reflection of carbohydrate quality also. However, research suggests that disease risk is predicted by both GI and GL. Therefore, in theory, neither GI nor GL should be used in isolation. The key is to encourage consumers to eat lots of good quality carbohydrate foods. Simply using GI with no other nutritional advice may encourage excessive consumption of foods that may not offer the best nutritional value (such as chocolate, ice cream, high fat or high protein, and low GI foods). Similarly, focusing on GL or GR alone may promote a diet with very little carbohydrate, but a lot of saturated fat and excessive amounts of protein. In practice, it makes sense, at least for now, to make the best use of consumer interest in GI.

Calculating overall dietary GL is difficult outside a research setting. We don't all eat the same portion sizes and if we choose to eat a larger portion than that which might be stated on a label, the assigned GL value is no longer appropriate. The GI value however does not change with portion size. But it would not be appropriate for us to only consider GI, which one could infer to mean that you could eat all you want of a food so long as it offered a low GI rating.

Professor Jeya Henry, speaking at the Food and Drink Innovation Seminar in June 2005, stated:

"*GI recognises the intrinsic property of the food. In contrast, GL is predicated by the amount you eat. If GL is on a food label, different people will eat different amounts, so it is practically difficult to apply.*"

In general, the promotion of intact wholegrains, beans, lentils, fruit, vegetables, nuts and seeds, all make sound nutritional sense. So, wouldn't it be much easier to simply advise people to eat a diet rich in these foods, much the same as we have been doing over the years?

The reality is that this "sensible way of eating" is just not sexy enough for Joe Public. Perhaps the GI furore has helped dietitians and nutritionists to convey sound nutritional messages under the banner of something that may even appear sensational to the consumer. The media certainly sensationalises GI, but is this really a problem? Perhaps this is where fashion can meet fact and the hype around GI may actually be a blessing for those of us who can now latch our traditional healthy eating messages onto something that appears more funky and desirable. The key, though, is to convey these messages ethically without being misleading.

Professor Jennie Brand-Miller warns:

"*Beware GL and GGEs. Unlike GI, they do not distinguish slow carb from low carb. It's carbs we want, but the tricklers, not the gushers.*"

We also need to keep messages simple for consumers. Graphs may be better understood than scientific concepts around blood glucose. Perhaps graphical representation of carbohydrate quality is more appealing and simple than a series of numbers? The current use of low, medium and high GI offers another option. However, the industry needs to be careful not to promote foods that may offer a low glycaemic effect, but are inherently unhealthy. Since GI is affected by

factors other than carbohydrate quality (such as fat or protein), it is possible to boast a low GI label on a packaged food that may otherwise be undesirable. Obviously, GI, GL or GR have little to do with other elements of the nutritional composition, so factors such as sodium also need to be considered when promoting packaged processed foods.

Standard dietary advice on eating less fat while encouraging carbohydrates generally increases the glycaemic effect of the diet. Both quantity and quality of carbohydrate influence post-prandial blood glucose response. Typical high carbohydrate Western diets tend to be based on high GI foods such as low fat processed cereal products, potatoes and refined breads. This can result in a high GL and therefore an increased insulin response. Where insulin resistance is present, high GI foods may in fact provoke even more hyperglycaemia and insulinaemia. However, low GI yet high carbohydrate foods may help to maintain insulin sensitivity.

GI may indeed be the current buzzword. Tesco, M&S, Burgen, Warburtons, Nairns and others refer to GI on packaging. Consumers may not fully understand GI, but at least the term is familiar. Do we continue to use GI and build rapport with consumers? Can we use GI as a springboard to explain the value of keeping blood glucose, insulin levels and weight under control? When giving out dietary advice, we are trained to simply start from the known/familiar and lead them to the unknown new advice. It may be that we decide to start with familiar terms such as GI and lead them to the key attributes and benefits of good glycaemic control. We may introduce concepts such as energy balance, sustained energy release, avoiding blood sugar crashes, cycles of sweet eating (eat a sweet high GI food, blood glucose then goes down, so you want another one), and so on.

What we must do is focus on wider health issues, not just the slimming angle that the media are latching onto. Glycaemia has an important role to play in conditions such as insulin resistance and metabolic syndrome, diabetes, cardiovascular disease, polycystic ovarian syndrome and obesity. Let's use the slimming excitement on which to piggy-back our wider health promotion messages. In the end, if we get more people eating healthy low GI foods regularly, would it do any harm? Or would it encourage those foods we have been trying to push for decades? Perhaps the current climate is one of GI, and if that is what consumers appear to be attracted to, let's take advantage of it. But it doesn't stop there.

The Food Standards Agency have proposed a nutrient profile model (http://www.food.gov.uk/healthiereating/nutres/nutprof/) and have identified that an alternative approach to take account of carbohydrate quality warrants further investigation. The Gi Plan offers one way of reducing the limitation of using GI in isolation. The Australian trademark certification programme on GI values offers us a successful model that incorporates GI within the context of balanced food choices. It may be worth considering implementing the Australian GI symbol on food labels as a means of helping consumers to select healthy low GI foods, assuming that there is merit in encouraging patient understanding of slow-release food.

Conclusions

So, is GI the right measure? Yes – from a sense of inevitability and already having critical momentum, GI is the measure that will dominate– at least for now.

While GI is not a perfect measure and should not be used in isolation, it is currently the most familiar term with UK consumers and the use of an alternative term could cause confusion in the whole glycaemic concept. The science behind the benefits of lower GI is robust and means that this is not a short-term fad. As part of a balanced diet (that is low in sugar and saturated fat), GI can help consumers make more informed choices.

The end-game, however, is about improved insulin management and insulin sensitivity, and this has multiple benefits. We must continue to reflect on whether any 'glycaemic' term is really going to work in the long-term in the UK. Perhaps we will adopt phraseologies that are seemingly more easily understood by consumers, such as energy balance or reduction in peaks and troughs of sugar/energy levels.

Here is the opportunity for healthcare professionals to fully make use of the media who, lets face it, have more impact on our patients than we could ever hope to achieve. In time, hopefully we will develop the best and most full explanation and terminology. But for now, it makes sense to work with what we have and indeed to take advantage of it. The time has come for us to distinguish between carbohydrates as we currently do for fat. It's about slow carbs, not low carbs. Carbs are fine, but it's the good carbs that really matter.

About the Author
Azmina Govindji is a consultant nutritionist and freelance registered dietitian. She began her career as a clinical dietitian specialising in diabetes and weight management. This led to her appointment as chief dietitian to Diabetes UK in 1987, where she acted as national consultant on diet and diabetes for eight years. Govindji now runs her own consultancy practice, providing dietetic advice to the food industry, healthcare professionals, the media and national organisations. A regular contributor to various magazines, television and radio programmes, Govindji is lead author of 'The Gi Plan' – a guide to healthy weight loss.

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